About Nordic Swan Ecolabelled

Renovation



Version 1.4

Background to ecolabelling
15 September 2020

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Note: In this background document there are large text sections in several different Scandinavian languages. The reason is that the development of Nordic Ecolabelling's criteria is subject to Nordic cooperation, in which all countries are involved in the process.

Nordic Ecolabelling believes that, for as long as it concerns large continuous text sections, this variation in the language used can be considered as a confirmation of the Nordic cooperation that is one of the strengths of developing the Nordic Ecolabelling criteria.

Addresses

In 1989, the Nordic Council of Ministers decided to introduce a voluntary official ecolabel, the Swan. The following organisations/companies are responsible for the official "Swan" Nordic Ecolabel on behalf of their own country's government. For more information, see the websites:

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1 Summary

Criteria for the brand new product group Nordic Swan Ecolabelled renovation have been developed as a joint project between the Nordic countries. The decision to develop criteria for renovation is based on the feasibility study presented by Nordic Ecolabelling in June 2016. The market analysis revealed considerable interest in Nordic Swan Ecolabelled renovation. In combination with the interest in Nordic Swan Ecolabelling new buildings, this made it natural to develop criteria for renovation. Our Nordic countries arel facing major need of renovation of post-war buildings that have passed the end of their technical service life. The EU Energy Efficiency Directive sets the focus on renovating existing building stocks in order to reduce energy consumption by 20% by 2020. Improving the energy efficiency of existing building stocks is one of the main challenges associated with energy consumption and hence greenhouse gas emissions from buildings. Nordic Swan Ecolabelling is a good tool for ensuring that these renovation projects provide healthy indoor environments and are carried out in compliance with strict environmental requirements and quality assurance standards.

Four focus areas in the criteria

Listed below are the four main areas that the project has focused on. These are reflected in the criteria. Nordic Ecolabelling believes that strong mandatory requirements in these areas are crucial for Nordic Swan Ecolabelled renovation to be carried out in an environmentally sustainable way and to ensure high environmental standards and a safe and healthy indoor environment in the renovated building. This creates value for the property owner, occupants, users and office tenants.

1. Survey/environmental analysis. It is essential that a qualified and experienced building surveyor performs a high-quality survey to ensure correct remediation of the building and correct handling and disposal of hazardous waste.

2. Recycling/reuse. A growing number of studies show that building materials account for a significant and increasing proportion of the overall impact on energy and the environment for new and renovated buildings. The criteria include several requirements in this area, in particular requirements stating that consideration must be given to potential reuse of materials. It is not often possible to impose a requirement that compels reuse because each project is unique and also this is a relatively new area.

3. Improving energy efficiency. In order for the environmental benefits to be significant, renovations that can be Nordic Swan Ecolabelled are those that are more extensive and often yield high energy efficiency gains. It is important to make energy efficiency improvements in existing building stocks in order to reduce energy consumption and environmental impacts. Each renovation project is unique in terms of the building that is to be renovated and the project's scope, financial parameters and purpose. There may be a number of factors that are unknown at the start of the project and these can lead to changes as it progresses. Buildings have been constructed in different periods of time using varying construction techniques and this makes them all different and affects the potential for energy efficiency gains. The common objective with Nordic Swan Ecolabelling is that the Nordic Swan Ecolabelled renovation/renovated building shall have a good energy performance after it has been renovated, not how large the energy efficiency gains are.

4. Indoor environment. To ensure a focus on a good and healthy indoor environment, a number of requirements are placed on the area of indoor environment. Some are basically the same as in Nordic Swan Ecolabelled new buildings, while the requirement for a plan to minimise the risk of spreading airborne contaminants (quality plan for the indoor environment), and measurement of PCB levels in indoor air is completely new.

Conditions that must be met to qualify for Nordic Swan Ecolabelling

As the name indicates, it is the renovation of buildings that can be Nordic Swan Ecolabelled. In other words, Nordic Swan Ecolabelling of the building should be the result of an active process. Existing buildings cannot become Nordic Swan Ecolabelled unless they undergo a renovation process. The following conditions must also be met so that the requirements are adapted and the renovation is of a certain scope and not too constrained:

- The building that is to be renovated must come into one of the following categories (or is to be converted into): single-family homes, apartment buildings, pre-school buildings, educational buildings and schools, or offices.
- The scope of the renovation (excluding demolition) must be at least 25% of the value of the building (excluding the land value) or cover at least 25% of the surface of the building envelope.

Similarities and differences with the criteria for Nordic Swan Ecolabelled new buildings

The renovation process has many similarities with new construction, particularly with regard to the construction process. Several requirements are therefore identical or very similar to corresponding requirements in the criteria for Nordic Swan Ecolabelled new buildings, generation 3. Other parts of the process are unique for renovation, for example, survey/environmental analysis and remediation and the potential reuse of materials. Appendix 1 contains a table comparing the criteria documents.

The criteria cover a total of 46 mandatory requirements and deliberately no points requirements for two main reasons. Partly to minimise complexity and the number of requirements in this first generation of criteria. And partly because each renovation is unique, which makes it extremely complex to use points requirements where a certain number of points have to be taken. Two of the mandatory requirements are formulated in a way that allows more choice to make it possible for the renovation project to excel in a particular area or technology. The requirements are also designed with a high degree of flexibility which is necessary for renovation projects.

Naturally, a chemical product or construction product that meets the requirements for Nordic Swan Ecolabelled new buildings may also be used in Nordic Swan Ecolabelled renovations. This means that the Construction Products Portal (Husproduktportalen) that Nordic Ecolabelling launched in 2016, which contains both ecolabelled products and the products that meet the requirements for Nordic Swan Ecolabelled buildings (so-called listed products), will also be useful in Nordic Swan Ecolabelled renovation projects. The criteria for renovation can, however, contain material requirements that only apply for renovations, or requirements that have wider scope when the renovation also includes office buildings.

2 The criteria development process

2.1 Aims and objectives of the criteria

Nordic Ecolabelling has had criteria for Nordic Swan Ecolabelled new buildings since 2005. These now include newly-constructed single-family homes/small houses, apartment buildings, pre-school buildings and school buildings. Large construction contractors like Skanska, NCC/Bonava, Veidekke Sverige and Peab and smaller contractors like Trysilhus in Norway, Järvenpään Mestariasunnot Oy in Finland and ABC Pavillioner in Denmark are licensees and have erected Nordic Swan Ecolabelled buildings. There are almost 500 single-family homes, more than 1,700 apartments and five pre-school buildings in Sweden, Norway, Denmark and Finland that are completed and Nordic Swan Ecolabelled. Planning for a large number of buildings is currently in progress. In Sweden alone, more than 5,000 housing units are being constructed, comprising 360 single-family homes and 4,700 apartments (owned and rented).

The interest in the Nordic Swan Ecolabelling of new buildings, the experience of managing these licenses, contacts with the industry and the audits of the criteria for new buildings has given Nordic Ecolabelling excellent knowledge of the environmental conditions in the Nordic construction industry. Development of criteria for renovation has therefore been a natural response to this.

Nordic Ecolabelling decided on 10 June 2015 to begin developing criteria for renovation. The decision was based on a feasibility study conducted by Nordic Ecolabelling, "Study on the feasibility of Nordic Swan Ecolabelling Renovations and Conversions, April 2015". A market analysis conducted by the consulting company Sweco[1] was a central part of the feasibility study. It asked 40 stakeholders in all the Nordic countries to complete a questionnaire.

One focus area during the criteria preparation process has been on how Nordic Ecolabelling's requirements for renovation can contribute to increased recycling/reuse of building products, construction materials and construction elements either in the building that is to be renovated or in other buildings. A growing number of studies show that building materials account for a significant and increasing proportion of the overall impact on energy and the environment for new and renovated buildings. This has been described in a report from the green think-tank CONCITO, which has assessed LCA studies (including two LCA studies conducted in the Norwegian ZEB project)[2]. Substantial amounts of resources are used in the renovation of buildings and it is important to establish a circular economy approach. This focus area in the criteria development process is described in more detail in Chapter 6.

Based on the feasibility study and the market analysis, Nordic Ecolabelling is developing criteria for Nordic Swan Ecolabelled renovation that aims to:

- Help clients/purchasers of renovation services to make environmentally sustainable choices.

[1] Nordic Swan Ecolabelled rehabilitation. An analysis of the market potential in the Nordic countries and possible definition of Nordic Swan Ecolabelled rehabilitation; Report March 2015; Sweco. This report can be ordered from Nordic Ecolabelling, sara.bergman@svanen.se

[2] Michael Minter «Bygningers klimapåvirkning i et livscyklusperspektiv» (The climate impact of buildings seen in a life cycle perspective) Concito, 27 February 2014. Downloaded from: http://concito.dk/files/dokumenter/artikler/bygningers_klimapaavirkning_endelig_270214.pdf

- Help companies that sell renovation services to market and communicate their services in a way that clearly presents the benefits of these services to the environment.
- Clearly communicate to the end customer the value of a Nordic Swan Ecolabelled renovated building with regard to the significant environmental aspects.

