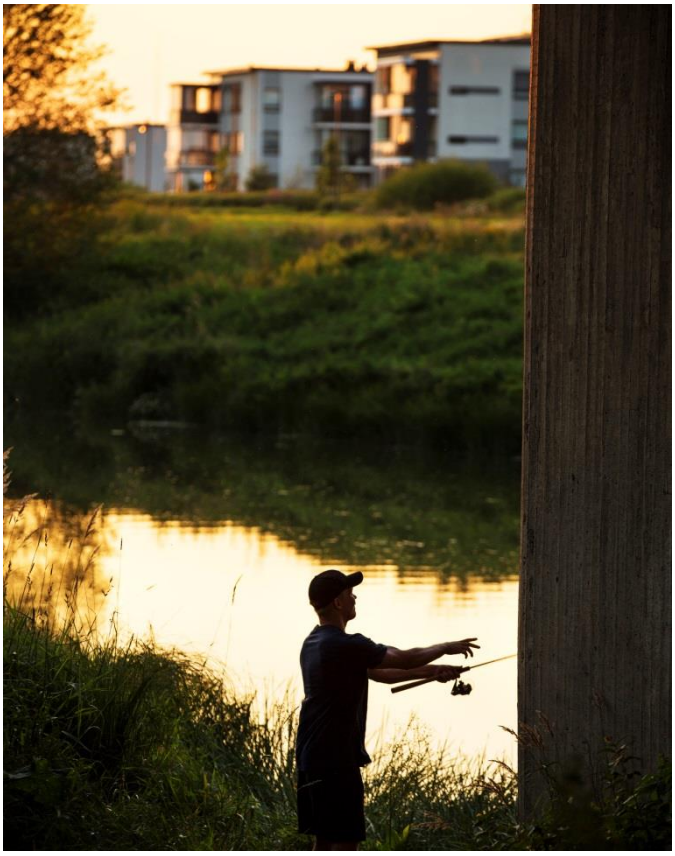
About Nordic Ecolabelled

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



Version 3.0

Background to ecolabelling
21 May 2015
Draft for consultation

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 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

Small houses, apartment buildings and pre-school buildings may be Nordic Ecolabelled. As from and including 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 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 Ecolabelled buildings are assessed on the basis of a lifecycle perspective, and fulfil high environmental and health requirements in terms of:

- low energy consumption
- construction supplies and materials
- chemical products controlled regarding health and environment
- a good indoor environment and low emissions
- a quality-assured construction process

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

Energy

The purpose of the energy requirement is that Nordic 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 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. See requirement O4 for the proposed percentage rates. To also apply household energy, the requirement is supplemented with stricter requirements of lighting and 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 in either new production or renovation. The economic incentives for residents to save energy by reducing indoor temperatures is so low that this might even be counter-productive. The requirement of individual measurement of domestic hot water has been changed from a mandatory 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.

Version 2 of the criteria gave the opportunity to win points if the building's energy performance exceeded the mandatory level. As the energy requirements in the building regulations are tightened, the scope to be even more energy efficient is narrowing. In other words, the potential is limited. Nordic Ecolabelling's viewpoint is that the

mandatory energy requirement (O4) gives a Nordic Ecolabelled building with good energy performance and that a point-score requirement would add little value. The relevance 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, see requirement P4. 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 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. New studies have shown that as much as almost 80% of the climate impact related to a low-energy building with a lifetime of 50 years can be traced to its construction materials and building products.

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 included a comprehensive review of the daylight requirement (O18) with 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. We hope that the revised requirement will served as inspiration to build homes, pre-schools and schools with good daylight and to put focus on an important issue for which it has been difficult to achieve the impact it deserves.

The point-score requirement for noise levels from small houses and apartment buildings from version 2 has been changed to a mandatory requirement, supplemented with a point-score requirement for an even better noise environment. 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 solid building 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 building 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 building products, as these products fulfil strict environmental requirements.

In order to streamline the verification of the requirements of products and materials, Nordic Ecolabelling has commenced work on a construction materials database. The purpose is to be able to share information concerning which products fulfil the Nordic Ecolabelling requirements among licence holders and administrators at the various Nordic Ecolabelling secretariats. The aim is for the construction materials database to be up and running when the licence holders commence their re-inspection for compliance with the requirements in version 3.

In autumn 2014 Nordic Ecolabelling undertook an assessment of the forestry and timber requirements, which resulted in an improved work process that interacts better with the established international forest certification systems. These new timber requirements,

which were sent for consultation in the spring, have been added to these criteria and Nordic Ecolabelling hopes that this will make both the requirement and verification process both simpler and clearer.

Other

The number of mandatory points is reduced from 51 to 44. 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. As previously stated, this concerns individual measurement of heating energy, as well as the mandatory 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 12 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.

Nordic Ecolabelling's objective is that this proposal for version 3 of the criteria should 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 mandatory 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 (O4) and requirements for moisture- and damp proofed building techniques (O12 and O13).

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 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.

The Nordic Ecolabel makes requirement of the building's energy use, chemical products, solid building products/construction supplies and a number of indoor environmental factors that are relevant to people's health and to the environment. The Nordic Ecolabel also makes requirements of quality management in the construction process, and the handover of the building to the residents and administration/operations. Nordic Ecolabelled buildings are assessed on the basis of a lifecycle perspective, and fulfil high environmental and health requirements in terms of:

- low energy consumption
- construction supplies and materials
- chemical products controlled regarding health and environment
- a good indoor environment and low emissions
- 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.
- 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 entire life cycle. The RPS analysis is summarised in this section and the full text can be found in appendix 4[2].

[1] The separate MECA analysis for buildings is written in Scandinavian languages and can be ordered via the Nordic Ecolabel: sara.bergman@svanen.se
[2] Appendices 2-12 are not translated into English, but are available as appendices to the Background Document written in Scandinavian.

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 building products
- Chemical products and hazardous items in construction supplies and materials
- Indoor environment

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 building 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 hazardous substances in construction supplies and materials

Environmentally hazardous and harmful chemicals occur in a large number of construction supplies and chemical products. Stringent requirements of hazardous substances in chemical products and supplies are assessed to distinguish the Nordic 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.

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. The Nordic Ecolabel makes requirement of certified

[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

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. Nordic Ecolabelling has the declared ambition to strengthen the link between a Nordic Ecolabelled building and a good indoor environment and good health status. This is relevant as our labelling includes homespre-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 Ecolabelled.

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 buildings for lower and upper secondary schools. 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 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 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 Ecolabelled, and what falls outside. This text can also be found in the introduction to the criteria document.

2.5 Who may be licence holders?

The rules for Nordic Ecolabelling of products states that licence holders 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 Ecolabelled small houses, apartment buildings and school and pre-school buildings, the licence holder 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 licence holders 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 building products. Appendix 3 summarises relevant directives, acts and regulations for this area.

3.1 Denmark

The building and construction sector is one of the main industries in Denmark. The building and construction sector includes 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[4]. 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[5].

[4] Statistics Denmark: Building statistics 1 January 2014 Construction and housing.
[5] 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.

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 rain water. 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[6].

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 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.[7] 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[8].

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 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 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[9], Byggvarubedömningen[10], SundaHus[11]). These are web-based systems consisting of databases with both chemical substances and solid building 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

[6] http://www.bolius.dk/alt-om/tag/artikel/groenne-tage-der-holder-paa-regnvandet/
[7] The Swedish National Board of Housing, Building and Planning 's housing survey of the country's municipalities, Byggvärlden no. 10 2014.
[8] http://publications.lib.chalmers.se/records/fulltext/145201.pdf (p.18)
[9] http://bastaonline.se/
[10] http://www.byggvarubedomningen.se/sa/node.asp?node=455
[11] http://www.sundahus.se/home.aspx

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 building products are a priority area.

3.3 Norway

Approximately 30,000 homes are built annually in Norway, in a normal year[12]. The total sales increase for the residential construction sector in Norway was 17% in 2011[13]. 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[14]. 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[15].

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 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[16] 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.

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

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[17]. The improvement in the June 2014 sales of new homes gives hope that the trend for a downturn in home construction is changing[18].

Prognosesenteret[19] 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.

[17] Reve, Torgeir 2007. "En verdiskapende BAE-næring" (A value-adding building, construction and property industry). Presentation at Bygg Reis Deg 18.09.2007.
[18] http://www.bygg.no/article/1203709 Visited on 12082014 by Ola Rise.
[19] Prognosesenteret, 2012 "Nye boliger NORGE - Prognoser mot 2014" (New homes NORWAY - Forecasts towards 2014).

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. 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 building materials.

3.5 Nordic Ecolabelling licences

In March 2015, the following licences per country were reported:

Norway

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

Denmark

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

Sweden

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

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 Ecolabel'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 both 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 BREAM 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[20].

[20] 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).

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 is hereby finally determined, and is 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 mandatory to use an assessor to undertake certification.

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, various 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 either 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 building 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 con-

struction 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 be 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 2014 evaluation. 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.
- Be more specific so as to minimise the need for interpretation.
- 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.
- Be adapted for Norway, Finland, Sweden and Denmark.

The revision has the following sub-objectives:

- Expand the product group with school buildings[21,22]. 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 building 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 mandatory requirements such as individual measurement of heating energy.
- Draw up requirements of the intrinsic energy in any relevant material(s), such as concrete and cement.

[21] Extensions to school buildings will be included automatically since extensions to the types of buildings included in the product group definition are already included.
[22] 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 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 "Proposed criteria" document.

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

5.1 Product group definition and delimitations

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 Nordic Ecolabelling of the following. The background text below presents further information for each item.

- Newly constructed small houses, apartment buildings and buildings for schools and pre-schools, regardless of the form of tenure.
- Extensions to existing buildings. The extension must be a home, pre-school or school, and only the extension will be ecolabelled.
- Newly constructed homes for the elderly that are classed as homes and not as care facilities. 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 Ecolabelling.
- Newly constructed cottages/holiday homes, provided that the building is not exempt from the national building permit regulations, is heated, has running water and drains, and is 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 due to size, etc.
- Homes, pre-schools or schools that are temporary, i.e. constructed for a limited time. This are often called modules, pavilions or annexes.

Licences can be given for everything from fully controlled concepts to unique projects. A deviation from the building type and layout may be made if the variations fulfil the Nordic Ecolabelling requirements. This means that both the standard execution and options such as kitchen design and white goods must fulfil the requirements. In section 2.5 it is described who may hold a licence.

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 huts, tool sheds, bicycle sheds, refuse depots[23] and so on must fulfil relevant requirements in the criteria, but may not themselves be ecolabelled.
- Separate buildings such as gymnastics halls, ball sports halls, swimming halls, etc. that may belong to a school cannot be labelled either "themselves" or as part of the labelling of a school building. This means that when a school and a sports hall

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

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.

- Nursing and care homes and homes for dementia patients may not be Nordic Ecolabelled as they are more like premises and cannot be fully included under the definition of homes.

A building is Nordic Ecolabelled on its completion/occupation/implementation. The building can communicate that it achieved Nordic Ecolabelling in a specific year: "Nordic Ecolabel 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.

Background

Since the first version of the criteria it has been possible to achieve Nordic Ecolabelling of small houses (detached, row houses, semi-detached houses and terraced houses) 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 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

One result of the revision is that school buildings are subject to the criteria and can be labelled. This means that lower and upper secondary schools are included, but not buildings for higher education and training.

A Nordic 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).

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[24]:

- 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. There are no clear definitions or rules for how housing for senior citizens should be designed.
- 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.

[24] 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.

Housing for senior citizens and sheltered housing are more or less like ordinary homes. There is no special definition and they may therefore be designed in many different ways. The communal elements may be classed as homes if they are parts of rooms and spaces that have been moved out of the individual flat, such as kitchens and living rooms/ rooms for social interaction. But if this concerns communal spaces in addition to the rooms and functions that a home must include, according to statutory provisions and regulations, such as weaving rooms and table tennis rooms, these will not necessarily be classed as homes or premises. Nordic Ecolabelling's position is that as little as possible of a home for the elderly must be excluded from the Nordic Ecolabelling requirements, whether it is counted as a home or as premises, due to status as a communal space. The basic rule is that the same requirement must apply, whether "ordinary" apartment buildings or homes for the elderly are constructed. It must be clearly stated that communal areas intended for the residents of the home for the elderly and its staff are also subject to Nordic Ecolabelling. When this is described in this way we do not need to consider whether an area constitutes premises or housing, according to a country's building regulations.

With regard to energy requirements, which often vary between homes and premises, reference is made to how buildings are defined in building permit applications and in conjunction with the calculation of energy consumption. No special "Nordic Ecolabel" definition is required.

In summary, the following applies:

- Housing for senior citizens (also called 55-plus housing, lifestyle housing, etc.) and sheltered housing (nursing homes) are included in the product group definition and may be Nordic Ecolabelled.
- Care and nursing homes/homes for dementia patients are not included and may not be Nordic Ecolabelled. The reason is that they are more like premises and cannot be fully included in the definition of Housing.

Extensions
Extensions to existing buildings may be Nordic 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 Ecolabel's O4 energy requirements. Energy calculation to verify the requirement may only be performed for the extension or the overall building, i.e. both the extension and the existing building together.
- 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 Ecolabel 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 Ecolabelled. A module pre-school that is withdrawn cannot thereafter be rented out/sold as e.g. a Nordic 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. Licence holders of the module may market the module as Nordic Ecolabelled in conjunction with the first lease of the module. At the next lease period they must prove that the module still fulfils the requirements, and show that the materials and chemical building products used in renovation or "refreshing" also fulfil the requirements. They can then continue to market the module as Nordic Ecolabelled. If 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?

Buildings including any permanent supplementary buildings that are constructed together with and marketed with the Nordic Ecolabelled buildings are subject to the requirements. The requirements concern the entire building/building carcass, but commercial areas such as shop premises, 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), outhouses, sheds, bicycle sheds, refuse depots and so on. 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.

//illustration in the final document//

The licence applicant must be able to document to Nordic Ecolabelling that all of the requirements in the criteria are fulfilled. Licences may be granted for:

- A specific type of small house, apartment building, pre-school or school
- Unique buildings that are covered by the product group definition

Variations of a building type (options or customer adjustments) are permitted provided that the variations also fulfil the Nordic Ecolabelling requirements.

The requirements to be fulfilled as those that apply at the time of the commencement of construction, i.e. when the base plate or basement floor is laid. The only exception is the energy requirement, which is "locked" 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.

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, the Nordic Ecolabel sets requirement for anything above the capillary layer. The Nordic Ecolabel does not set any requirements of the layers **below** the insulating and radon-protected base plate. This means that The Nordic Ecolabel does not set requirements on single, gravel or similar even if these layers have an isolating function[25]. The Nordic Ecolabel does not set requirements on the pipes laid under the plate, such as drainage pipes in the capillary layer, see Figure 2.