The criteria for Nordic Swan Ecolabelled renovation shall:

- Provide clear environmental benefits for the building being renovated, for those who will live in or use the building, and for the renovation process itself.
- Include requirements that are simple to understand and easy to document so that the process is non-bureaucratic.
- Have a high level of ambition.
- Be cost-effective.
- Focus on increased recycling/reuse of construction components and materials.
- Ensure high-quality survey/environmental analysis of hazardous substances in and environmental remediation of the building.

Experience from the criteria for Nordic Swan Ecolabelled new buildings has been incorporated into the renovation criteria development process. It has also been important to coordinate the chemical product requirements and requirements for building products between the two criteria documents. Naturally, a chemical product or construction product that meets the requirements for Nordic Swan Ecolabelled new buildings must also satisfy the requirements for Nordic Swan Ecolabelled renovations. This means that the Construction Products Portal (Husproduktportalen) that Nordic Ecolabelling launched in 2016, which contains both ecolabelled products and the products that meet the requirements for Nordic Swan Ecolabelled buildings (so-called listed products), will also be useful in Nordic Swan Ecolabelled renovation projects.

Appendix 1 contains a table that compares the requirements of the criteria for Nordic Swan Ecolabelled new buildings and the criteria in Nordic Swan Ecolabelled renovation.

2.2 Project organisation

The project began at the end of 2015. Sara Bergman, with Nordic responsibility for the Construction area, has served as project manager. The following persons have been involved in the criteria development process: Elisabeth Magnus, Heidi Bugge, Stinus Kappel Andersen and Kristian Kruse. Product specialists in the construction area from each Nordic Ecolabelling organisation have also made worthwhile contributions to the project. The Nordic project team is reflected in concrete terms in the mix of Scandinavian languages in which the report is written.

Karen Dahl Jensen holds the position of Nordic product development manager and commissioned the criteria development project.

Nordic Ecolabelling has conducted the project through internal workshops and workshops for external stakeholders. We have also had regular contact with a large number of stakeholders and experts in the industry. The results of these meetings were of great value to the work. In addition, a considerable number of contacts have been taken. Nordic Ecolabelling would like to thank all external stakeholders that contributed to the process.

2.3 Development project in circular, resource-efficient materials

In parallel with the preparation of criteria for Nordic Swan Ecolabelled renovation, Nordic Ecolabelling has conducted a development project that has been funded in part by Husbanken (the Norwegian State Housing Bank). The first part of this mainly two-part project comprised a consultancy study conducted by the Norwegian firm Hjellnes Consult.[3] The study has resulted in a report with a survey/environmental analysis of hazardous substances in existing buildings and demolition in all the Nordic countries. The report also describes the first preliminary stage before making decisions about renovation and the purpose of the renovation.

The second part of the development project centred on how Nordic Ecolabelling ought to set environmental and resource requirements for products and materials used in Nordic Swan Ecolabelled renovations. Nordic Ecolabelling presented the final report "Bærekraftige materailvalg i kriterier for svanemerket renovering"[4] (Sustainable choice of materials in criteria for Nordic Swan Ecolabelled renovations) for Husbanken on 20 November 2016.

The key findings of this project are summarised in Chapter 6.

3 Basic facts about the criteria

3.1 Justification for Nordic Swan Ecolabelled renovation

Our Nordic countries are facing major need of renovation of post-war buildings that have passed the end of their technical service life. The EU Energy Efficiency Directive sets the focus on renovating existing building stocks in order to reduce energy consumption by 20% by 2020. Improving the energy efficiency of existing building stocks is one of the main challenges associated with energy consumption and hence greenhouse gas emissions from buildings. Despite this, only 1.2 percent of Europe's building stocks are renovated each year. Energy efficiency gains and reduced environmental impacts are key drivers for renovation of buildings. But there are naturally several reasons for renovating a building. Such as the need to improve the internal and external environment, general refurbishment and value increase, create a long-term sustainable supply system and system solutions, adaptations for a different target audience of residents/tenants, and other reasons.

Renovation is often a better environmental and more cost-effective option than demolishing the building and building something new. Every year, some 1,400 residential properties are produced in Sweden alone through the conversion of offices, industrial buildings etc. To meet national, European and global targets for reduced energy use, reduced environmental impacts, a non-toxic environment and the conservation of biodiversity, it is essential that the renovation of existing buildings also contributes with sustainable solutions. Renovation is a

[3] Werner, E. et al.: "Miljømerking av renovering og miljøkartlegging. Viktige momenter for vudering av kriterieutvikling" (Ecolabelling of renovation and environmental analysis. Key factors for assessment of criteria development). Report from Hjellnes Consult to Nordic Ecolabelling; January 2016. This report can be ordered from Elisabeth Magnus at Ecolabelling Norway em@svanemerket.no.
[4] Nordic Ecolabelling: "Bærekraftige materialvalg i kriterier for svanemerket renovering," (Sustainable choice of materials in criteria for Nordic Swan Ecolabelled renovations) Report to Husbanken, November 2016. http://biblioteket.husbanken.no/arkiv/dok/Komp/Barekraftig%20materialvalg%20i%20kriterier%20for%20svanemerket%20renovering%20ny.pdf

complex process. It involves multiple aspects that necessitate a big-picture, long-term perspective.

Nordic Ecolabelling sets requirements for the renovated building's energy use, environmental survey/analysis prior to renovation, chemical products, construction products, waste management and a number of aspects relating to the indoor environment. The criteria also set requirements for quality management in the renovation process and for the transfer of the renovated building to the property owner.

In the criteria development process, renovation is assessed on the basis of a life cycle perspective and a Nordic Swan Ecolabelled renovation guarantees that:

- The building has a low energy use after renovation.
- The building has a good indoor environment and low emissions of hazardous substances.
- The building has been surveyed and hazardous substances and hazardous waste have been dealt with.
- Construction products, materials and chemical products comply with stringent environmental and health standards.
- The renovation work has focused on reuse of construction components, building products and materials.

3.2 Creating value

In addition to the focus area circular material flows, described in chapter 6 the criteria för Nordic Swan Ecolabelled renovation focus on low energy consumption, materials that comply with stringent environmental and health standards, survey of hazardous substances and hazardous waste and a good indoor environment.

The strict requirements on the Nordic Swan Ecolabelled renovated building creates value for the property owner, occupants, users and office tenants.

3.3 Products that can be labelled

As the name of the criteria document indicates, it is the renovation of buildings that can be Nordic Swan Ecolabelled. In other words, Nordic Swan Ecolabelling of the building should be the result of an active process in the form of renovation. It is not possible for existing buildings to be Nordic Swan Ecolabelled. The building categories that can be Nordic Swan Ecolabelled are single-family houses, apartment buildings, pre-school buildings, educational buildings and schools and office buildings.

The following conditions must also be met so that the requirements are adapted and the renovation is of a certain scope and not too constrained.

- The building that is to be renovated must come into one of the following categories (or be converted in connection with the renovation): housing, pre-school buildings, educational buildings and schools, or offices. Se also chapter 7.1.1.
- The scope of the renovation (excluding demolition) must be at least 25% of the value of the building (excluding the land value) or cover at least 25% of the surface of the building envelope.

More details about the product group definition can be found in Chapter 7.1.

3.4 Licences and licensees

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

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

For the product group of Nordic Swan Ecolabelled renovations, the licensee is normally a building contractor, renovation contractor, property owner, house manufacturer or other party that can take full responsibility for all requirements. This means that architects or technical consultants can only be licensees if they can take full responsibility for all requirements.

A first-time licensee must verify and document all requirements in the criteria in order to obtain their licence. This licence can then be extended with new renovation projects. In practice, this means that the requirements that are specific to the project must be reviewed and checked when undertaking a second project and future projects (extensions), while the conditions that are the same do not need to be re-assessed and verified again.

The building that is renovated becomes Nordic Swan Ecolabelled. The date when the renovated building was Nordic Swan Ecolabelled must be communicated: “Nordic Swan Ecolabelled renovated building, 20XX”. As required, the current version number of the criteria can be stated. Nordic Ecolabelling accepts no responsibility for the building not complying with the criteria at a later date.

4 The Nordic market

In the aforementioned market analysis (see Chapter 2.1) Sweco described the Nordic market for renovation today and in the future. This chapter presents the main findings of this market analysis.

4.1 The renovation market today

Sweden

There are a large number of apartments in need of renovation in Sweden. At the present rate of renovation, it would take about 30 years before they were all completed. It is mainly larger properties, i.e. blocks of apartments that are being renovated. Energy Agencies of Sweden, which provides advice on energy efficiency in renovation projects, says that in 2014 there were about 600,000 apartments in need of renovation in Sweden. In many cases, they are buildings with huge technical debt. One reason why public housing (rental apartments) is not being renovated at a faster rate is that it is difficult for a renovation project to be economically viable if financed solely by income from rents.

Norway

According to Statistics Norway, more than seven out of ten apartments are owned by private individuals.[5] When you add to that the 250,000 or more apartments owned by housing associations,[6] almost 90% of the Norwegian housing stock is owned by private individuals and/or housing associations. This means that private property owners are the most important factor for renovations actually being carried out. A large proportion of the Norwegian building stock should be in need of renovation.

Denmark

51% of the total building stock is year-round housing, 40% are commercial properties and the rest are public, culture and leisure facilities. Renovation and repair work in Denmark was unusually high in 2014 due to the storm at the end of 2013 and the "BoligJobordning" tax deduction scheme for domestic and home-improvement services. Leaving aside these two factors, Denmark also has a low rate of renovation. Although interest rates are low, private homeowners have been especially cautious about investing in renovations.

Iceland

Iceland has a comparatively young building stock, on average 30 years. Its building stock has grown sharply since the 1950s due to an increase in population and urbanisation, and a need for modernisation of buildings. Nearly 65% of the population lives in the capital Reykjavik where more or less all construction and renovation work is taking place.

Buildings constructed between 1960 and 1980 are more and more in need of renovation. At the same time, there is a growing need for smaller apartments designed for an ageing population. This demographic factor is important for residential planning and renovation and for Iceland, with its free access to thermal energy, a more important factor than energy efficiency. Typical renovation projects are replacement of windows, new water and wastewater piping, improved building airtightness and installation of lifts.

Finland

The majority of the renovation activities are carried out on buildings constructed between 1960 and 1980. There is great need for renovation of dwellings constructed in the 60s and 70s as part of the Million Programme public housing scheme. There is currently also great need for renovation of pre-schools and schools due to problems with damp, mould and other aspects relating to the indoor environment.

Under a new act passed in 2013, a planning permission application must factor in the energy efficiency of the building (applicable to renovations). Unless the property owner can show, using a life-cycle cost analysis, that energy efficiency measures are not cost-effective, these must be carried during the renovation.

[5] Statistics Norway (SSB): «Housing, 1 January 2013», published: 12 July 2013.
[6] The Co-operative Housing Federation of Norway (NBBL) (Norske Boligbyggelags Landsforbund). NBBL's HOUSING STATISTICS 2013 (accessed 19 April 2015).

4.2 Future developments

Sweden

In its economic report from February 2015, the Swedish Construction Federation (the Swedish construction industry's trade and employers' organisation) states:

Investment in residential property conversions was good last year and a 10% increase is expected. General household demand will increase this year, leading to growth in conversion project activities. This trend will continue next year, driven primarily by refurbishment of public housing by the property companies.

The economic report also states, however, that like investment in new build properties, a clear slowdown of investment in conversion projects is predicted in the 2015-2016 period. It is high time for most of the dwellings constructed as part of the Million Programme public housing scheme[7] to be renovated. According to a study conducted in 2013 by the independent market analysis company "Prognoscentret", 29% of the apartments in the Million Programme districts had been renovated (see Figure 1). At that time, there were also plans to renovate as many Million Programme apartments over the next five years.

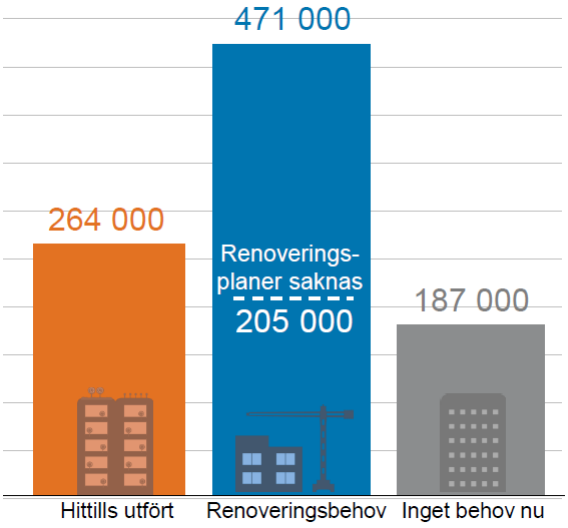


Figure 1: Need for renovation in the Million Programme. Source: Prognoscentret.

The study also shows there are concrete plans for renovating 33% of the apartments included in the survey. This amounts to 284,000 apartments. 65% of this stock is situated in cities or larger municipal districts. The plans primarily involve renovation, particularly water and wastewater piping replacement. For more extensive renovations (which are the most interesting from an ecolabelling point of view), Sweco believes that large-scale renovation requires government subsidies.

Norway

The rate of renovation in Norway can be given as 1.5% for both housing and premises. See Table 1 below.

[7] The Million Programme is the common name for the housing construction scheme in Sweden from 1965 to 1974.

Table 1: Annual rate of new production, renovation & conversion, energy-efficiency measures and remediation and demolition respectively. Source. Lavenergiutvalget. Energieffektivisering, 2009 (The Low Energy Commission, "Energy Efficiency").

	Prosentvis rate*		Antall kvm bruksareal per år	
	Boliger	Yrkesbygg	Boliger	Yrkesbygg
Nybyggrate	1,33 %	1,94 %	2,91 mill. m²	2,46 mill. m²
Rehab-rate	1,5 %	1,5 %	3,28 mill. m²	1,91 mill. m²
Enøk-rate	2,0 %	2,0 %	4,37 mill. m²	2,54 mill. m²
Rivings/saneringsrate	0,6 %	1,2 %	1,31 mill. m²	1,52 mill. m²

There is reason to believe that, with the growing focus on energy and a risk of rising energy prices, the type of renovation that will increase is energy-efficient renovation of housing. It is estimated that 19% of all housing renovation projects are energy-efficiency renovations. With regard to office buildings, Enova[8] reports increased interest in investments leading to reduced energy consumption. Public buildings are generally in considerable need of maintenance and renovation. The trend in recent years has been to construct new, lavish public buildings instead of investing in renovation.

FutureBuilt is a ten-year Norwegian programme with the vision of developing climate-neutral urban spaces and architecture of high quality. The aim is to complete 50 pilot projects that will reduce greenhouse gas emissions by 50% in the areas of energy consumption, material use and transport.

Denmark

A housing contract that was signed in December 2014 increased the renovation budget of the Danish Landsbyggefonden (National Building Fund) from 2.0 to 4.2 billion Danish kronor. The Danish Construction Association forecasts a decline in public housing renovation projects in 2015 and 2016 as they were at a high level in 2014.

Finland

Figure 2 illustrates the forecast for renovation of different types of buildings in 2014–2016.

[8] Enova is owned by the Norwegian Ministry of Petroleum and Energy and provides advice and financing to support change in the use and production of energy.

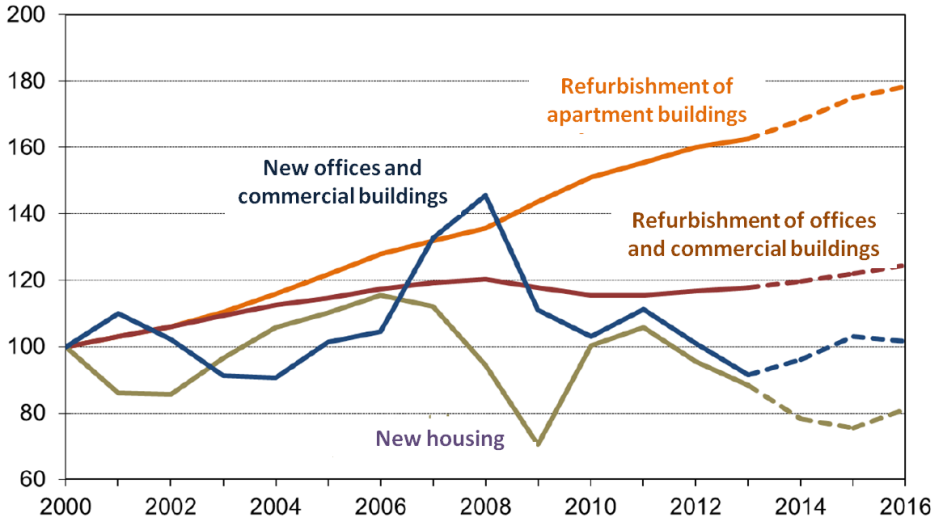


Figure 2: Value index for new-build projects and renovation projects in Finland, relative to the values in 2000. Source: Forenom Oy.

4.3 Labelling and certification schemes

The growing debate on how operators in the construction industry should safeguard the environment and create a sustainable property stock forms the platform for the growth of environmental certifications/environmental classifications of buildings. A building that is environmentally-certified has been audited and verified that it conforms to environmental standards for energy efficiency and sustainable materials, a good indoor climate and other factors in accordance with the selected certification system. There are many established environmental and health benefits associated with a certified building. There are also other benefits, such as lower running costs, which attract tenants or buyers, a generally higher attraction value, increased sale value, reduced risk of future environmental debt, easier to procure financing and better insurance terms.

Building certification systems, which have existed for many years in North America and the UK, are well established in the Nordic countries. There are now also certification schemes for infrastructure/construction projects and entire city districts. A building that is environmentally-certified is a relatively easily understandable means of communication that shows that a company takes its environmental responsibility seriously. There are a number of certification schemes that assess the environmental performance of a building. The most prominent schemes in the Nordic countries are presented in Appendix 3.

The criteria for Nordic Swan Ecolabelled renovation should offer the market a well-reputed ecolabel that is widely recognised among end consumers. A Nordic Swan Ecolabelled renovation guarantees the work has been carried out to high environmental standards and that the most important environmental aspects of the renovation have been managed from a life cycle perspective.

5 Environmental impact of renovation

Renovation comprises activities such as demolition, construction, conversion, upgrade and/or extension work. Some or many of these activities are carried out, depending on the extent and purpose of the renovation and on the type of building. When the activities have an environmental impact, they are called aspects. These are presented in Table 2 below.