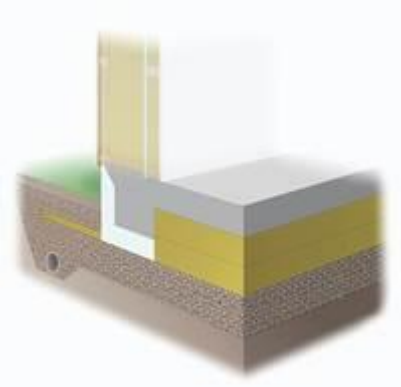


Figure 1: A ground slab can be insulated under the concrete, above the concrete, or both under and above the concrete. This picture shows the insulation (yellow) under the concrete.

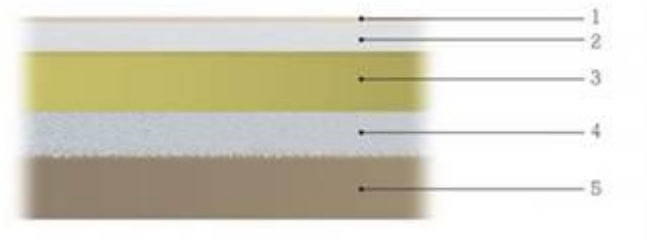


Figure 2: A ground slab normally consists of several layers and a theoretical structure is: 1. Floor covering, 2. Concrete slab, 3. Heat insulation, 4. Capillary layer (single, gravel) and 5. Ground

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 concerning Chemical products, solid building products (goods) and materials.

[25] The capillary layer can influence the presence of radon and is then to be handled by the radon-requirement (O11).

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:

- Details of the number of storeys, number of square metres of living space in usual terminology, and details of any premises/commercial space.
- Statement that the Nordic Ecolabelled building includes measurement of electricity consumption for each residential unit (also called individual electricity metering).
- A description of the building or building type's type of carcass/bearing structure, façade, roof, foundations, heating system and ventilation system.
- Details of any supplementary buildings such as garages, storerooms, bicycle sheds, refuse depots, etc.
- Details of any lifts, as well as balconies and terraces.
- Details of any options for various layouts or materials and fittings.
- A report on the work that the buyer of the home, the tenant and/or tenants of the premises may themselves perform.
- For pre-schools and schools the type of activities must also be described, as well as the estimated number of children.

✉ Description of the aforementioned items.

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 Ecolabelled, so that licence administration is correct and effective.

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

The requirement is supplemented with a sub-requirement that for Nordic Ecolabelled buildings the electricity consumption 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 electricity consumption 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 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 regard to pre-schools or schools, it is sufficient for electricity to be metered for the school or pre-school overall, and not by department or equivalent.

O2 Responsibility for Nordic Ecolabelling

The licence holder 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. If subcontractors are used, for example, the licence holder is responsible for the sub-contractor being informed of the requirements and being held responsible for their fulfilment.

There must be a description of the client, contractor, any use of subcontractors and type of contract.

Reference must be made to requirements O36 and 037.

Certain exemptions may be made from the basic rule concerning the licence holder's responsibility. See Appendix 2.

✉ Must be reported as stated above.

Background

The purpose of the requirement is to ensure that the licence holder takes full responsibility for the fulfilment of all of the requirements. This naturally applies to both process/routine requirements and those linked directly to the Nordic 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 licence holder is the client and in cases where the licence holder has the role of contractor. The requirement now refers to Appendix 2, which contains the exemptions that can be made from this responsibility.

O3 Points achieved

The licence applicant must receive at least a certain percentage points in order to be granted a Nordic Ecolabelling licence. The point requirements are stated in chapter 7 of the criteria document.

- For small houses this corresponds to 25 % which is equivalent to 10 out of 40 possible points.
- For pre-school and school buildings this corresponds to 25 % which is equivalent to 10 out of 38 possible points.
- For apartment buildings this corresponds to 30 % which is equivalent to 13 out of 42 possible points.

✉ Description and assessment of the points that the licence holder 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 mandatory 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 building products.

Previously, 9 out of a total of 22 points had to be achieved, equivalent to 40%. Now it is proposed at least 25% for small houses and 30% 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.

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 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 the requirement will "follow".
- 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 mandatory requirements of interior and exterior lighting, energy-labelled white goods and individual energy metering.

Experience from the licensing of Nordic Ecolabelled buildings as shown that 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 Ecolabel 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[26].

In 2012 the Swedish National Board of Housing, Building and Planning wrote a PM[27] 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

[26] 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.
[27] Comparison of energy regulations in the Nordic countries and Germany. The National Board of Housing, Building and Planning 2012. Journal no. 1271-5280/2011.

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.

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 "road-map" 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 Ecolabelled buildings is to provide the security that a Nordic 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 influence the use of household electricity/commercial electricity for energy-efficient illumination and white goods, demand-managed illumination and water-saving taps. On the other hand, the point requirement that made it possible to achieve points for even better energy performance than the mandatory requirement has been removed. The reason is described later under the headline "point requirement removed".

O4 The building's energy consumption

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

- Finland: 85% of the Ministry of the Environment's regulation for buildings' energy performance, 2012.
- Sweden: 75% of BBR21 and thereafter 85% of the energy management requirement that entered into force on 1 March 2015 in BBR22.

- Norway: 75% of TEK 10[28].
- Denmark: 90% of Low energy class 2015.

The transitional periods set by the national authorities also apply to the fulfilment of the Nordic Ecolabel'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. On the other hand, the energy calculation can be made for the overall entity, i.e. both the extension and the existing house, or only the extension.

The energy calculation must be performed in accordance with:

- NS 3031 in Norway
- BE10 or equivalent in Denmark
- Ministry of the Environment's regulation for buildings' energy performance or equivalent in Finland.
- National practice in the sector for Sweden, see Appendix 4.

✉ 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.

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 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.

The way forward is, after all, a requirement which entails that a "Nordic Ecolabelled building must be X% better than national energy requirements in building regulations",

[28] The Ministry of Building Quality is on behalf of the Municipal and Modernization Ministry performing a review of TEK 10. The revises TEk10 is planned to enter into force in 2017. In the proposal for hearing the energy requirements are suggested to be sharpened such that residential buildings should be 26% more energy effective compared to today level.

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 with various percentages for various different countries. 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.
- 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.
- The opportunity to differentiate the percentage rate in the energy requirement for various types of buildings has also been discussed. It would be a benefit to be able to adjust the energy requirement according to the potential for lower energy consumption than the legislative requirement for an apartment building, which can differ relative to a small house. However, in the criteria development process this was assessed to be far too complicated to be included in the project. Requirement O4 thus entails one and the same percentage improvement compared to the country's building legislation.

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 shows that Nordic Ecolabelling's requirements in version 2 of the house criteria of 75% of the 2012 regulations for apartment buildings are very ambitious and do not correspond to the Nordic Ecolabelling objective that approximately one third of the products in the market must fulfil the Nordic Ecolabelling requirements. The requirement level is therefore adjusted from 75% to 85% of the Finnish Ministry of the Environment's regulation on the energy performance of buildings, Regulations and guidelines, Part 3 (2012)[29].

[29] http://www.finlex.fi/data/normit/37188-D3-2012_Svenska.pdf

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.

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 mandatory 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 mandatory energy requirement (O4) gives a Nordic 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 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.

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 mandatory 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, but "incorporated" in requirement O1 since Nordic 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 mandatory 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[30] 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 window panes 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 mandatory requirement for individual heat metering.

O5 Energy-efficient light sources

When the Nordic Ecolabelled building is taken into use/on occupation light sources for both indoor and outdoor lighting must be:

- of the LED type and in at least energy class A+

or

- Energy-efficient fluorescent lamps (T5 fluorescent lamps and T5 circular fluorescent lamps of the eco type) in at least energy class A in accordance with regulation regarding energy labelling of electrical lamps and luminaires (874/2012/EU).

Lighting that is built into technical installations, equipment and fittings are exempt from the requirement.

✉ Reporting of the type and number of fixtures and light sources and related labelling in product specification, and so on.

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

Background

For light sources, there are considerable opportunities for environmental gains by reducing energy consumption, and thereby reducing climate impacts. In a building, approximately 25%[31] of household electricity is estimated to be used for lighting, even though there is great variation in the course of the year. Household electricity is defined as the electricity or other energy used for household purposes, such as cooking, refrigeration and freezing, lighting, TVs, computers, etc.

EU regulations concerning ecodesign requirements and energy labelling for lighting introduced in 2009 have today been established. There are requirements for lighting in homes, streets and offices, as well as reflector lamps and LED lamps that are overall expected to save 102 TWh annually in the EU up to and including 2020[32]. The requirement concerns energy efficiency and functions such as lifetime, number of on and off cycles, and good colour reproduction. Energy labelling that is mandatory concerns all lamps for both household and professional use. The labelling includes energy class, where A^{++} is most efficient and class E is least efficient. At the same time as the introduction of ecodesign and the energy labelling requirements, the phasing out of incandescent bulbs within the EU commenced.

Facts about LED light sources

LED light sources have up to 15 times longer lifetimes than incandescent bulbs and use around 80% less electricity. They do not contain mercury, can be found in versions for different light fittings, and are dimmable. Manufacture of LED bulbs requires material that is extracted and manufactured using energy-intensive processes and that entails emissions to the environment. To assess these environmental factors, the US Department of Energy performed a life cycle analysis. The conclusion is that even if relatively large amounts of energy are used in the production phase, their contribution to the total energy consumption during the life cycle is small, because LED are so energy efficient in the operational phase.

Events in recent years:

- Since autumn 2012 the last incandescent bulbs have been phased out of the European market.
- As from autumn 2013 LED lamps and reflector bulbs are also subject to the energy labelling requirements. Reflector bulbs spread light in a radiation angle and are customary in spotlights and reading lamps. Reflector lamps are found as both LED and halogen bulbs. There are various different halogen bulbs.

In summary, development has accelerated in this area and LED is now an established technology and is seen as the first choice for any new production. Nordic Ecolabelling will promote energy-efficient lighting and tighten the lighting requirement from energy class B to the requirement that light sources be LED in at least energy class A.

For pre-schools and schools fluorescent lamps of the energy saving (HE/eco type) are accepted. In such case this must be an energy saving type that gives energy savings of approximately 10% compared to traditional fluorescent lamps, and in at least energy class A.

[31] Brukarindata bostäder version 1.0 (User input, housing, version 1.0.) Sveby. Industry standard for energy in buildings. Sweden 2012.
[32] www.energimyndigheten.se

In the proposed criteria for the EU Ecolabel for light sources the energy class requirement is set as A^{++}. This was subject to some criticism. In order to achieve our ambitious requirement that all indoor and outdoor lighting must be of the LED type, Nordic Ecolabelling has set the requirement as energy class A^{+}.

The triviality limit has been introduced that certain lighting that is permanently mounted in installations and equipment is not subject to the requirement. With regard to fan lamps, the energy labelling of an extractor hood also takes account of the lamp's energy consumption. In summary, this means that the lamp in an extractor hood, oven, refrigerator, freezer and emergency lighting is not covered by the requirement.

On the other hand, light sources installed in a kitchen or bathroom cabinet, in a mirror, or in a fixture, such as counter lighting in a kitchen is included.

O6 Lighting management

For any building, outdoor lighting must have automatic demand control. The requirement also applies to private balconies, patios and terraces.

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.

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.

✉ 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. It is made clear that the requirement also applies to private balconies, patios and terraces, i.e. which belong to the resident and to entrance balconies of covered galleries.

"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 a mandatory 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, basements, 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.

Outdoor lighting comprises lighting installed on the Nordic 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 Ecolabelled school or pre-school.

O7 Energy-efficient white goods

The following energy class requirements apply to the white goods that are installed.

White goods consumer (Energy labelling regulation in brackets)	Lowest permitted energy class
Washing machines (1015/2010/EU)	A^{+++}
Fridges and freezers* (1060/2009/EU)	A^{++}
Dishwashers (1059/2010/EU)	
Tumble dryers (392/2012/EU)	
Ovens (65/2014/EU)	A^{+}
Extractor hood (65/2014/EU)	A
Combined washing machines and tumble dryers (combi-products) (96/60/EU)	

White goods that are not subject to the EU's energy labelling directive (2010/30/EU) are exempt from the requirement.

** For wine coolers the requirement of minimum energy class A applies.*

✉ Reporting of the type and number of white goods and related labelling in product specifications, and so on.

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.

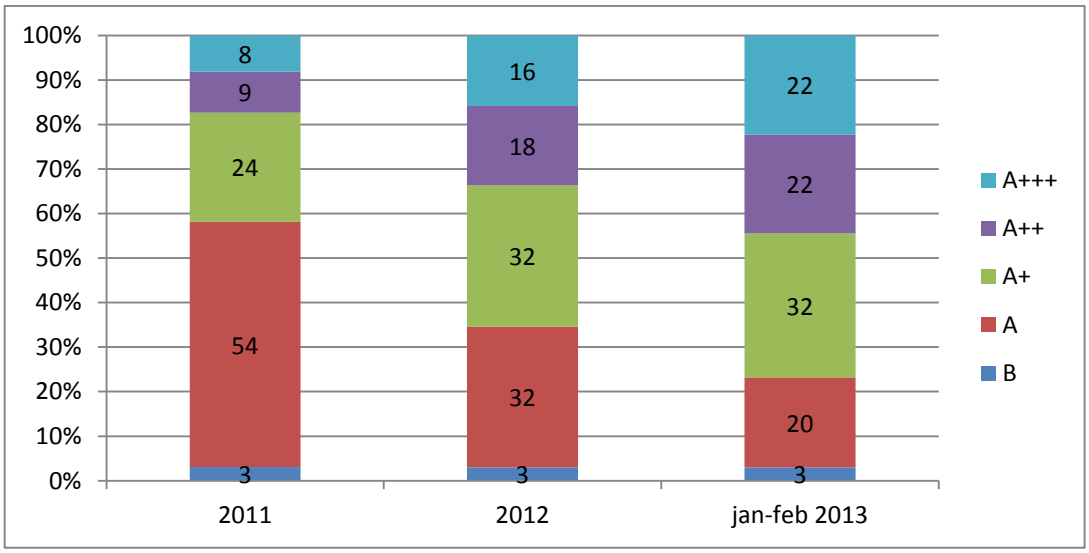
The requirement entails a tightening from previous requirements of at least energy class A^{+} for refrigerators, freezers and washing machines, and at least class A for tumble dryers and dishwashers. For ovens the requirement level is already class A, and the requirement also includes extractor hoods.

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"[33] from March 2014.