The actual decision to carry out a renovation project is a key initial step in the process. The decision has often been preceded by an analysis to determine the need for renovation and the cost, etc. The analysis is central to decision on what kind of renovation to perform and the scope of the renovation. However, Nordic Ecolabelling assumes that the decision to perform a renovation has been taken and that it is based on solid data and analysis.

Nordic Ecolabelling uses an analysis tool called the RPS model to assess the environmental benefits that can be achieved for a Nordic Swan Ecolabelled product or service in the Nordic market. The key questions in an RPS analysis are:

- Relevance: Is there an environmental problem and how large is it?
- Potential: Can the environmental problem be reduced? What are the best ones in the industry doing?
- Steerability: It is possible to steer it with ecolabelling?

The key requirements should include the activities and processes that together achieve a high RPS. It is usually most important for relevance and potential to be high, from a life cycle perspective, in order to achieve maximum possible environmental benefits in the Nordic market. However, it is important that steerability is not low because then ecolabelling is not the right solution to the problem. The development of criteria in the areas where there is high relevance and high potential is also a mission that Nordic Ecolabelling has been tasked with by the Nordic Council of Ministers.

5.1 Findings of the RPS analysis

The aspects that rate highly overall in the RPS analysis are listed first in Table 2 below. Thereafter come the aspects with a moderate rating and finally those with a low RPS rating. When relevance is rated for the different aspects, the key environmental impacts in the life cycle are assessed. For example, energy consumption, content of undesirable substances and biodiversity are included in construction materials.

No renovation project is identical with another project. The importance of the individual aspect in each renovation project therefore varies greatly. The following summary of the RPS analysis should be seen as a broad reflection of what is generally considered to be important when performing extensive renovation on a building.

Table 2: Summary of the RPS analysis. The full RPS analysis is presented in Appendix 2.

Aspect Evaluation	Comments
Overall high RPS	
Demolition waste	High relevance, large amounts of waste and loss of resources for society. Moderate potential. Legislation covers the area but several measures can be implemented. Nordic Ecolabelling can add third-party controls. High steerability: The management as well as the statutory level are decided in the projects.
Presence of hazardous substances in existing building	High relevance due to presence of hazardous substances in older buildings. High potential because many of the substances can be removed if remediation work is done correctly. High steerability with regard to choices in the project.
Use of materials and construction products	High relevance due to environmental impacts from production of the material. The potential varies between product groups but is considered to be moderate to high. High steerability with regard to choices in the project. Highest potential in order to avoid hazardous substances. It is more difficult to find products with documented lower environmental impact.
Use of chemical (construction) products	The overall relevance is high, especially due to the content of substances that are hazardous to health and the environment. Moderate to high potential when there is a phasing-out process. High steerability with regard to choices in the project.
Moisture control	High relevance. Moisture in buildings has a significant effect on quality and health problems related to indoor environment. High potential. Measures can be taken to minimise the risk of moisture. Moderate steerability. Workers and subcontractors must follow procedures.
Energy consumption of the building in use	High relevance as the building has a long service life. High to moderate potential through various technical measures. High to moderate steerability. User behaviour has a lower steerability.
Fixtures and furniture	Moderate relevance. Content of chemical compounds affects the indoor environment. High potential, there is a variation of products on the market. Moderate to high steerability as it is not possible to prevent emissions entirely.
Operation and maintenance, including waste management	High relevance as several environmental aspects are affected by the operation and maintenance work. High potential as operation and maintenance can make a difference. Moderate steerability. Full steerability for what the operation and maintenance instructions cover but not how they are applied in the building's operation phase.
Overall moderate RPS	
Recycling/reuse of construction products and materials	Moderate relevance. Construction generally accounts for a high level of resource utilisation which varies according to the type of material. The potential is considered high, but depends on finances, safety and health. Steerability assessed as low to moderate
Waste in the construction phase	Low to moderate relevance. The amounts of waste are lower than the amounts created by demolition and are less hazardous. The potential is considered moderate due to preventive measures. Low to moderate steerability.
Radon	High relevance. Radon causes lung cancer. Potential assessed as low to moderate. The presence of radon in buildings is regulated by legislation, but levels of radon may be high in older buildings. Steerability for measures is assessed as high. Techniques not directly related to renovation work and measurements should be carried out in the winter months when rooms are not aired.
Noise environment in a renovated building	High relevance. Noise is the environmental pollutant that residents complain about the most. Moderate to high potential depending on the extent of the renovation. Moderate steerability. A risk that measures might be incompatible with other requirements.
Daylight in a renovated building	High relevance since people need natural light. The potential has been assessed as low to moderate, depending on the nature and extent of the renovation.

Aspect Evaluation	Comments
	Moderate steerability. Requirements for daylight may be incompatible with requirements for functionality, energy performance and locality.
Energy consumption during the construction phase	The relevance is assessed as low, represents 10–15% of the overall climate impact. Moderate potential as measures are available. Moderate steerability as it often requires real estate developers and building contractors to "pull in the same direction".
Increased biodiversity	Moderate relevance as increased biodiversity is valuable in urban settings too. Moderate potential as several measures can be implemented. Low to moderate steerability, depending on the building and on the extent of the renovation.
Communications/travel for those living in or using the building.	High relevance with measures aimed at making the travel environmentally sustainable. Potential assessed as low to moderate. Moderate to high steerability for measures related to parking spaces for cars and bicycles.
Storm water management	Low relevance, governed by local authority regulations. Moderate potential, for local disposal of storm water. Moderate steerability.
Occupational health and safety	Moderate relevance with regard to occupational health and safety. The building and construction industry reports a number of fatal accidents each year. Low to moderate potential as there are several measures, even if it is governed by legislation. Moderate steerability as it is governed by procedures and work instructions.
Overall low RPS	
Transport in the demolition phase and renovation phase	The relevance is assessed as low. Transport in the construction phase accounts for 3% of the upstream climate impacts. The overall potential is assessed as low. Low steerability, the aspect is mainly determined by the carrier's own processes.
Energy consumption during demolition	Low relevance. Certainly less environmental impact than transport. Low potential. Depends mostly on the need for machinery and time required. Low steerability. Demolition is normally carried out by subcontractors.
Noise during the demolition phase	High relevance as many areas already have noise at elevated levels. Low potential as legislation places restrictions on noise emissions during unsociable hours. Low steerability. Demolition includes on-site activities that generate noise.
Noise during the construction phase	High relevance as many areas already have noise at elevated levels. Low potential as legislation places restrictions on noise emissions during unsociable hours. Low steerability, noisy activities on site and transport to and from.
Water consumption during renovation	Low relevance for water consumption in most geographic areas in the Nordic countries. Low potential: Renovation does not include any unnecessary high-water-consuming processes. Low steerability.
Local emissions to the air, ground and water	Low to moderate relevance especially from exhaust fumes from machinery and vehicles. Low potential to upgrade the fleet of machines. Environmental legislation governs safe storage of fuels and chemicals and compliance is considered to be good. Low to moderate steerability since measures can be costly and are controlled by subcontractors.
Water consumption in a renovated building	Low relevance for lack of water in most geographic areas in the Nordic countries. Potential assessed as low to moderate. Measures that can have an effect include individual measurement and billing, and fixtures that restrict the flow of water. Low steerability since the water consumption is primarily affected by user behaviour.

5.2 Summary of the RPS analysis

The RPS analysis shows that several significant aspects have a high overall relevance, potential and steerability for environmental improvements and can thus provide environmental benefits for Nordic Swan Ecolabelled renovations. A total of ten aspects are assessed as

having a high overall RPS, which shows that renovation is a product group where Nordic Swan Ecolabelling can play an important role.

All aspects that have a high overall RPS shall be subject to requirements in the criteria document. It can be seen in the table above that there are just as many aspects that are assessed as having a moderate overall RPS. Nordic Ecolabelling has decided to include the aspects that have the highest rating in this group in the criteria too. These aspects are Reuse of building materials, Waste in the construction phase and Radon. This is reasonable as these have an obvious environmental and health relevance and clearly signal the intentions of the Nordic Swan Ecolabel. The main idea of the criteria is to focus on contributing to the circular economy through the efficient use of resources, reuse and recycling of materials and minimisation of substances that are hazardous to health and the environment to make reuse easier in the future.

Furthermore, Nordic Ecolabelling shall always have requirements that ensure that the labelled product has a good standard of quality. Based on this reasoning, requirements shall be set for the following aspects:

- Demolition waste
- Presence of hazardous substances in existing building
- Use of materials and fixed building products
- Use of chemical products
- Recycling/reuse of building products and materials
- The building's energy consumption in use
- Moisture control
- Radon
- Waste in the construction phase
- Fixtures and furniture
- Operation and maintenance for the building's continued sustainability
- Quality aspects in the construction process

Nordic Ecolabelling does not set requirements for other moderate aspects in this first generation of the criteria to ensure that the set of criteria does not become too comprehensive. It is worth noting that the amount of aspects gives the product group great potential for development and therefore has a role to play in several generations of the criteria.

During a review of these criteria, when creating generation two, the aspects of daylight and noise environment will be taken into account. These are critical to the achievement of a good, healthy indoor environment and it is natural to include them when expanding the criteria for renovation.