[33] 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: GfK[34] 2013)



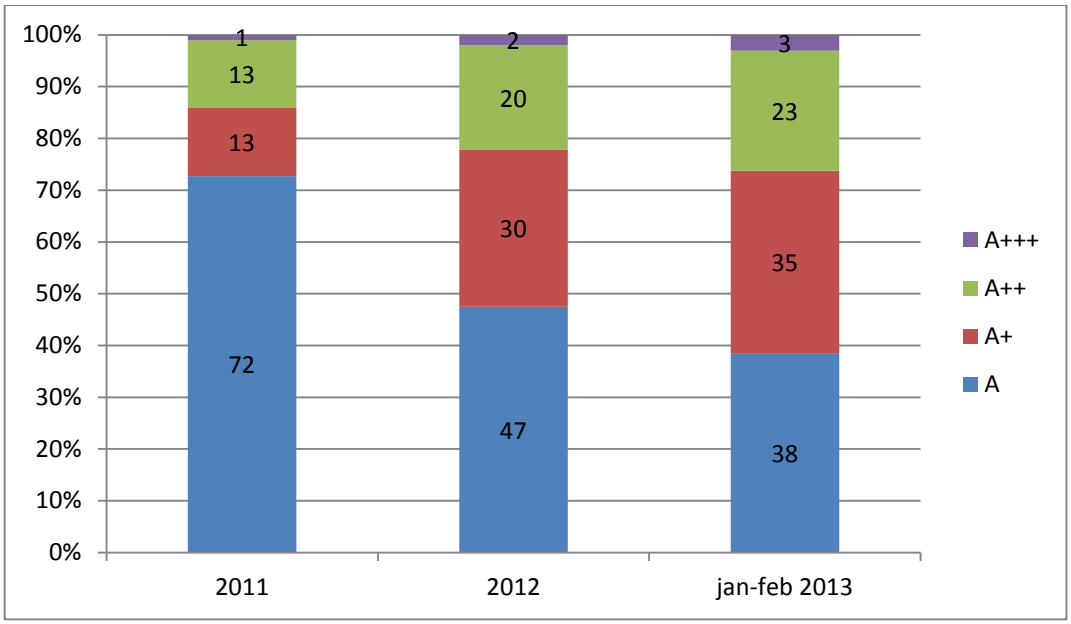
Market data from the European industry organisation CECED (the household appliance industry in Europe) shows that the proportion of washing machines in the market in the two best energy classes (A^{++} and A^{+++}) is as high as 54%, which is a higher figure than the combined 44% sold for products in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

A quick check against the machines in the Swedish market[35] shows that in December 2014, 45- 55% of the washing machines were in energy class A^{++} and 30-40% in class A^{+++}. Information from the white goods manufacturers shows that as many as 71% of the white goods sold are already in energy class A^{+++}. The rapid development in sales of products in the best energy classes exceeds the forecasts previously made. In summary, there are good arguments to require that a washing machine in a Nordic Ecolabelled building must be in energy class A^{+++}.

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.

[34] Gesellschaft für Konsumforschung. Germany's largest market survey institute.
[35] Source: Prisjakt.se and Pricerunner.se. Both sites show various numbers of products and various shares of products in the energy classes. The high figures come from Pricerunner.

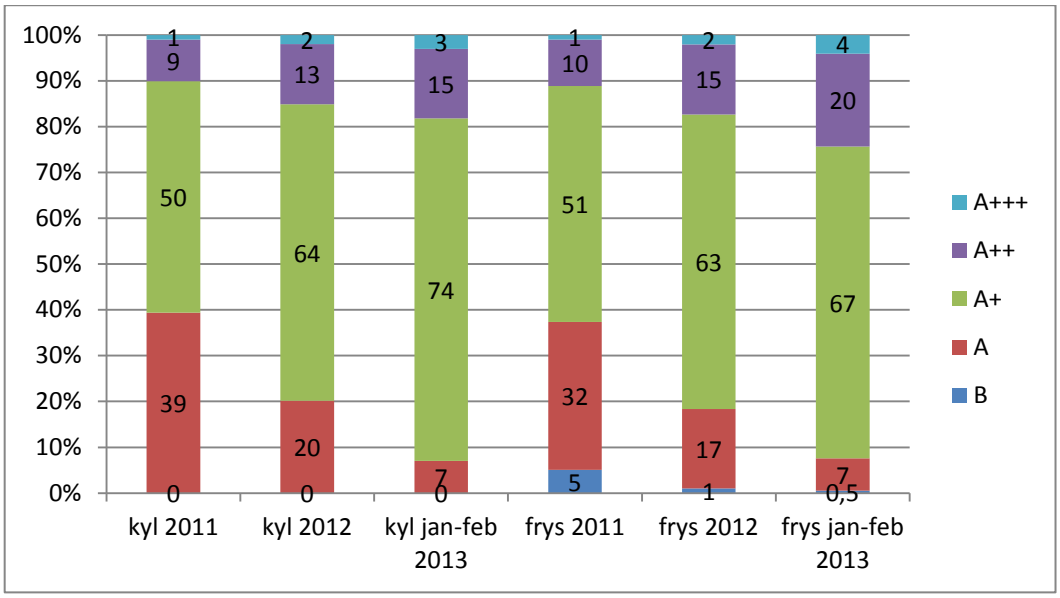
Table 2: Distribution by energy class of dishwashers sold, 2011-2013 (Source: GfK 2013)



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 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 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 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.

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. As from 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. The actual hood does not use so much energy, but the heated indoor air sucked out by a hood must be replaced with new, heated air. According to the Swedish energy authority this may be equivalent to 10 times more energy than the energy actually required to run the hood. 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 extractor hoods and A^{+} for ovens. 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 Ecolabelled building.

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. The 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.

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 O7) for the product group, it can be read which types of products are included and which of them are exempted.

O8 Sanitary fixtures

Mixer taps, shower heads and showers mainly used to tap water for personal hygiene, cleaning and cooking and as drinking water must have the following maximum energy consumption:

Type of sanitary fixture	**Maximum measured energy consumption** **Corresponding energy class**	**Measurement standard**
Washbasin and mixer taps	2.2 kWh Equivalent to energy class B	SS 820000 Sanitary fixtures - Method to determine the energy efficiency of mechanical washbasin and mixer taps
Thermostatic mixers with shower	1.6 kWh Equivalent to energy class A	SS 820001 Sanitary fixtures - Method to determine the energy efficiency of thermostatic mixers with showers

Touchless taps are accepted regardless of energy performance.

Flow regulator is permitted.

Any aerators must be activated when the building is handed over to the customer or it is taken into use/on occupation.

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.

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.

☒ Reporting of measured energy use in kWh and statement of the standard used. Nordic Ecolabelling can accept the use of other standards for the measurement of energy efficiency if an independent expert authority/testing laboratory or similar can document that the testing methods are equivalent.

☒ For energy labelled fixtures only the energy class label is required 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[36], 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.

[36] Saving potential of energy labelled taps and showers. SP Report 2014:3P08445, Sara Jensen, 2013.

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 Ecolabelled building sanitary fixtures will be selected that focus on energy efficiency while retaining functionality, but which also indirectly reduce water consumption[37]. The EU Ecolabel requirements for sanitary fixtures also focus on limiting the flow and not on reducing energy consumption. Nordic Ecolabelling therefore did not assess this to be a viable alternative.

Table 4: 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

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 4 above. The manufacturers are leading manufacturers in the European market. The requirement level is set as energy use equivalent to energy class B or better for washbasin taps and kitchen taps, and energy class A for thermostatic mixers with showerheads. Nordic Ecolabelling has assessed this to be a reasonable level during the criteria's term of validity.

If the product is energy labelled, only the energy label should be displayed. In order to also allow for non-energy-labelled taps, the requirement is formulated as a specific energy class, as well as the highest permitted energy use. Products that are not labelled must show test results to verify the energy use, as well as a statement by an independent third party that the test methods are equivalent.

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

[37] Marc van Brink, certification officer, Kiwa Sweden, personal communication.

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, wash rooms, guest toilets, etc.

Low-flush toilets - requirement removed

The requirement for low-flush toilets/dual-flush toilets (O31) in version 2 have 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 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.

5.4.2 Waste

O9 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 Ecolabelled residential unit, i.e. in the flat and small house;
- five fractions to be installed in or adjacent to the kitchen of the Nordic Ecolabelled school and pre-school.

Residual waste is deemed to be a 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 O26 (nano) also applies to waste disposal units.

✉ Description of vessels for waste sorting at source.

Background

That the Nordic 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 benefits 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.

O10 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 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
- Hazardous waste

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

Background

It is important that Nordic 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 Ecolabelled building. If there is already a waste sorting station close to the Nordic 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[38] 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

[38] The distances are guidelines set by the City of Stockholm.

5.5 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 climate.

A poor indoor climate 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[39]. 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 ventilation, cleaning level, air humidity, mould and airborne particles from building materials such as formaldehyde affect the occurrence of chronic rhinitis[40].

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 mandatory requirements:

- Radon and other radiation
- Moisture- and water-protected building techniques
- Ventilation
- Formaldehyde
- Sound/noise
- Daylight
- Use of chemicals (in chemical products and building 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.

O11 Radon

The radon content in Nordic Ecolabelled buildings must not exceed 100 Bq/m^3 in the indoor air.

✉ Documentation to show how the requirement is fulfilled. The example is the result of geotechnical studies and a description of how the radon risk is handled (such as radon protection or radon protected execution).

Background

The purpose of the requirement is to ensure a very low radon content in the Nordic Ecolabelled building via preventive work, to guarantee a threshold value of 100 Bq/m^3.

[39] www.kominmiljo.eu/byggnadstart

[40] 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.

Radon concentrations in Norwegian homes have increased in the last 20-30 years and are usually highest in newer homes. 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 a increased inflow of radon from the ground, as well as negligence in observing the requirement for e.g. radon barriers in new production.

According to an overview article in the Journal of the Norwegian Medical Association[41] 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 has a synergetic effect. This shows how it is still important to control the amount of radon coming into buildings' indoor air. 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.

Nordic Ecolabelling has chosen a threshold value of 100 Bq/m^3. This is also the limit proposed by the working group in the "New Nordic scheme for indoor climate classification" project in the report sent for public consultation in autumn 2014[42].

In version 2 of the criteria the requirement was formulated that the national threshold value for radon had to be fulfilled. This meant that a Nordic Ecolabelled building constructed in Denmark had to achieve the requirement of 100 Bg/m^3, while a Nordic Ecolabelled building in e.g. Sweden had to achieve less than the threshold value of 200 Bq/m^3. This difference between the same Nordic Ecolabelled products based solely on country is not optimal. The requirement has therefore been tightened in the revision and formulated as a requirement that will apply wherever the building is constructed. The threshold value has been tightened at maximum 100 Bq/m^3, which is the same as the Danish threshold value, see Table 5. Since 2009, the World Health Organisation, WHO, has recommended the world's countries to reduce the guideline and threshold values for radon in the indoor air to 100 Bq/m^3.

[41] 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).
[42] Indoor Environment/ — classification of the indoor environment in buildings − Office buildings, schools, kindergartens and residential buildings. The Nordic project "New Nordic scheme for indoor climate classification". Downloaded from http://nordicinnovation.org/events/public-consultation-nordic-region-as-standard-maker/public-consultation-new-nordic-scheme-for-indoor-climate-classification/ (18.01.2015).

Table 5: The official threshold values for radon in buildings in the Nordic countries. 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.

	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.*

As there are various local conditions and many different technical building methods to ensure low radon levels, the individual construction projects must described the measures that will be taken during the construction process. Appendix 6 describes several of the methods recommended by the Nordic authorities.

Other radiation

No requirements are made concerning other radiation, such as electromagnetic radiation. See more in Appendix 12 Requirements discussed, but not included in the revision.

O12 Moisture prevention

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

a) selection of materials and technology;

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

c) ensuring 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 plus a safety margin);

e) control of moisture protection by calculating or measuring the moisture in concrete. Borehole measurements must be undertaken as surface moisture measurement is not sufficient to determine whether the concrete slab is dry enough.

In addition, competent moisture expertise must be designated to follow up on the moisture protection 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 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 intended moisture protection with a description of competence.

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[43]. One third of Sweden's buildings have 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.

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 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, Nordic Ecolabelling does not require diplomas or any type of third-party verification of the competence of the moisture expert.

Exposure of building materials to moisture can lead to increased emissions of volatile chemical substances. On the degradation of plasticizers (phthalates) that are e.g. found in PVC floors and on the degradation of acrylate polymer in glue, 2-ethyl-1-hexanol is formed. This substance is used a biomarker for moisture problems. 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.

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.[44]

O13 Waterproof construction

Products must fulfil and the execution of water installations* must adhere to the relevant latest version(s) of the following national industry regulations.

Wet room installers must be certified in the countries where certification is possible, and follow the relevant latest version of the following national industry regulations.

Sweden

- Branschreglerna Säker Vatteninstallation (Industry safety regulations for safe water installation)
- Golvbranschens våtrumskontroll, GVKs branschregler Säkra Våtrum
- Byggkeramikrådets branschregler för våtrum, BBV
- Måleribranschens våtrumskontroll, MVK

Norway

- ByggbranschensVåtrumsnorm, BVN

[43] 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.
[44] http://www.fuktcentrum.lth.se/verktyg-och-hjaelpmedel/byggregler/

Denmark

- The BR10 Building Regulations' chapters 4.6 and 8.4 and chapter 8.4 (or later versions of BR)

Finland

- Finland's Building Regulations Compendium for moisture and for properties' water and drainage installations.
- Föreningen Inneklimat instructions for moisture-protected buildings.

Prefabricated wet rooms
Prefabricated wet rooms must be subject to technical approval by SINTEF, type approval by SP or another system of equivalent quality and scope granted by an independent third party**.**

Water installations are pipe systems for domestic hot water, heating and drainage.

✉ Documented routine to show how the requirement is fulfilled.

Background

Water damage due to incorrect or defective installations and/or construction is unfortunately not completely unusual for new production. Leaking water pipes, incorrect installation of wells, sealing layers and connections in wetrooms often lead to moisture problems. In many cases there are national industry regulations in order to minimise the risks of water damage. One example is Säker Vatteninstallation (Safe Water Installation) in Sweden, Våtrumsnormen (Wetroom standard) in Norway, and Föreningen Inneklimat instruktioner för fuktsäkert byggande (the Interior climate association's instructions for moisture-protected buildings) in Finland. In Denmark there are no equivalent industry regulations, but Nordic Ecolabelling refers to the BR Building Regulations requirements. Appendix 8 presents a comparison of the Nordic industry regulations and building regulations.