The reason for renovating a building is grounded on many different values and decisions. Each building is unique (energy performance, architecture, value, rental income, location, need of modernisation, and so on). All in all, it means that each renovation project is unique.

6 Focus areas: circular economy and resource-efficient use of materials

It is important to perform assessments early on to ensure the quality of the renovation project taking into account the construction work and components relative to their service life both before and after the renovation. This is highlighted in the report "Miljømerking av renovering og miljøsanering – viktige momenter for vurdering av kriterieutvikling"[9] (Ecolabelling of renovation and environmental analysis. Key factors for assessment of criteria development) conducted by Hjellnes Consult in 2016 (hereafter called the Hjellnes Report), and is the experience from the Nordic project "Sustainable refurbishment, Decision support tool and indicator requirement"[10] and several other projects. The Hjellnes Report describes five areas that are important to assess:

1. Sustainability and robustness of technology in relation to wear from the impacts of climate change.
2. Space efficiency and energy-smart design, including adaptation to local climate and ease of maintenance.
3. Adaptability (strategies that ensure generality - the ability of a building to meet changing requirements for functionality, its versatility - the ability to change qualities or characteristics) and elasticity - opportunities for growth).
4. Reusability
5. Cultural values and architectural quality (not covered by these criteria)

Sound knowledge of materials and building products and the role they play throughout the life cycle is important for the assessments in all these strategies. The Hjellnes Report focuses on what is directly related to materials, first and foremost items 1 and 4, i.e. not the architectonic aspects or other measures that can also contribute to less material use. Reference is made to the Hjellnes Report for a more detailed description of how aspects such as space efficiency, energy-smart design and adaptability can be addressed.

What is reuse?

Reuse means moving a product that is considered no longer useful in its present situation to a new situation where it can serve a purpose. It lengthens the life of the product without it being reprocessed.

Reuse places less strain on resources and the environment than recycling which reprocesses products into raw materials for use in new products.

Reuse is also known as recovery as it recovers the product itself for the same or similar end use.

Reuse of building products

To save resources, it is important to consider at an early stage of a renovation project what can be reused in the building, what materials need to be remediated and what must be removed. Elements and materials removed can either be used in the building (local reuse) later on, reused by others or treated as waste that is sent for material recovery or energy recovery. A final option is disposal of non-combustible materials. In the case of material recovery and disposal, Nordic

[9] Hjellnes Consult as. «Miljømerking av renovering og miljøsanering - viktige momenter for vurdering av kriterieutvikling» (Ecolabelling of renovation and environmental analysis. Key factors for assessment of criteria development) 2016. Commissioned by Ecolabelling Norway. This report can be ordered from Elisabeth Magnus at Ecolabelling Norway em@svanemerket.no

[10] Sustainable refurbishment – Decision support tool and indicator requirements. Secretariat: Standards Norway, Public consultation, Nordic Innovation, Date: 4 August 2014. The report from 2015 can be ordered from Elisabeth Magnus at Ecolabelling Norway em@svanemerket.no

authorities are concerned about the leakage of substances that are hazardous to health and the environment. The goal is to phase environmental toxins out of the ecocycle as far as possible. See for example the report from the Swedish Chemicals Agency "Route to non-toxic and resource-efficient material cycles" 2016.[11]

In addition, demolition planning must ensure that time is allowed for construction products and materials to be dismantled for reuse or recycling in a way that maintains the quality of the products and materials. This can be difficult when demolition contractors on tendered services are used for the work. It should therefore be a stated ambition in the projects and sufficient time should be allowed in the projects for materials to be properly dismantled. However, experts emphasise that there are challenges involved in this. There is some uncertainty as to how the law should be interpreted. There are no standard processes for various materials, building logistics are complicated and time schedules are tight.[12] Reuse requires good understanding of materials in all parts of the construction industry. Experts say that "a paradigm shift is needed in the building and construction industry. Everyone is doing what they usually do".[13]

The plan for the circular economy in Europe puts a focus on this and several Governments want to contribute to a greater spread of knowledge in the industry and to greater reuse by e.g. analysing resource flows and barriers to the reuse of building materials.[14]

Figure 3 illustrates so-called reuse hierarchy. It shows how building products/materials and construction can be reused and recycled to increase the service life before the materials become waste. The reused materials can thus replace new building materials. This means that less waste is generated and the need to extract new raw materials is reduced. Other input factors for the production of new materials will also be reduced, such as energy consumption. The findings of several studies show that most materials that are reused are downgraded. The greatest challenge is therefore to improve the quality of reused materials[15].

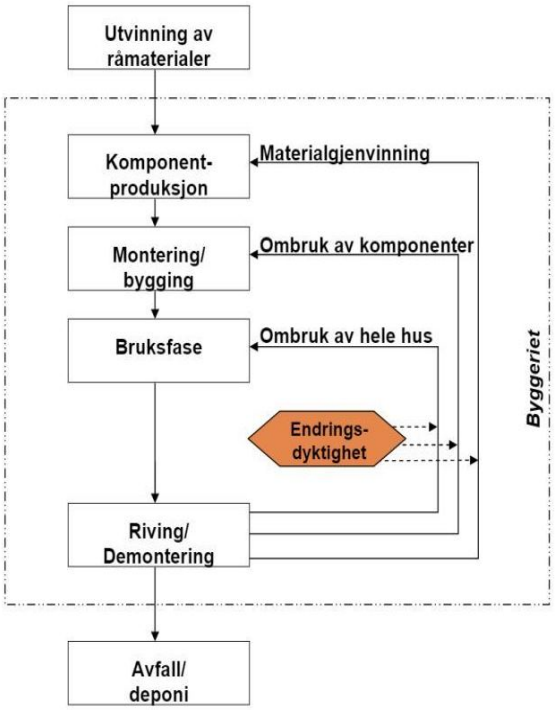


Figure 3: Reuse hierarchy. The figure comes from a talk given by architect Anne Sigrid Nordby at a workshop in 2007.

Typical components that can be reused are concrete structures,

[11] Swedish Chemicals Agency: "Route to non-toxic and resource-efficient material cycles" report 7/16 from 2016.
[12] Mistra Closing the loop, article on the website Comprehensive approach to better recycling of construction waste", 13 May 2016.
[13] Ingeniøren: "Split up a building and see what can be used", online article 17 Nov 2016.
[14] The Danish government's resources strategy «Denmark without waste II - Waste prevention strategy», 2015.
[15] Grøn Industrisymbiose: BYGGEMATERIALER GENERISK CASE, Grøn Industrisymbiose, Erhvervsstyrelsen (Construction materials generic case, Green Industrial Symbiosis, The Danish Business Authority) DK 2015

masonry, windows, doors and inner walls. Materials can be concrete, bricks, glass, aluminium, wood, etc.[16] The Hjellnes report suggests 6 design principles to contribute to this type of increased reuse and recycling of materials. These are described in the report in more detail and with suggestions for activities to achieve them:

- Limit material selection
- Long service life
- High generality
- Flexible connections
- Sensible storage
- Available information

A number of reports provide examples of how this type of principles are used in practice and several of the reports describe both environmental benefits and technical challenges.[17] [18] [19] [20] [21] [22] They also show that it is important to plan for reuse and recycling of materials at an early stage in the projects. Construction products and materials mentioned for reuse include concrete (concrete elements and broken concrete), bricks, wood, roof tiles, doors, windows, fixtures, metal plates and glass. Technical installations such as sanitary ware, water pipes, ventilation ducts and electrical components are also examples of this.

Construction products are reused to a relatively small extent. There could be numerous reasons for this. It has been pointed out there are not enough "second-hand markets" for reusable products. Challenges include maintaining the quality of products being dismantled, documentation of the quality of the products and storage difficulties. Until now it seems that the trade in reusable materials has mainly been driven by enthusiasts, many of whom have focused greatly on parts for listed buildings. Norway has Miljømarkedet, run by the Norwegian Environmental Protection Association[23], Sweden has Byggigen[24] and Denmark has GENBY:DK[25] and J. Jensen Genbrug[26]. There is also an international website called SalvoWeb[27] which also lists other dealers of used building materials, as well as being a forum for those who have products to buy or sell. Also websites for regular classified advertisements (e.g. finn.no) seem to be used for buying and selling used building materials, but are perhaps mainly for the private market. According to the Hjellnes report, the highest turnover goods in the Oslo used-goods market were doors, windows, handles, signs, wrought iron, outdoor lamps, electrical products (switches, dimmers, sockets, etc.), iron staircases, straight wooden

[16] Nordic Innovation publication: «Environmentally Sustainable Construction Products and Materials – Assessment of release and Emissions» 2014:03.
[17] Leland, B et al. 2008: «Planning for reuse and recycling.» Report funded by Husbanken and Byggemiljø, RIF 2008. ISBN 978-82-91510-87-3.
[18] Nordic Built: Final report «Nordic Built Component Reuse» 2016,
[19] IVL (Swedish Environmental Research Institute): «Reusing fixtures in commercial, office and service spaces - A recycling guide» 2016
[20] Pettersen, N.: "Pilot Project Reuse building in Trondheim - A bridge from destruction to construction". Trondheim Local Authority, 2005.
[21] Sørnes, K. et al.: «Recommendations for the reuse of construction materials», from Upgradeprosjektet, SINTEF, 2014.
[22] Sakårdal, V. and Strand, E.S.: "Reuse of existing industrial buildings - illustrated by two case buildings", Master's dissertation at the University for Life Sciences in Norway, 2010.
[23] http://www.nmf.no/default.aspx?pageId=8
[24] http://www.byggigen.se/
[25] http://www.genbyg.dk/en/
[26] http://jensengenbrug.dk/
[27] http://www.salvoweb.com/

stairs, sanitary ware, kitchen furnishings, lumber, unused LECA blocks, bricks, roof tiles and slate.