Prefabricated bathrooms can be a reasonably priced alternative to bathrooms constructed on site. To ensure the quality of prefabricated bathrooms, they must be subject to written verification of technical approval/type approval. Established systems in the marker are SINTEF Technical Approval or SP. These approvals guarantee that the bathroom modules fulfil the technical requirements for wetrooms, i.e. that the bathroom modules are impermeable and there are no water leaks at joins, walls and floor angles, floor drains and fixtures, etc.

The purpose of the requirement is that products must fulfil and the execution of water installations must follow 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. Prefabricated bathrooms can possibly not be certified as a product, but the contractor must follow the rules/guidelines. Since it is important for several reasons, including duration, quality and indoor environment, to minimise the risk of water damage, the requirement is essentially unchanged from version 2 of the criteria. On the other hand, formulations and references have been specified and updated. Since rules can change over time, it is important that the latest version is applied.

O14 Ventilation

Ventilation systems in Nordic 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 mandatory 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.

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 mandatory 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 mandatory 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.

O15 Noise environment (solely concerns small houses and apartment buildings)

Bedrooms and living rooms/family rooms must comply with noise class B (according to national standards) for noise from technical installations directly connected to the building (indoor or outdoor).

National noise standards: Denmark DS 490, Sweden SS 25267, Norway NS 8175, Finland SFS 5907.

✉ Calculated or measured values showing that the requirement is fulfilled.

Background

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.

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. According to the Norwegian Association Against Noise, both airborne noise and impact noise insulation must ensure that noise from indoor and outdoor noise sources, such as activities in neighbouring flats and stairways, technical installations in buildings, road, air and rail traffic, commercial activities, etc. do not significantly inconvenience residents[45].

Version 2 of the criteria also included acoustics requirements. This was a point requirement for small houses and apartment buildings, and a mandatory requirement for pre-schools. Elements of the point requirement for small houses and apartment buildings have now become mandatory and the point requirement has been expanded so that two points can be achieved. For pre-schools and schools this is a mandatory requirement, as before.

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. In Denmark, it is stated that in a new residential block, 70 to 85% of the residents must be satisfied with the noise conditions in class B. The best noise class, class A, imposes very strict noise levels which entail that noise should be only exceptionally perceived, and in Denmark over 90% must be satisfied in new houses (one-family homes) in noise class A. There are variations between the national standards, which noise parameters are included, and which threshold values apply. See Table 6 which shows the requirements for noise class C in all of the Nordic countries.

[45] Norwegian Association Against Noise, downloaded from the website http://www.stoyforeningen.no/Hva-er-stoey/Boligstoey-regelverk (2014-12-01).

Table 6: Noise classes for various types of buildings in the Nordic region. Downloaded from a lecture by Iiris Turunen-Rindel, Standards Norway, October 2013[46]

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.

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. To fulfil a noise class, all of the various criteria for noise conditions stated for a class must be fulfilled. In the Norwegian NS 8175:2012 standard, threshold values are set for e.g. homes, pre-schools and schools, which are divided into:

- Airborne noise insulation (the noise passing through the wall via the air)
- Impact noise level (the nose is carried via physical contact with the floor)
- Noise level (noise level from various sources)
- Room acoustics dimensions (reverberation time (how long the noise stays in the room, echo), reverberation time related to room height, milder sound absorption factor, speech transmission index, etc.)

Nordic Ecolabelling has determined that the mandatory requirement for small houses and apartment buildings will only apply to airborne noise insulation from technical installations because project design and building is the best time to noise insulate the technical installations. By technical installations is meant installations in or in connection with the building, and which belong to the building. This e.g. applies to ventilation system that may have elements both inside and outside the building. As the requirement also includes noise from outdoor technical installations, it is assumed that this will also limit the noise to the building's neighbours. It is assessed that the requirement would be

[46] 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).

too strict if all parameters were to fulfil airborne noise installation and impact noise insulation in noise class B.

With regard to noise from the surroundings, this is covered by statutory requirements. In areas with a lot of traffic, this could, for example, lead to the use of extra insulating windows. The Nordic Ecolabel does not set any requirements concerning noise from external sources.

An ongoing project in Europe called COST Auction TU 0901 (Integrating and Harmonizing Sound Insulation Aspects in Sustainable Urban Housing Constructions) will propose joint noise classification for homes and propose "new" measurement dimensions for noise insulation.

O16 Noise environment (solely applies to pre-school and school buildings)

Buildings must fulfil noise class B for all parameters assessed.

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 the Danish building regulations (BR).

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.

✉ Calculated threshold values and statement of the noise class achieved for all parameters in rooms where people stay more than temporarily.

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 Danish building regulations BR (with associated advice like SBI 218).

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 class-

rooms, working rooms, playrooms, family rooms, wet playrooms, ateliers, canteens and rooms for quiet and sleep.

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 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 such as corridors, entrance halls, photocopying rooms, changing rooms, sports halls and WCs.

O17 Daylight

In pre-schools and schools the average daylight factor must be at least 3.0% in common rooms/playrooms, or classrooms.

In small houses and apartment buildings the average daylight factor must be at least 2.0% in at least one room per residential unit.

If the average daylight factor exceeds 5.0% in any of these rooms the licence holder must use calculations or equivalent to verify that the official requirements of the summer indoor temperature are fulfilled.

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

A small house and a flat are considered to be a residential unit.

A computer program must be used to calculate daylight. See Appendix 5 for calculation variables and methodology.

✉ Calculation results showing the average daylight factor 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

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. It is widely accepted 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[47].

A building with good daylight can help to minimise health risks. We wish 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[48] and also suggest that daylight improves student performance[49]. Good daylight also saves electrical energy that would otherwise be used for lighting.

[47] 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?) -rapport 12996.
[48] 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.
[49] Heschong Mahone Group HMG, 1999, Daylighting in Schools. An Investigation into the Relationship Between Daylighting and Human Performance. For George Loisos, California.

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. [50] 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 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.

Why does the Nordic Ecolabel 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 integrity of the building envelope. Nordic Ecolabelling sets requirements for daylight in order to ensure that Nordic 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 project designed that the licence holder must already be aware of the balance between the building's orientation, glass areas, window location, connection and combination of the window pane's 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.

[50] Interview with Paul Rogers, Architect M. Arch, BAU - Byrån för arkitektur och urbanism.

The daylight requirement has therefore been adjusted as follows:

- The new version of the criteria has been expanded to include residential buildings.
- Since school buildings can now be Nordic Ecolabelled they must also fulfil the daylight requirements.
- The requirement of the average daylight factor is set at minimum 3.0% for common rooms/playrooms, and classrooms, and minimum 2.0% in one room per residential unit. The intention is to assess the daylight requirement in the rooms in which people spend most of their (waking) time, irrespective of whether this is in a home, pre-school or school.
- The requirement of the lowest daylight factor has been removed.
- 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.
- 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.
- In order to minimize interpretation and to ensure that daylight calculations are carried out in a consistent manner, the requirement's calculation methodology has been more clearly defined.

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 is either equal to or more stringent than 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 document stage. In order to verify fulfilment of the requirement, one calculation is sufficient. There are free computer programs for this purpose, of which the most well-established are Radiance, Velux Daylight Visualizer and Relux. Standardized calculation variables for use in daylight calculations are stated in Appendix 5 of the criteria document.

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.

O18 Formaldehyde emissions

The requirement concerns all wood-based panels that are not solely marketed as façade panels.

Panels that are either building panels, floors or fittings containing more than 3% by weight formaldehyde-based additives must fulfil one of the following two requirements:

1. The average content of free formaldehyde must not exceed 5 mg formaldehyde/100 g dry substance for MDF panels and 4 mg/100 g dry substance for all other types of panels, in accordance with the current version at the time of sampling of EN 120, or an equivalent method approved by Nordic Ecolabelling, see Appendix 1.

   The requirement applies to wood -based panels with a moisture content of H = 6.5%.

   If the panel has different moisture content within the range of 3-10%, the measured perforator value must be multiplied by the factor F, which is calculated using the following formula:

   For chipboard: $F=-0.133\ H + 1.86$

   For MDF panels: $F = -0.121\ H + 1.78$

2. The average emission of formaldehyde must not exceed 0.09 mg/m³ air for MDF panels and 0.07 mg/m³ air for all other types of panel in accordance with the current version at the time of sampling of EN 717-1, or an equivalent method approved by Nordic Ecolabelling, see Appendix 1.

   EN 717-1 shows the correlation with the test methods ASTM E 1333 and JIS A 1460. This requirement can therefore alternatively be documented according to these methods as in the Table below:

Test method:	EN 717-1 (23°C/45% RH)	ASTM E 1333 (23°C/50% RH)	ASTM E 1333 (23°C/50% RH)	JIS A 1460
MDF	0.09 mg/m³	0.06 ppm	0.07 mg/m³	0.66 mg/l
Other panels	0.07 mg/m³	0.08 ppm	0.10 mg/m³	0.53 mg/l

3. 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).

☒ 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 used, the laboratory that conducted the analysis, and that the analysis laboratory is an independent third party. Other analysis methods than those stated may be used, provided that the correlation between test methods can be verified by an independent third party. For more information, see Appendix 1.

Background

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

Glue systems with formaldehyde are often used for wood-based panels. The development is towards reducing formaldehyde emissions from the finished panels. However, a study shows a tendency for the indoor air in especially larger, newly built houses to

contain formaldehyde. In two out of 2 houses tested, formaldehyde concentrations were even found that exceed the threshold value set by the World Health Organisation (WHO)[51].

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 tree-based panels, EN 13986, the TC112 technical committee has proposed a new class E1plus, with 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, as it will be in conflict with many countries' national legislation[52].

The requirement level for formaldehyde emissions from panels is harmonised across the Nordic Ecolabelling criteria for Construction Panels, Furniture, Floors and Outdoor Furniture and Playground Equipment. On using the Perforator method, the level of ½ E1 is retained. The reason for the difference between the two standards is that a correlation between the perforator method EN 120 and the chamber method EN 717-1 shows greater uncertainty for the perforator method.

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 can be tightened from 0.124 mg/m^3 to 0.09 mg/m^3 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 strict, but are deemed to be realistic to achieve.

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.

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 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 building materials) to minimise the risk of primary emissions.
- Requirement of moisture and water-proof buildings, to minimise the risk of secondary emissions.

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

Nordic Ecolabelling's principle is sufficient to ensure minimum emissions and therefore no emission measurement is required for buildings, or emission requirements for building materials, 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.

For some years Norway had a guideline for the maximum content of VOC in the indoor air, but it was withdrawn due to the inadequate scientific basis.

Illuminance - requirement removed

Version 2 of the criteria had a mandatory 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[53] 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.

5.6 Chemical products, solid building products (goods) and materials

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

The requirement must be fulfilled for the Nordic Ecolabelled building, but also for any supplementary buildings that are constructed and marketed with the Nordic Ecolabelled building. This might e.g. concern refuse depots, outhouses, bicycle sheds and huts.

In general, for ecolabelled products (Nordic Ecolabel and EU Ecolabel) subject to the requirement in section 5.6, the documentation requirement will lapse. Nordic Ecolabelled products fulfil the requirements automatically and only need to be included in the list of materials/logbook with the product and manufacturer name.

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

5.6.1 General

O19 List of materials and logbook

1. There must be a list of the chemical products and solid building products to be used to construct the Nordic Ecolabelled building. The list of materials must include the name of the producers and products, as well as details of the type of product, showing the area of use.
2. The Nordic Ecolabelled property must have a digital materials logbook for the solid construction supplies and chemical products used in production. The logbook must state:
   - Type of product, product name and producer.
   - Compounds used in the chemical product and solid building products/goods, and the main constituent elements of the material. This can be done by e.g. reporting the safety datasheet or building product declaration.
   - Approximate location in the building

The following products are not subject to either part 1 or 2 of the requirement:
Building fixtures (e.g. locks, handles, hole plates and hinges).
Nails, screws, nuts, bolts, washers and similar fasteners).

✉ List of materials in accordance with 1 and 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 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 Ecolabel 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.

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.

The following building products do not need to be included in the logbook:

- Building fixtures (e.g. locks, handles hole plates and hinges).
- Nails, screws, nuts, bolts, washers and similar fasteners).

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 building product declarations and a voluntary assessment system for construction supplies.

5.6.2 Chemical products

Introduction

In version 2 of the criteria the term chemical **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 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.

The Nordic Ecolabel 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. The Nordic Ecolabel 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 Ecolabel, REACH has no separate regulations for nanomaterials.

Definition of constituent substances

Chemical products are liquid and/or uncured chemical products that are used in construction work at the building site or by manufacturers of prefabricated construction elements. Chemical products used to construct any supplementary buildings and playground equipment at the site are also included.

Constituent substances are all substances used in the chemical products, including additives (such as preservatives and stabilisers) in the raw materials, but does **not** include impurities from production including primary production. Impurities are residues from production including primary production which may be found in the finished chemical

products at concentrations below 700 ppm (0.07% by weight, 700 mg/kg), but not substances that have been added to a raw material or the product actively and for a particular purpose, irrespective of quantity.

Impurities of over 1% concentration in the primary product are, however, regarded as constituent substances. Substances known to be degradation products of the constituent substances are also themselves considered to be constituent substances.

The 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 700 ppm or lower.

What applies to two-component products?
For two-component products it is the ingredients added to the sub-components that must comply with the requirement. Alternatively, 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 system, the requirement may apply to the hardened product.

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
- Painted wooden panels, both exterior and interior, and ceilings. Applies to both primed and final coated elements. As a triviality limit, primed or final coated mouldings, skirtings, bases and thresholds, or stained loose timber incorporated in the Nordic Ecolabelled building, are not included.
- Surface treatment of indoor staircases.

Delineations
The requirements of chemical products comprised what is "incorporated". The requirements do not include fuel for construction machines, marking paint, marking tape that is removed, 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.

For cement, concrete, mortar and plaster, the requirements for chemical products solely concern any chemical additives. Nordic Ecolabelling thus does not make chemical requirements of the actual cement or concrete.

Triviality limit
As a rule of thumb, the requirements do not have to be fulfilled for the chemical products that are used to a very limited extent. All exemption requirements must be communicated to Nordic Ecolabelling for approval. 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.

O20 Classification of chemical products

Chemical products used to produce Nordic 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 or the EU's Dangerous Preparations Directive 1999/45/EC as amended in 2008 or later).

Classification under CLP Regulation 1272/2008		**Classification under Dangerous - Preparations Directive 1999/45/EC 2008**
Hazard class and category	**Hazard phrases**	**Hazard class and risk phrases**
Toxic to aquatic organisms Category acute 1 Chronic 1-2	H400, H410, H411	N with R50, R50/53, R51/53
Hazardous to the ozone layer Hazardous to public health	H420, EUH059	N with R59
Acute toxicity Categories 1-3	H300, H310, H330, H301, H311, H331	T+ with R26, R27 or R28 T with R23, R24 or R25
Specific target organ toxicity (STOT) with single and repeated exposure STOT SE category 1 STOT RE category 1	H370, H371,H372	T+ with R39 T with R39, R48
Carcinogenic Carc 1A/1B/2	H350, H351	T with R45 and/or R49 (Carc 1 or Carc 2) or Xn with R40 (Carc 3)
Mutagenic Mut 1A/B/2	H340, H341	T with R46 (Mut 1 or Mut 2), Xn with R68 (Mut 3)
Reprotoxicity Repr 1A/1B/2	H360, H361, H362	T with R60 and/or R61 (Repr1 or Repr2), Xn with R62, R63 and/or R64 (Repr3)

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

✉ 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 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).

O21 CMR substances

The chemical products used in the production of Nordic Ecolabelled buildings may not contain chemical substances that are classified as carcinogenic (Carc), mutagenic (Mut) or reprotoxic (Rep), according to CLP Regulation 1272/2008 or the EU's Dangerous Substances Directive 67/548/EEC with subsequent amendments and adjustments, see the Table below.

Classification under CLP Regulation 1272/2008		**Classification under the Dangerous Preparations Directive 1999/45/EC 2008**
Hazard class and category	**Hazard phrases**	**Hazard class and risk phrases**
Carcinogenic Category Carc 1A/1B/2	H350, H351	T with R45 and/or R49 or Xn with R40
Mutagenic Mut 1A/1B/2	H340, H341	T with R46 or Xn with R68
Reprotoxic Repr 1A/1B/2	H360, H361, H362	T with R60 and/or R61 or Xn with R62, R63 and/or R64

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

An exemption is made for:

- Tin organic compounds that are governed by O23.
- The level of free formaldehyde (from formaldehyde not intentionally added or from formaldehyde-releasing substances) in the end-product may not exceed 200 ppm (0.02% by weight).
- Desiccant driers classified as reprotoxic category 2 in paint containing alkyd-based binders are permitted up to and including 30 November 2016 for outdoor paint (both consumer products and industrial paint). The total content of desiccant with the same classification must also be less than 0.3%. The exemption does not apply to substances on the EU's Candidate List.

✉ Declaration from the manufacturer of the chemical product, in accordance with Appendix 8.

✉ 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 EU's 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.

O22 Preservatives

The amount of preservative/combination of preservatives is limited according to the following:

Isothia-zolinone com-pounds totally	**Iodopropynyl-butylcarbamate (IPBC)**	**IPBC + isothiazolinone**	**MIT*** (2-Metyl-3(2H)-isotiazolinon (CAS-nr 2682-20-4)	**CMIT/MIT (3:1)** (5 chloro-2-methyl-3(2H)-isothiazolinone CAS-no. 26172–55-4 or 2-Methyl-3(2H)-isothiazolinone (CAS-no. 2682-20-4)	**Preser-vatives totally**
Indoor paints and varnishes					
500 ppm (0.0500 % w/w)	n.a	n.a	100 ppm (0.0100 % w/w)	15 ppm (0.0015% w/w)	600 ppm (0.0600% w/w)
All other chemical building products for indoor use					
500 ppm (0.0500 % w/w)	2000 ppm (0.2000% w/w)	2500 ppm (0.2500% w/w)	n.a	15 ppm (0.0015% w/w)	n.a

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

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 8.

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

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[54,55], 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 sens 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 (e.g. MIT). The requirement limits in version 1 are generally seen (by manufacturers) as tough and several manufacturers have had difficulty in fulfilling the preservative requirement.

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 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.

O23 Other substances excluded from use

The following substances may not be constituent in chemical products used in the production of Nordic 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**.
- 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***.
- 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

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

- The heavy metals lead, cadmium, arsenic, chromium (VI), mercury and their compounds.
- Volatile organic compounds at more than 1% by weight
- Organic tin compounds Exemptions are made for dibutyltin (DBT) and dioctyltin (DOT) which are included in the following levels and products in sealing systems****:
  - Maximum 0.5% in SMP polymers such as MS polymers.
  - Maximum 0.2% in silicon products and PUR polymers containing silanes instead of isocyanates.
  - Maximum 0.03% in PUR polymers with isocyanates.

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

*** Substances that are "deferred" or substances "under evaluation" are not considered to have PBT or vPvB properties.*

**** See the following link: http://ec.europa.eu/environment/chemicals/endocrine/strategy/being_en.htm*

***** By sealing system is meant both the joint product and primer. In this case only primer for porous material may contain the organic tin compounds in the exemption.*

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

✉ Declaration from the manufacturer of the chemical product, in accordance with Appendix 8.

✉ 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.

An important change in the revision is that the opportunity to use grouting with certain phthalates has been removed. Nordic Ecolabelling is aware of the positive development with grouting, which entails that phthalates are being removed and replaced with plasticisers that are not phthalates (This substitution is now taking place in expansion joints for outdoor use in which primarily DIDP are replaced with DINCH). The phthalate DINP that is mainly used/has been used in acrylate joints (interior paint joints) has already relatively easily been replaced by the sector with other plasticisers.

This naturally also entails that the exemption introduced in version 2 of the criteria in May 2014 that DINP and DIDP were accepted in outdoor joints in concrete on façades, sites, balconies, galleries and so on is no longer needed and has been removed.

To avoid material breach and cracking in the connected building components it is necessary to use sealants and that the grouting is broad enough to take up movement. Sealing must be elastic in order to absorb movement, and in order to function over time the sealant must have good and resistant adhesion to the joint edges. For porous materials such as concrete it is often necessary to first use a primer. The exemption for tin organic content now also applies to primers included in joint systems for porous material.

Appendix 8 gives a brief outline of the background to the prohibition for each of the substances/group of substances.

The lists of PBT and vPvB substances previously found on the ESIS website have been discontinued. Substances with these characteristics will gradually be included in the SVHC list. Nordic Ecolabelling is aware of this issue and will have the correct reference in the final version of the criteria.

O24 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):*

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

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

**** This applies to traditional synthetic amorphous silica. Chemically modified colloidal silica may occur for as long as the silica particles form an aggregate in the end product.*

✉ Declaration from the manufacturer of the chemical product, in accordance with Appendix 8.

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 Ecolabelled buildings and is in line with equivalent requirements in Nordic 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."

[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).

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

5.6.3 Solid building products/goods

Requirement O25 comprises two parts. First, the building products to which the requirement applies are listed. Then the chemical substances that may not be included in these building products, are listed.

By " included" is meant substances added by the producer or its subsuppliers and that are included in the end-product with more than 100 ppm.

O25 Substances excluded from solid building products

The requirement applies to the following solid building products:

- Sealing products (such as vapour, wind and radon barriers, fixed waterproofing of wet rooms, roof surfacing and roofing membrane).
- Thermal, acoustic and technical insulation.
- Interior and exterior building panels (besides 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 coverings of plastic for floors, ceilings and walls. Technical areas are exempt from the requirement*
- Drainage pipes, electricity cables, plastic sleeve pipes to carry electricity, and plastic pipes for central vacuum cleaners. Technical areas are exempt from the requirement*

In the above groups of construction supplies none of the following substances may be included:

- A substance on the EU's Candidate List**
- Persistent, bioaccumulative and toxic (PBT) organic substances***
- Very persistent and very bioaccumulative (vPvB) organic substances***
- 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****.
- Highly chlorinated short chain (C10-C13) and medium chain (C14-C17) chlorinated paraffins.
- Phthalates.
- Brominated flame retardants.
- The heavy metals lead, cadmium, arsenic, chromium (VI), mercury and their compounds.
- Perfluorinated and polyfluorinated alkylated substances (PFAs).
- Alkylphenol ethoxylates(APEO) and other alkylphenol derivatives (substances that release alkylphenols on degradation).
- Bisphenol A.
- Boric acid, sodium perborate, perboric acid, sodium borate (borax) and any other boron compounds classed as carcinogenic, mutagenic or reprotoxic.
- Tin organic compounds.

** Technical 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*

**** PBT and vPvB substances are defined in Annex XIII of REACH (Regulation (EC) No. 1907/2006). Substances that are "deferred" or substances "under evaluation" are not considered to have PBT or vPvB properties.*

***** See the following link: http://ec.europa.eu/environment/chemicals/endocrine/strategy/being_en.htm*

✉ Declaration from the manufacturer of the solid building product, in accordance with Appendix 9.

Background

The requirement comprises two parts. First it is described which (solid) building 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 4.

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 7 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[58] (e.g. wall elements, façade elements, joist elements), roof trusses or bathrooms and similar are built on site or as prefabricated building elements, the requirement in O25 will apply.

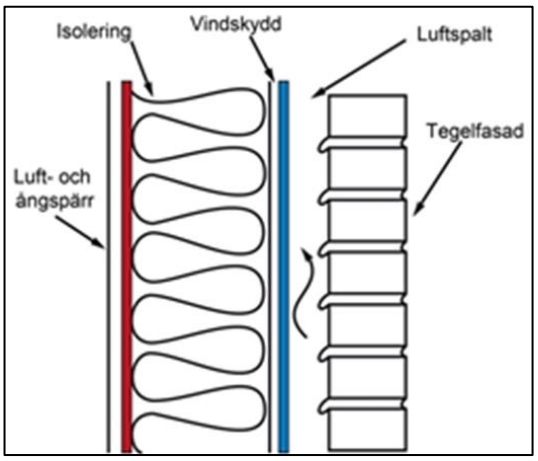


Figure 4: Outline to show an air/vapour barrier that prevents hot, moist indoor air from penetrating the insulation, which would give moisture damage. The air/vapour barrier is always placed on the warm side of the building envelope. Weather and wind protection is placed outside the building envelope in order to prevent the wind blowing through the building envelope, and to protect from precipitation.

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

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 building 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 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

[58] 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.

thus already included under the first item. But the "phthalates" item 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 solid building products/goods, and not just chemical products. For the Swedish industry this would be quite natural and possible, due to the impact of (voluntary) building element declarations and the building element assessment system in the market, with a broad impact.[59] The Nordic 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 material is based completely on what the producer of the construction material 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.

More detailed description of the product groups listed:

Table 7: The Table describes the product groups that must verify requirement O25 and what is included or exempted.

Product/material and brief description	Covered by requirement O25	Not covered by requirement O25
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).	Roofing foil, roofing/ Underlay and radon barrier. 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. Reason: triviality limit
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.	Wooden panels (solid wood, laminated timber, veneer, plywood, OSB, MDF and chip-board), which instead must fulfil the requirement in section 5.7.
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 clinker[60]. 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 impreg-nated as protection from rot, blue stain and mould.	Pre-impregnated construction supplies such as windows and outer doors. Fire protection impregnated timber.

[59] This concerns the Sunda Hus (Healthy Buildings) and Byggvarubedömningen (building element assessment) systems, as well as the BASTA self-declaration system.
[60] Often called Leca blocks after the manufacturer Ab Svenska Leca (now part of the Saint-Gobain Group).

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 Ecolabelled buildings and related courtyards, play areas or supplementary buildings.	
Interior covering of plastic for floors, ceilings and walls.	Concerns surface layers, i.e. what you "walk on and see", in contrast to the scope of O27. Vinyl flooring is included. Fixed sealing layers are covered by fixed sealing products - see above.	Products in technical areas are completely exempt from the requirement. Technical 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 technical areas: all living areas and communal areas such as stairways, entrance areas, storerooms, corridors in basements/galleries, pram rooms, bicycle rooms and broom cupboards for property cleaning. Shower walls are not included.
Drainage pipes, electricity cables, plastic sleeve pipes to carry electricity and plastic pipes for central vacuum cleaners. The products share in common that the material is plastic - traditional chlorinated plastics (PVC).	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. The requirement does not include Internet, data, telephony and TV cables. 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.

O26 Nanoparticles and antibacterial additives in goods

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

** 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.*

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

Background

There is still great uncertainty related to how nanoparticles affect health and the environment[61]. 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 "antibacterial". 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 O25, 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 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, window sills and other

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

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.

O27 Surface layers on floors, roofs and walls

Interior surface layers on floors, roofs and walls may not contain chlorinated plastics (PVC).

Technical areas are exempt from the requirement. Technical 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.

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

✉ Documentation to show how the requirement is fulfilled.

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 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. Since this does not exist in practice for vinyl flooring, used vinyl flooring ends up in landfill.

O28 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 30% 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**.

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

- external cladding of outer wood components for the sole purpose of weatherproofing;
- (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 Ecolabelled window, window door and outer door will fulfil the requirement and must only verify the requirement with product name and licence number.

** Recycled material is defined as post-consumer material, recycled waste materials from window and outer door manufacturing, and waste from other production of e.g. plastics and metals. Production waste from the manufacture of window and door profiles, however, is not included in the proportion of recycled material.*

*** Plastic items weighing 50 grams or less are exempt from the requirement concerning lead and cadmium.*

✉ Specification of the proportion of recycled material used. Declaration from the manufacturer that the raw material is recycled.

✉ For recycled plastic, also test results or the equivalent showing that the requirement concerning lead and cadmium is fulfilled.

Background

The requirement has been harmonised with equivalent requirements in the criteria for Nordic 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[62]. To handle these energy consumption variations Nordic Ecolabelling requires a certain ratio of recycled material.. The requirement is fully harmonised with equivalent requirements in the criteria for Nordic 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, which 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 Ecolabelled windows and exterior doors.

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

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), which are[63] regulated by product standard EN 1873, nor windows and exterior doors that are resistant to fire under standard EN 16034.

O29 Façades and roofs

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

✉ Documentation to show that the requirement is fulfilled.

Background

Copper

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 Ecolabelled) projects in which both small houses and apartment buildings were newly produced, using copper as the material for façades and/or roofs.

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 extraction[64]. 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%).

A recent study from IVL Swedish Environmental Research Institute[65] has shown that rainwater from large copper roofs in Stockholm does not significantly increase the copper content of the surrounding recipients, Lake Mälaren and Saltsjön. The study concludes: "Runoff of copper-roofs can only be an insignificant source of Cu to the sediments in Lake Mälaren and Saltsjön in the city centre of Stockholm".

At the same time, wastewater treatment plants are concerned about the copper content and need to significantly reduce the intake. There is more information on the adverse effects of copper in the background text to requirement O32. Even though there is little likelihood of it being used as the façade or roof cladding on a Nordic Ecolabelled building, Nordic Ecolabelling has retained the prohibition of copper, due to copper's

[63] Dome ceilings are installed on flat or almost flat roofs, but otherwise fulfil many of the functions of a "normal" window.
[64] http://inside.mines.edu/UserFiles/File/economicsBusiness/Misc%20PDFs/Copper-Science-2014-Kerr-722-4.pdf.
[65] Ni, Cu, Zn, Cd and Pb in sediments in the city centre of Stockholm, Sweden. Origins, deposition rates and bioavailability, A. Jönsson, November 2011, IVL.

threat to aquatic organisms, and so as not to contribute to the addition of more copper to wastewater treatment plants.