There are many reports that provide examples of and conditions for reuse of consruction materials. Many reports also discuss reprocessing of the products or using the materials in new ways.[28] [29] [30] [31] Some of the conditions for the reuse of construction products is that they are not damaged, are clean and do not contain hazardous chemicals, that there is the relevant documentation for the product and that any additional processing of the materials is environmentally sound and economically viable. Re-used construction products/materials do not have a CE marking or a performance declaration that can make it difficult to guarantee the properties. The Hjellnes report refers to the "Nordic Built-in Component Reuse" project, which ended in 2016, where many proposals for the reuse of construction materials have been tested in practice. According to the Hjellnes report, some variation in material usage, simple components with a long service life, flexible connections and clearly distinct layers of material in the building will contribute to increased reuse. For example, dismantling can be facilitated if screws rather than nails are used.

It makes a huge difference whether cement mortar or lime mortar has been used for bricks. It is only possible to recover enough complete bricks for reuse if lime mortar has been used. In the case of concrete structures, reuse is easiest if it consists of elements that have been manufactured for dismantling.

Recycling of materials

The construction industry accounts for some recycling of materials, but the materials are sorted and sent to waste facilities or back to the manufacturers for further processing. The use of crushed concrete, which makes up one of the largest volumes of waste, is an exception to this and can be crushed on site and used in place of gravel and stone as a filling material if the concrete fulfill national requirements on content of hazardous substances.. There are also examples of how it is possible to save cement if the crushed concrete originates from high-quality concrete or reuse concrete as a filling material e.g. in indoor structures, dry environments or ground-cover foundations in low or normal safety classes.[32]

The concrete industry in the Nordic countries has been concerned that the use of crushed concrete as a filling material (instead of gravel and stone) will lower the quality of new concrete. In the Netherlands, crushed concrete has long been used in this way because of government backing with regulations and because of financial support to developers. According to an article in the Danish Ingeniøren magazine, the scheme now works in the Netherlands without any additional support.[33]

[28] Leland, B et al. 2008: «Planning for reuse and recycling.» Report funded by Husbanken and Byggemiljø, RIF 2008. ISBN 978-82-91510-87-3.
[29] Nordby, Anne Sigrid «Salvageability of building materials: Reasons, criteria and consequences regarding architectural design that facilitate reuse and recycling», Doctoral thesis NTNU 2009.
[30] Sørnes, K. et al.: «Recommendations for the reuse of construction materials», from Upgradeprosjektet, SINTEF, 2014.
[31] Technological Institute and CINARK "Material Atlas of the Potential for the Reuse and Recycling of Construction Materials», April 2016.
[32] Ingeniøren: “Resurrection of concrete divides opinion”, online article.
[33] Ingeniøren: “The Netherlands has cracked the code for reuse of concrete", online article, 16 Nov 2016.

Environmental remediation

There must also be an environmental focus during the renovation process on management of demolition waste and problematic substances in the building. This will prevent further spread of environmental toxins and help ensure the building can be part of the circular economy in the future.

Nordic Ecolabelling sets requirements for an environmental survey to be undertaken prior to the waste management plan. This is an important stage as an environmental survey pinpoints what measures are relevant for the renovation. If this environmental survey is not undertaken or is inadequate, all the subsequent requirements will has less effect. Nordic Ecolabelling sees strong potential in ensuring that a thorough environmental survey is performed by a qualified professional.

7 Justification of the requirements

This chapter comprises the main body of the Background document. The chapter includes the environmental labelling requirements, an explanation of why the requirement is set, the present requirement level and any limitations or restrictions. The appendices referred to in each requirement are the appendices in the criteria document.

Occasional reference is also made to the background document "Nordic Swan Ecolabelled small houses, apartment buildings and buildings for schools and pre-schools (089)".[34] There is a cross-reference list in Appendix 1 of this Background document that compares criteria for Nordic Swan Ecolabelled new buildings with the criteria for Nordic Swan Ecolabelled renovation.

7.1 Product group definition

The following product group definition describes what can and cannot be Nordic Swan Ecolabelled.

7.1.1 Types of buildings for which renovation can be Nordic Swan Ecolabelled

Part of the product group delimitation is the definition of which types of buildings are included in the product group "Nordic Swan Ecolabelled renovations". The following types of buildings are included:

- Single-family homes[35]
- Apartment buildings
- Buildings for pre-schools and schools
- Office buildings[36]

[34] Nordic Ecolabelling: "Nordic Swan Ecolabelled small houses, apartment buildings and buildings for schools and pre-schools" The document is available for download from the national websites: www.svanen.se, www.ecolabel.dk, www.svanemerket.no, www.svanurinn.is and www.ecolabel.fi

[35] Includes single-unit houses, villas, row houses, terraced houses and semi-detached houses if the relevant country's definition of building types in the building regulations doesn't pose differently.

[36] Includes buidlings for offices and administation of both private and public operations. Also including office-like buildings such as municipality buildings and city halls.

- Homes for the elderly[37]
- Cottages/holiday homes and holiday apartments[38]
- Buildings that are converted into any of these types of buildings, for example, a nursing home that is converted into apartments.

Buildings that cannot comply with one or more of the requirements in the criteria because of their cultural heritage cannot be Nordic Swan Ecolabelled.

Nordic Ecolabelling has had criteria for Nordic Swan Ecolabelled newly-built single-family homes, apartment buildings and buildings for pre-schools and schools in place for several years. It has been a successful product group and there has been interest in being able to obtain Nordic Swan Ecolabelling for the renovation of these types of buildings too. The question of Nordic Swan Ecolabelling office buildings has also been put by the industry and it is therefore natural to allow renovated and converted offices to be Nordic Swan Ecolabelled. A report recently published by the World Green Building Council (WGBC)[39] presents seven case studies which demonstrate that environmentally sustainable "green" offices are clearly beneficial to staff health, well-being, satisfaction and productivity. It is therefore highly relevant to include office buildings too.

7.1.2 The renovation must also be of a certain scope

Not only must the renovated building be one of the above types of building, the renovation must also be of a certain scope for it to qualify for Nordic Swan Ecolabelling. The aim is to establish a minimum level for what qualifies for Nordic Swan Ecolabelling. Simple redecoration or minor renovation work, such as kitchen remodelling or bathroom renovation, do not qualify.

Another aim is to clearly explain that it is not possible for existing buildings to be Nordic Swan Ecolabelled unless they have been renovated. Renovation work increases the value of the building, makes it more energy efficient, enhances the indoor environment and delivers environmental benefits.

One or more of the following will be met by a Nordic Swan Ecolabelled renovation:

- The scope of the renovation (excluding demolition) must be at least 25% of the value of the building (excluding the land value).

- The renovation covers at least 25% of the surface of the building envelope.

This definition is a modification of the definition of *major renovation* in Directive 2010/31/EU on the energy performance of buildings that focuses exclusively on energy renovations.

[37] Homes for the elderly that are classified as homes in the country´s building code and of the actual municipality. The same applies to residential institutions for persons with physical or mental functional impairment. Shared areas for the home's residents and staff areas are also covered by the Nordic Swan Ecolabel and must fulfill the requirements

[38] Provided that the building is not excluded from the national building permit regulations, is heated and has running water and sewage approved according to local regulations. Permanent residential properties must comply with the energy requirement without any simplifications or easing due to size, etc.

[39] Building the Business Case: Health, Wellbeing and Productivity in Green Offices, October 2016, WGBC.

The building's value is not really defined in more detail in the EU Directive on the energy performance of buildings. In this context, the value of the building should be understood as the cost that a reconstruction of the existing building would amount to. The value of the land on which the building stands is not included. The value of a building is included as a concept in generally established rules for property valuation and is not the same as market value or taxable value.

The building envelope is the outer structure of the building, i.e. the physical barriers that separate the inside from the outside, land or unheated space. The building envelope is usually walls, floors/foundation, roof, windows and external doors.

Exactly what the renovation project involves and how the work is done will obviously vary from project to project and from building to building. A renovation project is a highly unique undertaking. Renovation work can involve changes to the building envelope, to technical systems, to the structure, and to the function and appearance of the building. Since Nordic Swan Ecolabelled renovation work needs to be of a certain scope, many of the measures mentioned will probably be included.

It is of critical importance that the renovation process and the renovated building meet all requirements in the criteria document.

Communication difficulties may arise if only parts of the building or only some of the structural framework of the building are renovated as it may be marketed as a Nordic Swan Ecolabelled renovated building. A partial renovation must therefore form a clearly-demarcated unit that also constitutes a clear and natural demarcation for the user.

Prior to each application for a Nordic Swan Ecolabelled renovation, the extent of the renovation must be described and lodged with the case officer for approval. Also see Requirement O1. The case cannot be processed until Requirement O1 has been verified and approved.