In order to be reasonable and relevant, the requirement has been expanded to include roof and façade products such as rainwater drainage products, roof gutters, exhaust air hoods, eaves, roof profiles, and so on.

Lead
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).[66].

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 O23 and O25.

5.7 Timber, bamboo and fibre materials

Requirements of timber, bamboo and fibre materials - Introduction

In 2014 Nordic Ecolabelling launched an evaluation of Nordic Ecolabelling's cross-disciplinary forestry requirements. The main purpose of this evaluation was to elucidate whether Nordic Ecolabelling's current forestry requirements have an adequate environmental impact. The evaluation has focused especially on giving a recommendation for the design of future simplified forestry requirements. The new forestry requirements were in spring 2015 sent to hearing. Since the new forestry requirements, after hearing process, successively will be phased into the criteria documents, it is these proposed forestry requirements that are presented in the following chapter. The final requirements of timber and bamboo in the criteria for Nordic Ecolabelled buildings will be adjusted both according to hearing answers from the hearing of buildings and from the on-going hearing of forestry requirements.

Sustainably managed forests provide a number of other benefits to society besides wood for materials and energy. Forests protect from global warming by absorbing and storing CO_2, meet the daily needs of local communities and indigenous populations, ensure biodiversity (wild flora and fauna) and protect water and soil from pollution and erosion, etc. It has been proved that the certification of forests entails environmental gains[67] although it is difficult to derive quantitative environmental benefits, such as increased biological diversity, from the forestry requirements in the Nordic Ecolabelling criteria. Nordic Ecolabelling's manageability, i.e. the ecolabels' ability to influence the process of developing forestry certification standards, is very small. By setting requirements of

[66] Chemicals inspection, facts about lead.
[67] http://www.rainforest-alliance.org/resources/documents/biodiversity_certification.pdf.

certified timber resources, Nordic Ecolabelling can contribute to increasing the demand for certified timber.

Nordic Ecolabelling supports the development of forestry certification in order to achieve sustainable forestry, by setting requirements for timber resources originating from certified forestry. Forestry certification is an important tool to develop forestry towards more sustainable forestry whereby forestry methods are described and followed up/tightened via ongoing revisions. When producers switch to certified timber resources, a signal is also sent to the forestry industry that it is important to acknowledge and reduce the environmental impact from forestry. Switching to certified timber resources can therefore be deemed to be an environmental benefit. Nordic Ecolabelling influences this development directly by continuously tightening the requirement of the percentage of certified timber in its criteria documents.

Today, Nordic Ecolabelling approves relevant forestry standards individually in the countries from which licence applicants purchase their timber resources. This is a time-consuming process and a key question in the evaluation was whether the requirements can be simplified to full approval of certification schemes such as FSC and PEFC, whether these are national or interim standards. One reason for this is, among other things, that the individual assessment of forestry standards has shown that the quality of the forestry standards has improved during the period since the beginning of 1998. The EU has also introduced new legislation to prohibit the marketing and sale of illegally felled timber in the EU.

With the support of Nordic Ecolabelling's evaluation of forestry requirements, we propose the following requirements for timber and other renewable resources.

O30 Origin, legality and traceability

The requirement concerns all building elements and fixtures (including refined products, for example windows, floor coverings, doors and kitchen fixtures) containing solid wood, bamboo, plywood/veneer and fibreboard (panels) such as OSB boards, chipboard and MDF/HDF boards.

Nordic Ecolabelled products meet the requirements. State the manufacturer, licence number and name of the product.

The applicant must state the name (in Latin and one Nordic language) and geographic origin (country/state and region/province) and supplier of the timber and bamboo resources used.

Resources originating from a country with a corruption index (CPI) below 40 may not be used in Nordic Ecolabelled buildings without further risk assessment of the area. Risk assessment is performed by Nordic Ecolabelling.

The CPI index requirement applies at the time of application. CPI-index information can be found at http://www.transparency.org

Timber resources used in Nordic Ecolabelled buildings must fulfil European Timber Trade Regulation (EUTR) (No. 995/2010). Licence holders are obliged to inform Nordic Ecolabelling if they become aware of infringements of the legality principle in EUTR, either under their own auspices or in their supply chains.

Species of timber and bamboo listed in CITES, Annexes I, II and III, may not be used in Nordic Ecolabelled buildings.

Information on CITES annexes can be found at "The CITES Appendices" website: www.cites.org/eng/app/index.php

- ✉ Name (in Latin and one Nordic language) and geographical origin (country/state and region/province) of the tree species and bamboo used. Nordic Ecolabelling may require further documentation if there is any uncertainty concerning the origin of the raw material. Appendix 10 may be completed by the producer/supplier.
- ✉ Attestation by the producer/supplier that all timber resources fulfil the European Timber Trade Regulation (EUTR) (No. 995/2010). Appendix 11 can be used.
- ✉ Attestation by the producer/supplier that timber and bamboo resources listed on CITES, annexes I, II and II are not used in a Nordic Ecolabelled building. Appendix 11 can be used.
- ✉ In cases where the resources are from countries with a corruption index CPI < 40, an external risk assessment in accordance with EUTR may be included as documentation.

Background

Origin

Nordic Ecolabelling sets requirements of traceability in order to gain information on the timber species included in Nordic Ecolabelled products, as well as information on their origin. Names of suppliers must also be stated. By making requirements of traceability Nordic Ecolabelling wishes to ensure that timber and timber resources are from legal sources, and do not come from areas with e.g. high biodiversity, protected forests or areas of which the ownership is unclear, etc. The requirement supports the proposed requirement that timber resources that originate from countries or regions with high corruption should not be used in Nordic Ecolabelled products without further risk assessment of the area (see below). The requirement must be documented by the timber supplier or by the manufacturer of the Nordic Ecolabelled product.

Corruption index

Nordic Ecolabelling does not wish timber resources that originate from countries or regions with high corruption to be used in Nordic Ecolabelled products without further risk assessment of the area. For information on Nordic Ecolabelling's risk assessment practice, see below. On review of the forestry standards, Nordic Ecolabelling has found that there are often major problems related to forestry in high-corruption areas, even though the forestry itself is certified.

Transparency International's Corruption Perceptions Index (CPI) assesses and ranks countries/territories based on how corrupt a country's public sector is deemed to be. This is a combined index as a combination of surveys and assessments of corruption, compiled by a number of well-reputed institutions. The CPI index is a tool that is generally used in risk assessment, to which reference is also made in the draft EUTR user manual. CPI is updated annually.

A CPI index below 40 corresponds to countries assessed as "high risk regions and risk regions" by Transparency International. The requirement of CPI below 40 is not intended to be an absolute requirement, but entails that Nordic Ecolabelling must perform further risk assessment if timber resources originate from these countries. Certified timber resources from areas with a CPI index below 40 are not in themselves sufficient documentation of legal and sustainable timber resources. The CPI index requirement applies at the time of application.

In cases where the timber resources are from areas with a corruption index below 40, Nordic Ecolabelling will perform a risk assessment of the area. The risk analysis must assess five parameters: corruption/legality, traditional/civil rights, biodiversity/High

Conservation Values, conversion of nature types to other purposes, and GMO. The five parameters are the same as are included in Global Forest Registry[68] risk analyses. For information on corruption/legality, among other things risk analysis in accordance with EUTR is used. Further information concerning the risk analysis can be obtained from a number of relevant websites, such as:

- The illegal logging website: www.illegal-logging.info
- The CPI of Transparency International: www.transparency.org
- World Bank: www.wordbank.org
- Environmental Investigation Agency: www.eia-international.org
- Global Witness: www.globalwitness.org
- ELDIS regional and country profiles: www.eldis.org/country.index.htm
- Responsible Investment and Purchasing Advice Centre (ReIPAC) run by ProForest for subscribers: www.proforest.net/reipac
- The Global Forest Registry
- Cites: www.cites.org
- IUCN Red list: www.iucnredlist.org
- EU Timber Regulation: http://ec.europa.eu/environment/forests/timber_regulation.htm

In cases where the analysis shows that the risk is low, the timber resource may be included in Nordic Ecolabelled products. As documentation, applicants may enclose external risk analysis reports for areas with a CPI index below 40.

European Timber Trade Regulation
Even though illegal timber is prohibited in Europe in accordance with the European Timber Trade Regulation (EUTR) (No. 995/2010), it is generally known that illegal felling is still common practice in some countries. In a report from 2012, a joint investigation by the UN Environmental Programme and Interpol declared that illegal felling accounts for up to 30% of the global trade in timber and contributes to more than 50% of the deforestation of tropical forests in Central Africa, Amazonas and Southeast Asia[69].

For all distributors of timber and timber products in the EU, including those that solely resell timber and timber products after the timber has been put into the EU market for the first time, an official obligation is introduced to manage who the timber was purchased by, and who it was sold on to. The traceability requirement will oblige Nordic Ecolabel licence holders to ask their operators, either directly or via distributors, for information on their "Due diligence" and thereby information on where the timber originates from. This also applies to timber resources that are exempt from EUTR.

EUTR covers a wide range of products, including raw timber, sawn and processed timber, furniture and prefabricated buildings, as well as a large number of products containing paper and carton, while many other products (expressed in customs codes) are exempted70. Nordic Ecolabelling requires all timber resources included in Nordic Ecolabelled products to comply with EUTR. Licence holders are obliged to inform Nordic Ecolabelling if they become aware of any infringement of the legality principle in EUTR, either under their own auspices or in their supply chains (infringements cited by

[68] http://www.globalforestregistry.org/
[69] Illegal Logging Trade Decimates Forests, Africa: AllAfrica.com, 2012, retrieved 18 October 2012.
[70] http://ec.europa.eu/environment/forests/timber_regulation.htm

designated national inspection authorities). In such case, Nordic Ecolabelling will determine the severity of the infringement and its consequences for the Nordic Ecolabelling licence. It is likely that these exemptions will be removed when EUTR is revised in 2015/2016, but until then the requirement is in force.

Certified timber is not automatically (European Commission) deemed to be legal timber in accordance with EUTR. Both PEFC and FSC have launched a revision of their "Chain of Custody" standards in order to live up to the provisions of EUTR. However, both schemes have already made adjustments to help the certified companies to fulfil the requirements in EUTR. Nordic Ecolabelling finds that certification or other schemes controlled by an external party, and which include control of compliance with current legislation, and set sustainability requirements, may be used in risk assessment.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

CITES[71] is the Convention on International Trade in Endangered Species of Wild Fauna and Flora. This takes place by monitoring and regulating international trade. Its aim is that only sustainable trade is permitted - i.e. that international trade in specimens of wild animals and plants does not threaten their survival. In practice this means that special permits are required or, in certain cases, that trade in certain species of wild animals and plants, living or dead, as well as products made from their hides, feathers, teeth, etc. is completely prohibited.

CITES covers around 5,000 wild fauna species and around 28,000 flora species, of which approximately 300[72] are timber-relevant tree species (mainly tropical tree species). Depending on how far they are endangered, the species are listed in Appendices I, II or III. Species listed in Appendix I are highly endangered and trade in them is completely prohibited. The other species require special import and export permits (Appendices II and III). CITES is governed by EU legislation (Council Regulation (EC) No 338/97) and valid CITES licences are deemed to be legally felled in accordance with EUTR.

A recurring problem with the existing schemes to regulate trade in timber or endangered species (e.g. CITES) is that, due to extensive corruption, the required permits are often inexpensive to buy in the export country[73.] Nordic Ecolabelling therefore proposes that timber species listed in CITES, Appendices I, II and III, may not be included in Nordic Ecolabelled products, even though CITES licences live up to EUTR. Nordic Ecolabelling sees no reason to use timber species listed in CITES, since alternative species are available.

The requirement has been tightened slightly compared to the requirement in version 2 of the criteria, since the documentation of origin, legality and traceability now also applies to panel material. This is stated in the introduction to requirement O30.

[71] Convention on International Trade in Endangered Species.
[72] https://www.regjeringen.no/contentassets/0c04b085733e4d5cb806c132aaf36167/dn.pdf
[73] http://wwf.panda.org/what_we_do/how_we_work/policy/conventions/cites/

O31 Resources from controlled and certified forestry

Controlled resources

All timber and building products of solid wood, bamboo or plywood/veneer a in Nordic Ecolabelled buildings must, as a minimum, be from controlled sources, i.e. be subject to the FSC or PEFC controlled wood schemes.

The requirement does not include fibreboards (panels) such as OSB boards, chipboard or MDF/HDF boards.

Certified resources

For the following construction elements of solid wood, bamboo or plywood/veneered at least 70% of all resources must come from certified forestry:

- Roof trusses
- Frames and joists
- Interior panels
- Exterior façades including timber for balcony, terrace and veranda

Nordic Ecolabelled products meet the requirements. State the manufacturer, licence number and name of the product.

Certification (FSC or PEFC) must be performed by accredited certification bodies, i.e. an independent third party.

The requirement on 70% certified amount must be documented as the amounts of timber and bamboo purchased to the Nordic Ecolabelled building/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.

✉ **Controlled resources:** Documentation that purchased resources is subject to a control scheme. The traceability system must be described. A Chain of Custody Certificate issued by FSC or PEFC must be included in the documentation for the whole or parts of the supply chain. Appendix 12 can be used.

✉ **Certified resources:** Documentation that 70% certified amount is fulfilled. Calculation/estimation on the purchased total volumes and a copy of invoice(s) to confirm the proportion of certified timber purchased for the building/project. If a building product is labelled with the FSC- or PEFC-logo (logo licence product) it automatically fulfils the requirement and is documented with a photography/image.

Background

In future, minimum 70% by weight of all timber resources included in a Nordic Ecolabelled product must come from certified forestry in accordance with the FSC or PEFC certification schemes. The remaining proportion of the timber resources must come from controlled sources, i.e. be subject to the FSC or PEFC controlled wood schemes.

Today, FSC and PEFC are the dominant certification schemes for sustainable forestry. Even though there are considerable differences between the two schemes, both are deemed by Nordic Ecolabelling to be at the forefront of legislation, and thereby oriented towards more sustainable forestry. If the future brings new, credible, forestry standards, besides today's FSC and PEFC, Nordic Ecolabelling will assess whether these new standards can be used. Since Nordic Ecolabelling refers to FSC and PEFC, this entails that certification bodies that issue forestry and chain of custody certificates must be accredited/recognised by these certification schemes.