7.1.3 Special cases

Thanks to the product group definition described above, larger/more extensive renovations may be Nordic Swan Ecolabelled. However, renovations are unique projects which means they will vary greatly. In this section, we attempt to present some of the variants and what applies for them.

Complete renovations where only the load bearing structure remains

Since it is resource-efficient to reuse the load bearing structure, Nordic Ecolabelling shall not contribute to its demolition if it can be retained. Nordic Ecolabelling leans towards the national regulations for building and construction and the definitions for those regulations. If the construction regulations define a project as being a new-build project, the criteria for new production must be used. If the construction regulations define a project as a renovation project instead, the criteria for renovations must be used.

Demolition is a substantial part of complete renovations and it is therefore reasonable that Nordic Ecolabelling sets requirements for environmental survey/analysis and remediation, regardless of definition. The requirements in the section on environmental survey/analysis and remediation for renovations must be met, regardless of how the rest of the renovation is defined (as new construction or renovation).

Renovations that result in increased area (extension)

If the floor space of the building is increased, i.e. the building is extended while it is being renovated, the project is a combination of two criteria documents and will be treated accordingly.

1. The renovated section of the building must comply with the requirements in the criteria for Nordic Swan Ecolabelled renovations and conversions.

2. The basic principle is that the newly-built extension must meet the following requirements in the criteria for Nordic Swan Ecolabelled single-family homes, apartment buildings and buildings for pre-schools and schools (O89):

    - O3 Points achieved
    - O4 Energy consumption of the building
    - O7 Possibility for sorting at source
    - O9 Radon
    - O11 Ventilation
    - O12 Noise environment
    - O13 Daylight
    - O30 Air permeability
    - Point-score requirements (P1 – P14)

Other requirements must be documented according to the criteria for renovations when these are the same for renovation and new-builds.

An exception for smaller extensions allows the living or commercial space to be increased by a maximum of 10% or a maximum of 50 m^2. In this case, the extension and the renovated building only need comply with the requirements in the criteria for renovation.

This prevents there being any gap between the criteria. As a consequence of the criteria for new-builds (O89) not including offices, nor is it possible for renovations of offices that entail more than a 10% increase of space to be Nordic Swan Ecolabelled.

7.1.4 What may not be Nordic Swan Ecolabelled

It is as important to explain what is not included in the product group definition, and may therefore not be Nordic Swan Ecolabelled, as it is to explain which renovations may be Nordic Swan Ecolabelled.

- Buildings that have a very specific use, where the business itself has significant environmental relevance or where other considerations are required, such as hospitals, health care facilities, airports, hotels, conference, industrial, commercial, agricultural and historical buildings.
- Renovations that are more limited in terms of the surface of the building envelope or financial scale, compared with what is specified in 7.1.2
- Renovations by private individuals. On the other hand, purchases by private individuals of renovations carried out by a renovation company (legal entity) are included.

- Renovations of offices that involve an extension that increases the space by more than 10%.
- Permanent supplementary buildings such as a garage, refuse store, bicycle and tool sheds etc. must comply with relevant requirements in the criteria, but may not themselves be ecolabelled.

The following can be labelled according to the criteria for Nordic Swan Ecolabelled Small houses, apartment buildings and buildings for schools and pre-schools:

- Newly built small houses, apartment buildings and buildings for schools and pre-schools. See critera no. 089.
- Extensions to small houses, apartment buildings and buildings for schools and pre-schools. Only the extensions can be Nordic Swan Ecolabelled.

7.2 What is subject to the requirements?

Main building and supplementary building

The requirements apply to the main building plus any permanent supplemantary/auxiliary buildings that are part of the renovation project and that are constructed, renovated or marketed with the Nordic Swan Ecolabelled renovated main building.

Supplemantary buildings are garages (whether free-standing or connected to the building), refuse stores, sheds for bicycles, tools etc. If a supplementary building is renovated or newly constructed when the main building is being renovated, it must meet all relevant requirements, but the supplemantary building may not itself be ecolabelled. This limitation is the same as in criteria for Nordic Swan Ecolabelled small houses, apartment buildings and buildings for schools and pre-schools.

Limitations in the main building

The requirements in the criteria document apply to the entire building/structural framework of the building. Interior spaces that are not residential, office, pre-school or school premises, such as shop premises, restaurants, hair salons are excluded. An office property can be taken as an example. If there is a restaurant/café and a shop on the ground floor, this part of the building (the space occupied by the restaurant and shop) is not subject to Nordic Ecolabelling's requirements. However, common areas for residents of the building (e.g. gym or hobby room) must comply with Nordic Ecolabelling's requirements.

Any bombshelters belonging to the building must only apply to requirement O4, O5,O7 and O12.

Limitations of building components and installations

Installations up to the building are not included. This means, for example, that mains power cables outside the building and cables to the main fuse box are not subject to Nordic Ecolabelling's requirements. Nor are pipes for conveyance of water and wastewater up through the foundation to connecting pipes inside the building subject to the requirements.

Whenever anything that would normally have been built on site is purchased as prefabricated the same requirements apply as if it has been built on site. This is described in more detail in section 7.8.2.

Standard version and optional extras

The requirements in the criteria document must be met by both the solutions and products contained in a standard solution/version and in any optional extras. (i.e. options or customer adjustments).

7.3 General requirements

O1 Outline description of the renovation project

The application must include a description that includes the following elements for the renovation project and for the renovated building:

- An outline description of the extent, purpose and objectives of the renovation. The description must show which parts of the building are to be renovated and clearly state if a storey, buildings or parts of buildings are not included in the renovation work. The descrition must also include any supplementary buildings that are part of the renovation project or which are to be newly constructed/erected. Heated areas before and after the renovation must be specified.
- A description of the renovated building's carcass/load bearing structure, façade, roof, foundations, heating system, ventilation system and other essential installation systems.
- Floor plans with details of the number of storeys, number of square metres of living space or premises, and details of any premises/commercial space. It must be clearly stated if, during renovation, the floor space of the building is increased (extension) or if the building category is changed (e.g. an office is converted into housing).
- The building's energy consumption before (measured values) and after the renovation (calculated value, also see requirement O14)
- Statement that the renovated building has individual metering and billing for:
    - household electricity for each residential unit in apartment buildings and single-family homes.
    - electricity consumption at least for the operation as a whole (for pre-school and school buildings).
    - electricity consumption per tenant. (for office buildings).

☒ Documented description of the aforementioned items. Drawings, designs, illustrations and other project documentation can constitute the basis.

☒ The extent of the renovation (excluding demolition) either reported as a proportion of the building envelope being renovated or in relation to the building's value (excluding the land value).

Background

The requirement is intended to provide an overall picture of the renovation that is to be Nordic Swan Ecolabelled so that the licence application can be processed correctly and efficiently. Drawings, designs, illustrations and other project documentation ought to constitute the basis of the documentation. The applicant must report the extent of the renovation and the type of the building after renovation (see Item 1) to ensure at an early stage that an application meets the definition for the product group. The requirement is similar to equivalent requirements in the criteria for new buildings.

Heated areas before and after the renovation must be specified. The area must be reported according to each country's current definitions and calculation methods.

The building's energy consumption before renovation are preferably reported as measured values. Whereas the energy consumption after renovation are reported as calculated value.

The requirement is supplemented with a sub-requirement that the electricity consumption must be metered for each residential unit. Submetering the energy usage of each single-family home and apartment (housing unit) in a block of flats is important in helping prevent waste. If energy use was not measured in the building before renovation, it is cost-effective to install a submetering system when carrying out the renovation work. With regard to buildings for 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. Areas that are intended only for out-of-school activities can also be included in the submetering of the school. Electricity consumption in office buildings must be measured and billed per tenant.

O2 Responsibility for Nordic Swan Ecolabelling

The licence applicant must be responsible for all requirements in the criteria document and for compliance with the requirements, no matter who the work is performed by, until the renovation is completed and the building is ready for occupation.

If subcontractors are used, the licence applicant is responsible for the subcontractor being informed of the requirements and is responsible for ensuring compliance with requirements.

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

For more information, see chapter 3.4.

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

☒ Description as stated above.

Background

The purpose of the requirement is to ensure that the licensee takes full responsibility for the fulfilment of all of the requirements. This naturally applies to both process/routine requirements and those linked directly to the Nordic Swan Ecolabelled renovated building. The requirement should not be interpreted as meaning that only turnkey contracts are accepted as a type of contract, but that the responsibility applies to all the requirements of the criteria document. The requirement is identical to equivalent requirements in the criteria for Nordic Swan Ecolabelled new buildings.

Section 3.4 Licences and licensees, describes who can become a licensee. Corresponding information is also clearly stated in the criteria document.

The requirement refers to Appendix 2 in the criteria document, which contains the exemptions that can be made from this responsibility. For example, it is possible to renovate single-family homes in which white goods have not been installed, provided that this does not infringe national legislation. The same applies to flats in apartment buildings. However, kitchen fittings and white goods which fulfil the criteria for Nordic Swan Ecolabelled fittings and Nordic Swan Ecolabelled white goods, respectively, are recommended.