The applicant must document that minimum 70% of all timber resources included in the Nordic Ecolabelled product on a project basis originate from certified forestry. The remaining timber volume must comply with the FSC or PEFC requirements of timber from controlled sources.

Nordic Ecolabelling seek chain of custody (CoC) certified according to FSC or PEFC for the whole or parts of the supply chain. CoC certification will contribute to traceability in the supply chain within FSC and PEFC's guidelines and chain of custody control systems. A key aspect of CoC certification is verification of the proportion of certified timber sold, in the form of an annual third-party audit.

For Nordic Ecolabelled buildings the documentation must be in the form of invoices, order confirmations or cover slips. Any product labelled with FSC or PEFC (logo licence product) will also be approved as documentation.



Figur 5: Image of logo license for certified products.

O32 Durable/resistant wood for outdoor use

Pressure-impregnated timber in classes M, A and AB according to the Nordiska Träskyddsrådet (Nordic Wood Preservation Council) classification may not be used in or in direct relation to the Nordic Ecolabelled building, or in yards or outdoor playground areas that belong to the Nordic Ecolabelled house, school or pre-school.

Exemptions may be made from the requirement for wood in contact with the ground, in contact with fresh or salt water, and in special cases on ground where there is a considerable risk of rotting, i.e. risk classes 4 and 5 according to EN 335.

All durable wood for outdoor use must fulfil required O25, Unwanted chemical substances.

Nordic Ecolabelled sustainable durable timber for outdoor use fulfils the requirement and may be used without completing a form. Only the manufacturer and product name must be stated.

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.

✉ Duly completed Appendix 9. For Nordic Ecolabelled timber for outdoor use, only the product name/commodity name and manufacturer need to be stated.

✉ To use one or both exemptions, the need for pressure-impregnated timber must be documented in writing, stating the reason. An approval decision by Nordic Ecolabelling must be obtained.

Background

In principle the requirement is unchanged, but has been specified to state that pressure-impregnated timber may not be used in school yards or pre-school playgrounds in play equipment, fences, decking and so on.

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 a 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.[74.] 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[75].

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[76.] 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[77] 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.

[74] Treteknisk (Norwegian Institute of Wood Technology) website: http://www.trefokus.no/fullstory.aspx?m=329&amid=13078 (2014)
[75] 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.
[76] Statens forurensningstilsyn, Vurdering av virkemidler for å redusere utslippene av kobber (Assessment of methods to reduce copper emissions). 2005.
[77] Store norske leksikon (Norwegian Encyclopeadia): http://snl.no/kobber

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 various impregnation agents for the respective classes. EN 599 contains a description of the various methods to test durability.

Table 8 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 salt water (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

O33 Air permeability

The licence holder 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 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.

A measurement method according to EN 13829 or simplified method recognised by the industry must be used. Air permeability must be measured with at least 50Pa.

✉ 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.

O34 Material requirements

The licence holder must ensure fulfilment of the material requirements in chapter 4 (requirement O19 up to and including O32). 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.

Materials and chemical products added to the building via subcontractors must also be controllable, e.g. via agreements and inspection.

✉ Routines or agreements that show how materials requirements O19 to O32 are fulfilled for the entire construction process.

✉ If subcontractors are hired, their routines or agreement for this 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?

O35 Information to those involved in the construction process

Employees, including supervisors, site managers, subsuppliers 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 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 licence holder 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 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.

O36 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 the following (where relevant):

- Risk of the occurrence of radon, from the ground and from purchased aggregate
- Waste handling at construction sites
- Moisture/damp proofing
- Secure execution of water installations
- Electrical installations
- Ventilation
- Heating system
- Material requirements
- Routines for the performance of pre-inspection of the building before independent third-party control/final inspection.

If the licence holder is not the same as the contractor, the contractor's self-monitoring can be used for verification.

✉ Description of the self-monitoring system and the party responsible.

🔑 Results of the self-monitoring performed 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.

O37 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 licence holder's first Nordic 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 (often called final inspection) 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 P11 point requirement.

5.9 Instructions for residents and property managers

O38 Operation and maintenance instructions

There must be overall general information and operation and maintenance instructions for the Nordic 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 material and chemicals requirements in chapter 4 of the criteria, or be ecolabelled with the Nordic 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.

5.10 Quality and regulatory requirements

O39 Documentation

The licence holder must archive the documentation that is sent in with the application, or in a similar way store information in the Nordic Ecolabelling data system.

🔑 On-site inspection.

O40 Documentation of the buildings

The licence holder must have a list of the constructed Nordic Ecolabelled buildings. The documentation must be stored by the licence holder for at least five years after occupation.

🔑 On-site inspection.

O41 Planned changes

Written notice of planned product and market changes that affect the Nordic Ecolabelling requirements must be submitted to Nordic Ecolabelling. New material received after the licence has been granted must be approved if it is subject to the requirements in chapter 4.

✉ Routines describing how planned product and market changes will be handled.

O42 Unforeseen non-conformities

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

✉ Routines describing how unforeseen non-conformities will be handled.

O43 Complaints

There must be routines for the documentation, reporting and handling of any complaints/claims concerning the Nordic 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.

O44 Laws and regulations

The licence holder must ensure compliance with all relevant applicable laws and provisions at all production sites for the Nordic 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's 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.

5.11 Point-score requirements

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 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:

- from 10% up to and including 25% of the domestic hot water requirement give 1 point;
- 26 - 50% of the domestic hot water requirement give 2 points; or
- more than 50% of the domestic hot water requirement give 3 points.

Solar cell panels that are calculated to provide:

- from 5% up to and including 15% of the building's calculated electricity requirement give 1 point;
- 16 - 25% of the building's calculated electricity requirement give 2 points; and
- more than 25% of the building's calculated electricity requirement give 3 points.

Heat recovery from wastewater that is calculated to achieve:

- up to 15% of the domestic hot water requirement gives 1 point;
- 16 - 25 % of the domestic hot water requirement gives 2 points; and
- more than 25 % of the domestic hot water requirement gives 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.

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[78] 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 Ecolabelling of buildings. Solar cell panels and solar collectors located at a neighbouring building are also approved for as long as the electricity generated supplies the Nordic Ecolabelled building.

Locally generated wind power is problematic due to noise and solar fibrillation. Normally, wind turbines are nor 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.

[78] 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.

P2 Individual metering of domestic hot water

In buildings with shared hot water supply to several residential units, 1 point is give 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, also displays the domestic hot water consumption of other residential units in apartment buildings, either separately or as mean values.

Measuring instruments must be approved in accordance with the measuring instruments directive (MID) (2004/22/EC) 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 a mandatory requirement to a point-score requirement.

The Swedish National Board of Housing, Building and Planning's report from 2014[79] 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 Sveby's user input data[80] 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. that 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 counter-productive. 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.

[79] [79] Individual metering and billing for new buildings and conversions. Report, 2014:29. Swedish National Board of Housing, Building and Planning.
[80] User input data for energy calculations in homes. Sveby programme, project report 2009-04-14.

Metering system and measurement instrument requirements
Just 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 with "bad" water. The meter may display too little or too much, and also not start up on a low flow[81].

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" systems. 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 Minimised hot water circulation (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.

✉ Energy calculation clearly stating calculated HWC losses.

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[82]. 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[83].

[81] Personal communication with Gunnar Tysk, EcoGuard AB.
[82] 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).
[83] PowerPoint presentation Installationsssytem i energieffektiva byggnader (Installation systems in energy-efficient buildings). Tekn. Dr Per Kempe. Project engagement.

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.

P4 White goods with better energy class

If all products within a product group/category see table below, is classified in an energy class better than the mandatory requirement 1 point is gained. A total of maximum 3 point can be given.

Product group	**Mandatory requirement (O7)**
Washing machines	A+++
Fridges and freezers	A++
Dishwashers	
Tumble dryers	
Ovens	A+
Extractor hood	A
Combined washing machines and tumble dryers	
Wine coolers	

✉ Reporting of the type and number of white goods and related labelling in product specifications, and so on.

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 Ecolabelled buildings. This point-score requirement is therefore introduced, as a supplement to the mandatory white goods requirement (O7). For several reasons, tightening the mandatory requirement in the course of the criteria's term of validity, i.e. white goods requirements in two stages, is not feasible.

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[84]. 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%.

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[85].

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[86, 87]. 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[88]. Figure 4 from this study shows that the cement-based materials have the greatest impact.

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[84] Life Cycle Assessment of Different Building Systems: The Wälludden Case Study", SP Technical Research Institute of Sweden i 2013.
[85] 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
[86] Life cycle assessment of MiniCO_2 houses in Nyborg, Danish Building Research Institute, 2013.
[87] A. Dodoo, Life Cycle Primary Energy Use and Carbon Emission of Residential Buildings, 2011.
[88] Life cycle assessment of MiniCO2 houses in Nyborg, Danish Building Research Institute, 2013.

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%.

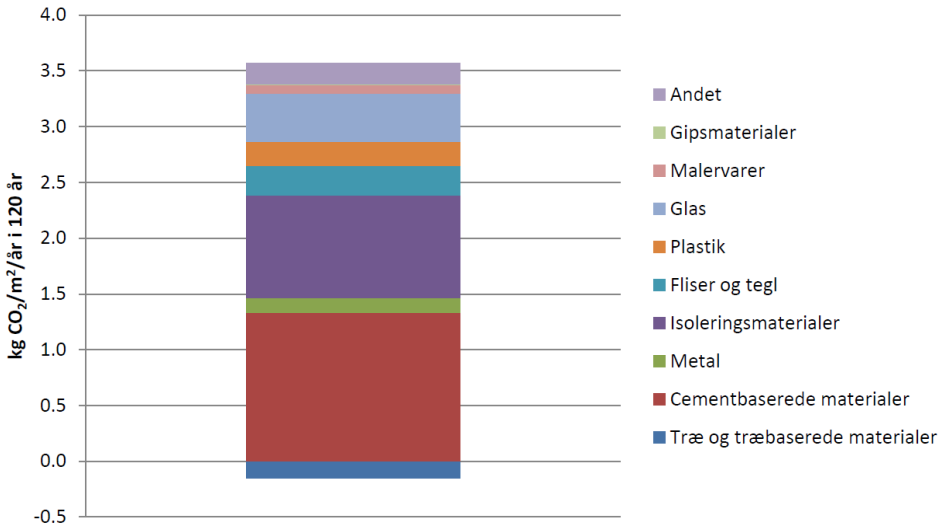

Figure 3: Materials' CO_2 contributions in the building's lifetime including maintenance. Source: Life-cycle assessment of MiniCO2 houses in Nyborg, Danish Building Research Institute, 2013

Nordic Ecolabelling's aim is for it to be possible to Nordic 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 a mandatory requirement. Buildings with concrete structures can achieve points by using concrete with a reduced environmental impact in requirement P5, and buildings with timber structures can achieve points in requirement P6.

P5 Cement and concrete with a reduced energy and climate impact

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 can give 1 point each:

- Roof trusses
- Bearing systems and ground/floor decks
- Wall elements
- Façade elements
- Balcony elements, terrace and porch

- Other types of cement products of equivalent size/scope may be approved by Nordic Ecolabelling.

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.

✉ Product sheet stating the cement clinker content for each cement/concrete product that will give points.

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.

Cement clinker is the main constituent of cement, see footnote[89]. 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[90].

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[91]. 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 microsilica 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.

[89] 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.
[90] EU BAT conclusions on industrial emissions for the production of cement, lime and magnesium oxide 2013.
[91] EU BAT conclusions on industrial emissions for the production of cement, lime and magnesium oxide 2013.

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 blastfurnace cement with 5-19% clinker to CEM II Portland microsilicate 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 blastfurnace cement with 5-19% clinker for all purposes. Since the requirement is made as a point requirement (and thus not mandatory) and points are given for less than 70% clinker, it is assessed to be realistic that points can be gained for this requirement. Several 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 means 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 a 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[92, 93]. In Danish concrete there will typically be a content of residual products equivalent to 20% of the cement content[94].

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%.

P6 Timber structures

The following points are given for renewable materials:

- For buildings of which the carcass/bearing structure (excluding the roof) is of wood or another renewable material, 1 point is given.
- For buildings of which the rood structure is of wood or another renewable material, 1 point is given.
- For buildings of which more than 50% of the façade area is of wood or another renewable material, 1 point is given.

A maximum of 3 points can be achieved for this requirement.

✉ A description of the building or building type's materials in the carcass/bearing structure, roof structure and façade, see also O1.

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[95]. At the same time, the study entitled "Carbon, Fossil Fuel and Biodiversity Mitigation with wood and forests" shows

[92] 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.

[93] 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.

[94]

[95] "Life Cycle Assessment of Different Building Systems: The Wälludden Case Study", SP Technical Research Institute of Sweden in 2013.

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[96].

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 O30 and O31.

P7 Better noise environment (solely concerns small houses and apartment buildings)

Apartment buildings and small houses can achieve the following points:

- 1 point if noise class B is achieved for the parameters airborne noise insulation and impact noise insulation between adjacent homes, e.g. between flats and row houses.
- 2 points if
  a) the building achieves noise class B overall
  or
  b) the requirement for noise class A for the parameters airborne noise insulation and impact noise insulation between adjacent homes, e.g. between flats or row houses, is fulfilled.

Noise from stairways is not included in the requirement.

National noise standards must be used: Denmark DS 490; Sweden SS 25267, Norway NS 8175 and Finland SFS 5907.

✉ Calculated or measured values and statement of the noise class achieved, showing that the requirement is fulfilled.

Background

The first part of the requirement is equivalent to the previous version of the criteria (version 2), but the opportunity to achieve two points is new. This is possible because noise is an important health problem and good noise insulation is related to a good indoor climate.

The point requirements are based on how noise from neighbours and impact noise are the most annoying noise for residents. The noise from stairways is not included in the requirement since this would require double outer doors, which is both an extra expense and impractical for residents. Noise from stairways is usually of limited duration, and can be managed by residents on a joint basis.

Since the first part of the point requirement - which gives 1 point - concerns noise between residential units, this is not relevant for small houses. However, a small house may fulfil the requirement, which can give 2 points.

For further information concerning acoustics, see under O16.

P8 Ecolabelled building products

Ecolabelled (Nordic Ecolabel or EU Ecolabel) building products used in the Nordic Ecolabelled building give points. For each product area/category:

- 1 point is given if at least 10% of the product requirement is covered by ecolabelled products;
- 2 points are given if at least 30% of the product requirement is covered by ecolabelled products; and

[96] Chadwick et al. Carbon, Fossil Fuel and Biodiversity Mitigation with wood and forests, Journal of Sustainable Forestry 2014.

- 3 points are given if at least 50% of the product requirement is covered by ecolabelled products.

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 breakdown of product areas, must be completed.

Background

The building materials contribute environmental impacts such as energy consumption, resource consumption, problematic chemical impacts and negative impacts on biodiversity. The ecolabelled building 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 Ecolabelled building uses some of the building products with a reduced environmental impact that are available in the market. There are more and more building materials with type I ecolabels such as the Nordic Ecolabel and the EU Ecolabel in the market, and it is thus obvious to encourage their use in Nordic Ecolabelled buildings. The advantage is that the ecolabelled (type 1) building 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.

P9 Chlorine-free plastic products

If all products within one of the following categories are chlorine-free, 1 point is given.

A maximum of 2 points can be achieved.

- Cable ducts for electrical wiring
- Mains cables (except lifts)
- Drainage pipes
- Plastic pipes for central vacuum cleaners

✉ 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 mandatory, 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 licence holders 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.

See requirement O25 concerning more information on what is included.

P10 High ratio of timber from certified forestry

If the volume of timber from certified forestry according to O31 exceeds 70% of the total volume of timber, points are given as stated below. Maximum 4 points can be achieved.

- 80% gives 2 points
- 90% gives 4 points

✉ Documentation according to O12.

Background

The requirement is aimed at increasing the use of timber from certified areas that guarantee sustainable cultivation in both environmental and social terms. The requirement was also included in version 2 of the criteria. The difference is that now two levels have been introduced, and a total of 4 points can be achieved.

P11 Recovered or reused materials in building products

For each building product and building material outside the vapour barrier consisting of at least recovered or reused resources, 1 point per product is awarded. A maximum of 3 points can be achieved.

The recovered resource may not contain any of the following substances at a level that exceeds 100 ppm:

- Halogenated flame retardants
- Cadmium, lead, mercury, chromium VI and arsenic, and compounds of these substances.

✉ Documentation showing the ratios of recirculated resources in building products or materials.

✉ Documentation of the occurrence of the substances listed in the requirement, for example via an analysis report.

Background

Building 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 building materials with recirculated resources. On using recirculated resources, the resource, energy and CO2 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 building materials, possibly with a point requirement that rewards the use of recycled building products.

Nordic Ecolabelling wishes to contribute to the development of the recovery of building 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 building products and building 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.

Nordic Ecolabelling is deliberately testing a cautious strategy with a point requirement that rewards recovery and recycling. Nordic Ecolabelling has expressly requested views on this proposed requirement in the consultation.

P12 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:

- 60% or higher 1 point is given, or
- 70% or higher 3 points are given.

A maximum of 3 points can be achieved.

The proportion of building waste that is recovered and recycled also includes the unsorted waste that is handled at the construction site, but which on subsequent sorting could be recovered, if this can be documented in writing.

✉ Documented waste volumes that are received and could be recovered or recycled in relation to the total volume of building waste occurring.

Background

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 60% of the building waste arising during the construction process is handled and sorted, so that it can either be recycled or the materials can be recovered. An additional 2 points are given if the percentage share is 70% or more.

If much of the work is done by a prefab manufacturer it is possible to include waste at this manufacturer, although this is voluntary.

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[97:]

- 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)[98] 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.

P13 Innovations

Points are given for innovation in construction projects. To ensure flexibility, the requirement is not completely controlled. The following list must be seen as a guide to the innovations that can be rewarded with points. Other innovations can be accepted as decided by Nordic Ecolabelling. In total, maximum 2 points can be achieved for innovation.

Innovation points are given for:

- Green roofs and façades, i.e. surfaces used to grow plants.
  - 1 point if the green area is 10% to 25%.
  - 2 points if the green area exceeds 25% of the total roof or façade area.
- Local disposal of surface water (1 point)
- Opportunities created for urban cultivation, such as via cultivation boxes (1 point)
- Creating habitats for wild animals such as bird feeders, insect boxes/cubes for wild bees, or by replacing lawns with meadow vegetation (1 point)
- Exterior solar protection (fixed or movable) on all south-facing windows (1 point).
- 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 protected from the elements (1 point)

[97] Att minska byggavfall-en metod för att förebygga avfall vid byggande (Reducing building waste - a method to prevent waste from buildings), Thyréns 2012.
[98] Miljöstyrningsrådet's procurement criteria for contractors' new construction of premises in 2009.

- At least one parking space is equipped with access to charge electric vehicles (1 point).

Other innovations may give points as assessed by Nordic Ecolabelling.

✉ Documented description of innovative measures.

Background

Nordic Ecolabelling will reward innovations in Nordic Ecolabelled building 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 2 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 rain water, 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 rain water to local filtering instead of to surface water drains. Parking spaces may, for example, be designed with grid pates to make them permeable.

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 window panes 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.

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.

6 Changes compared to previous version

Appendix 1 lists the most important changes compared to the previous version.

7 New criteria

Text will be inserted after the consultation.

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 Ecolabelling** Unchanged in principle
O3	O33	**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	**The building's energy consumption** 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 & O6	**Energy-efficient light sources and control of lighting** The requirement for energy classes of lighting has been tightened. 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 mandatory requirements for schools and pre-schools. The lighting requirement has been split into two requirements.
O6	O7	**Energy-efficient white goods** The requirement for energy classes of white goods has been tightened. A requirement for the energy classes of refrigerators and freezers for professional use has been introduced.
O7	O8	**Sanitary fixtures** The requirement has been tightened and the scope has been specified.
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	O14	**Ventilation** The ventilation requirement concerns function control of the ventilation system.
--	O15	**Sound environment (solely concerns small houses and apartment buildings)** Mandatory requirements of sound pressure insulation from technical installations have been introduced.
O10	O16	**Sound environment (solely applies to pre-school and school buildings)** Unchanged in principle
O11	O17	**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.

O12	---	**Illuminance** The requirement of illuminance that solely applied to pre-school buildings has been removed.
O13	O19	**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	O20	**Classification of chemical products** Unchanged in principle
O16	O21	**CMR substances** Unchanged in principle
--	O22	**Preservatives** New requirement to minimise certain preservatives in chemical products used indoors.
O17 & O18	O23	**Other substances excluded from use** Revised to avoid duplication. Otherwise unchanged.
O19	O24	**Nanoparticles** The requirement of nanoparticles in chemical products has been revised and clarified.
O20	--	**Handling of chemical products** Requirement deleted.
O21	O25	**Substances excluded from solid building products** Some building 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	O26	**Nanoparticles and antibacterial additives in goods** The requirement has been specified and also includes waste disposal units.
O23 & O24	O30	**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	O31	**Resources from 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	O32	**Durable wood for outdoor use** The requirement has been specified and also includes timber used in yards.
O27	O18	**Formaldehyde emissions** The requirement has been harmonised with the equivalent for construction panels.
O28	O29	**Façades and roofs** The requirement also includes products for roofs and façades.
O29	O27	**Surface finishes on floors, roofs and walls** The requirement is in principle unchanged
O30	O28	**Windows and doors of non-renewable materials** The requirement is harmonised with the materials requirement in the criteria for Nordic Ecolabelled windows and outer doors.
O31	--	**Low-flush toilets** The requirement has been removed.
O32	O9	**Possibility of sorting at source** Number of fractions increased.

O33	O10	**Waste sorting station** The requirement is in principle unchanged
O34	O11	**Radon** The scope of the requirement is in principle unchanged. Threshold lowered to 100 Bq/m^3. The requirement has been moved to the Indoor environment section.
O35	O34	**Material requirements** Unchanged
O36	--	**Waste handling in the construction process** The requirement has been removed.
O37	O12	**Moisture prevention** Requirement supplemented with the appointment of a moisture expert.
O38	O13	**Waterproof construction** The requirement is further specified, but otherwise unchanged
O39	O36	**The contractor's self-monitoring**
O40 & O41	O37	**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	O35	**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	O44	**Laws and regulations** Unchanged
O45	---	**Organisation and responsibility** Removed. Instead the information is requested on the application form.
O46	O41 & O42	**Planned changes and unforeseen non-conformances** Split into two requirements. Otherwise unchanged.
O47	O43	**Complaints** Unchanged
O48	O40	**Documentation of the houses built** Unchanged
O49	O39	**Documentation of application** Unchanged
O50	O38	**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	P7	**Better sound environment (solely concerns small houses and apartment buildings)**
P4	--	**Demand management of lighting** The requirement is integrated into the lighting requirement, O6
P5	P8	**Ecolabelled building products** The requirement will stimulate the use of ecolabelled products and give access to more points than before.

P6	P9	**Chlorine-free plastic products** Unchanged in principle.
P7	P10	**High ratio of timber from certified forestry** Based on several product groups and can give 2 points, in contrast to the previous 1 point.
P8	P12	**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 The requirement of individual metering of domestic hot water was mandatory in version 2.
---	P3	**Minimised hot water circulation (HWC) losses** New requirement
---	P4	
---	P5	**Cement and concrete with a reduced energy and climate impact** New requirement
---	P6	**Timber structures** New requirement
---	P11	**Recovered or reused materials in building products** New requirement
---	P13	**Innovations** New requirement

The marketing requirement (O50) in version 2.10 and previously has already been removed.

Appendix 2 Labels and classification systems for building products.

The Appendix is written in Danish and may be obtained from the 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 the Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 4 Relevance, potential and steerability (RPS)

The Appendix is written in Swedish and may be obtained from the 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 the Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 6 Radon

The Appendix is written in Norwegian and may be obtained from the 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 the 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 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[99]. Nordic Ecolabelling bans the use of substances that are considered to be potential endocrine disruptors, category 1 (there is evidence of a change in endocrine activity in at least one animal species) or category 2 (there is evidence of biological activity related to changes in hormone balance), in line with the EU's original

[99] Miljøstatus i Norge, 2008

report on "Endocrine disruptors" or later studies[100], 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[101,102,103] 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

[100] 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
[101] Substitution af alkylphenolethoxylater (APE) i maling, træbeskyttelse, lime og fugemasser, Working report from the Danish Environmental Protection Agency, No. 46/2003
[102] Nonylphenol og nonylphenolethoxylater i spildevand og slam, Miljøprojekt nr. 704/2002
[103] 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[104]. 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[105].

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

[104] Kartläggning av ftalater i varor, Kemikalieinspektioner (Investigation of phthalates in products, Swedish Chemicals Agency). PM 2/2014.
[105] 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 are used in a various range of products such as baby bottles, tins ans 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[106], but were subsequently removed since they are used in quantities of less than 100 tonnes per year. They have a number of inherent properties that are not desirable in Nordic Ecolabelled chemical building products, such as endocrine disrupting and environmentally hazardous, see more below.

- Tributyltin (TBT, CAS no. 688-73-3) is usually self-classified as H301, H312, H315, H319, H372, H400 and H410[107].
- Dibutyltin (DBT, 1002-53-5) is usually self-classified as H302[108.]
- Triphenyltin (TPT, 668-34-8) is usually self-classified as H301, H311, H331, H400 and H410[109].
- 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[110].

[106] http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-15-6/pdf/978-87-92617-16-3.pdf
[107] ECHA: www.echa.eu (http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=3635&HarmOnly=no?fc=true&lang=en, 24.06.2013)
[108] ECHA: http://clp-inventory.echa.europa.eu/DetailsOfNotifAndLabelling.aspx?SubstanceID=154766&NotificationID=10600814
[109] ECHA: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=228892&HarmOnly=no?fc=true&lang=en (24.06.2013)
[110] 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[111]. 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[112]. 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[113]. 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"[114]. 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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111 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

112 H. V. Kristensen et al, Nanoteknologiske overflader og nye kvalifikationskrav, Danish Technological Institute, 2010

113 Website for the NANOKEM project: http://www.arbejdsmiljoforskning.dk/da/projekter/nanopartikler-i-farve-og-lakindustrien---nanokem (06.01.14)

114 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)[115]. 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[116]. 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[117]. The carbon black used in paint is very finely ground and has a particle size of around 10-30 nm[118]. 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[119], 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 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[120].

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.

Surface-modified colloidal silica is permitted.

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

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[121].

Article 2(7)(b) of the REACH Regulation (1907/2006/EC[122]) 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[123] to accompany the second Regulatory Review on Nanomaterials from 2012[124] 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.

[121] Link to the Danish Environmental Protection Agency hearing: http://hoeringsportalen.dk/Hearing/Details/16910 (visited 20.01.14)
[122] Link to REACH: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf
[123] 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
[124] 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 the 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 for white goods connected to district-heating and domestic-hot-water networks

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[125].

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[126] presents several models, and the electricity savings lie between 20 and 60%.

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.

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[126] 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/

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[127]. 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 licence holder, 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.

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.

[127] Sammanställning av lågenergibyggnader i Sverige (Comparison of low-energy buildings in Sweden), LÅGAN (programme for low-energy use buildings) 2013

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

The relevance of and the opportunity to set requirements of materials for drinking water pipes were discussed during the revision.

In Denmark there is an established voluntary approval system (ETA Denmark's Approval of water supply and drainage systems (VA)) and a newly established system based on the "approval scheme" regulations with the Danish Energy Agency as the authority responsible.

In Sweden there is no authority responsible for approving materials that are in contact with drinking water. An investigation has commenced to elucidate the area and propose measures as well as an authority responsible.

Both polymeric materials (PEX, polypropylene, polybutylene, et al.) and metals such as copper, stainless steel and brass are used to a great extent in drinking water pipes. Alu-PEX is a common material that is a mix of an inner and outer polymer layer and an intermediate aluminium layer. Unsuitable materials can lead to the release of harmful substances to water. Other aspects such as lifetime, maintenance and technology, as well as finances, must naturally also be observed.

In new production, plastic materials dominate, but other materials are also used. Various water qualities affect the release of substances, so that various materials can be more or less suitable in different geographical areas. Another complicating aspect is that some sections of the population are not connected to the municipal water supply that is subject to ongoing control, but get water from e.g. their own wells. In Sweden it is estimated that up to two million people are not covered by the municipal water supply.

In summary, Nordic Ecolabelling has decided not to a add a requirement concerning materials in drinking water pipes to the criteria. The most important reasons for this are:

- There is a lack of a charting of the risks concerning materials in contact with drinking water. There is thus no basis for decision concerning wanted or unwanted materials.
- A party constructing a Nordic Ecolabelled building can only control the property's own drinking water pipes. The pipeline systems to which they are connected (trunk lines) account for a considerably larger share of the pipeline route and the criteria have no control over them.
- Drinking water pipes in new Nordic Ecolabelled production contribute only marginally to the spread of copper to treatment plants. According to information from the trade organisation Svenskt Vatten (Swedish Water & Wastewater Association), 75% of the copper led to treatment plants comes from properties' water pipes. The absolute majority of this is from existing building stock, and not new production.