7.4 Prior to the renovation work

7.4.1 Building condition assessment and reuse

There is major potential for environmental savings in renovation projects. However, it requires planning at an early stage. According to adaptability guidelines from Byggemiljø in Norway[40], early planning accounts for about 10% of the overall project planning costs. It is important at this stage to set the right level of ambition to make it possible for environmental best practices to be implemented. The guidelines show that life-cycle planning in general and adaptability in particular can provide

- a basis for increased rental income
- lower costs in the long-term
- reduced environmental impacts
- contributions to the positive development of society

O3 Building condition assessment and plan for resource use

Before the actual work of renovating the building has begun at an early stage of the project planning process, a building condition assessment and plan for resource use must be performed.

The building condition assessment

The assessment must at least include:

a) An assessment of the suitability and adaptability of the building for the purposes of the renovation project.

b) The condition and expected useful life of the building, the building elements and the technical installations.

c) An analysis of the possibility of preserving or reusing building elements, construction materials and technical installations.

The analysis must include at least: carcass, ventilation ducts, stairs, floors, interior and exterior doors, windows, building panels, roof covering, façades, bricks, concrete, structural timber, stone material, fixtures and sanitary ware.

When descision on preservation and reuse is taken, the results of both the condition assessment, the environmental survey (O4) and moisture survey (O5) must be included. If building components, material ans techincal installations are reuses, see also requirement O31 regarding resource-efficient material selection.

Plan for resource use

The above items must be made into a plan for the preservation and reuse of the building elements, materials and installations, either in this project or in other buildings. Also see requirement O6 waste plan and waste management. The resource use plan must include:

- Estimated amounts of the building components/materials.
- Specified space for storage that does not prevent or limit options for reuse.
- If any products or materials are covered by a closed-loop recycling scheme, specify the type of material, receiving facility and approximate quantities.

[40] Byggemiljø: "En introduksjon til tilpasningsdyktighet i byggeprosjekter og i bygg- og eiendomsforvaltningen", 2008 (Introduction to adaptability in construction projects and in building and property management).

☒ A building condition assessment for the preservation and reuse of building elements, materials and technical installations that includes a) to c) above.

☒ A plan for preservation and reuse that covers at least points a to c above.

Background

The criteria for Nordic Swan Ecolabelled renovation focuses on increasing awareness of reuse of building elements, building products and construction materials. Reuse can take place within the framework of the project or the products can be reused in another building. It is important to identify the potential reuse of materials early on in the project. There is therefore a clear focus in requirement O3 on reuse and circular economy.

The requirement lists the building elements, construction products, materials and technical installations that are most relevant for reuse, but other types may also be included. The foremost aim of the requirement has been to raise awareness and initiate systems that will ensure increased reuse. Some products offer the suppliers an opportunity to have the products/materials returned. This must be included in resource utilisation plans as it provides key opportunities for recycling of the materials.

It is generally considered that there is huge potential for increasing the reuse of building materials in construction projects from present-day levels. Several studies show that, although large amounts of the building waste are often registered as reused, most of the materials that were reused have been downgraded. The challenge, therefore, is to improve the quality of the recycling and reuse. The best possible solution is direct reuse, achieved through careful demolition of building elements which are not damaged and can therefore be reused directly, for example windows and doors.[41] There may be several reasons why reuse does not take place so often in the demolition process today. It may be due to a lack of expertise when it comes to identifying valuable materials in the building, or that not enough time has been allowed for careful demolition and keeping the materials as intact as possible and therefore reusable.

It is not possible to set an absolute requirement for the amount of construction material that must be reused directly in a Nordic Swan Ecolabelled renovation. The starting point for a renovation project can vary greatly. This also means there is considerable variation in opportunities for reusing construction materials. For this reason, a potential has been identified for each renovation project to undertake an in-depth analysis of the opportunities for reusing construction materials for a similar or new purpose either in the renovated building or in another construction project.

National authorities set different requirements for the reuse of materials. In Denmark, in addition to direct reuse, it is possible to use crushed concrete, for example instead of gravel and stone, from the demolished part of the existing building as filling material if it meets national threshold limit values for reuse of concrete. This saves on transport and the cost of gravel and stone. There are also examples of how high-quality concrete can be used, which means that less cement is required. According to Danish standards, it is only possible to reuse concrete as a filling material for structures in “passive environmental classes", which includes, for example, indoor structures, dry environments or ground-covering foundations in low or

[41] BYGGEMATERIALER GENERISK CASE, Grøn Industrisymbiose, Erhvervsstyrelsen (Construction materials generic case, Green Industrial Symbiosis, The Danish Business Authority) DK 2015

normal safety classes[42]. In the Norwegian Environment Agency's proposal for regulations on the disposal of concrete and brick waste (Miljødirektoratet 2013, Fact sheet M-14/2014 "Disposal of concrete and brick waste"), permission is given to use concrete and brick for a so-called useful purpose without the permission of the environmental authorities if the concrete is within the standard limits. Concrete, paint, grout, levelling compounds or plaster that contain PCBs, cadmium, lead and mercury must meet specific threshold limit values. A few physical requirements are also stipulated, including the requirement for a cover over the compounds, it cannot be deposited into lakes/pH values must not be affected, and it must be at least 1 m above the highest water table. Threshold limit values set for undesirable substances in reused materials are specified in Requirement O4 and Appendix 3.

The building condition assessment that is required should be used as a basis for planning what building elements, technical installations and construction materials it is technically feasible to preserve and reuse. An environmental analysis and moisture survey must be performed before deciding which building elements/materials can be reused in order to determine whether there are any problematic chemicals and damp or mould in the materials/building elements (Requirements O4 and O5). A resource management plan must also include details of how the elements and materials will be stored until reused, sold or given away to ensure that the potential for reuse is realised. Furthermore, it is important to have the suitability and adaptability of the building assessed (see Chapter 6) to ensure it has a long service life after it has been renovated.

7.4.2 Environmental analysis/survey

Unlike all other requirements on Nordic Swan Ecolabelled renovation, requirement O4 and O5 shall also be met by any bombshelters belonging to the building,

O4 Environmental analysis/survey and remediation plan

Before the actual work of renovating the building has begun, an environmental analysis/survey must be performed of the building including installations, fixed fittings and others, where there is suspicion of hazardous waste or hazardous substances. The survey must at least cover the parts of the building that are to be renovated .

The analysis/survey must as a minimum, meet national legislation and should include hazardous waste and the substances listed in Appendix 3. If an environmental analysis/survey has been performed previously, it must not be more than three years old.

The environmental analysis/survey must be performed by a professional who is able to provide the required documentation to verify that qualifying experience.*

The environmental analysis/survey must be documented in a remediation plan including all findings and results of representative material samples and analyses. In cases where PCBs have been identified and remediated in the building during the environmental analysis/survey or in another stage before or during the Nordic Swan Ecolabelled renovation process, PCBs should be measured in the indoor air after remediation. For more information, see requirement O12.

The remediation plan should serve as a basis for the procurement of remediation and demolition services. The remediation plan must include at least the following for each substance/waste covered by the environmental analysis/survey:

[42] https://ing.dk/artikel/genopstanden-beton-deler-vandene-188155?utm_source=nyhedsbrev&utm_medium=email&utm_campaign=daglig&cx_newsletter=daglig&cx_newsletterid=187558&utm_source=Ingeni%C3%B8rens+daglige+nyhedsbrev&utm_campaign=0092b2943-EMAIL_CAMPAIGN_2016_11_14&utm_medium=email&utm_term=0_4c5ce73f39-00972b2943-48247241 Visited 14 November 2016

a) Identification and statement of presence/location in the building by means of a description, photographs or drawings.

b) A summary of the total presence of hazardous waste and hazardous substances with a description of how the materials or the substances are to be removed or in other ways handled. This summary must include the type and estimated amount of hazardous waste, the European waste code and materials with hazardous substances according to Appendix 3.

c) Anything containing hazardous waste or hazardous substances exceeding the levels in Appendix 3, that is to remain or to be encapsulated in the building must be clearly stated. The technical method of encapsulation must also be described along with a risk assessment. See requirement O17 for further details.

d) A description of how the hazardous waste including waste from the removal process (e.g. sand blasting) will be stored, transported and finally disposed of.

e) A description of measures for protecting the environment and human health and the risk of damage and theft during the remediation process.

[*] *The person performing the environmental analysis/survey must be qualified to conduct an environmental analysis/survey and be qualified in the area of environmental law, or must have at least three years of relevant experience, e.g. construction, or have experience of having performed at least ten environmental analysis/surveys with an experienced supervisor. The person performing the environmental analysis/survey must have experience of environmental analysis/survey of the type of building in question, and must have knowledge and experience of the health and safety risks associated with the environmental analysis/survey and the removal.*

☒ The procedures for environmental analysis/survey stating the expertise of the appointed surveyor.

☒ Documented remediation plan that covers a) to e) above.

Background

The foremost aim of the requirements for a building condition assessment, environmental analysis and moisture survey (Requirements O3 - O5) is that substances which are hazardous to human health and the environment and moisture/fungi/mould in the building are managed in the correct manner. This may involve removal or encapsulation to prevent people from being exposed to them, and documentation of the technical condition of the building in general. An environmental analysis must be performed before remediation work begins and should preferably be carried out at the same time as a condition assessment and moisture survey on the building, since the results of all three will affect decisions about which building materials and elements of the building can be reused.

A previous environmental analysis may be accepted provided it is not more than three (3) years old. This limit has been set because of the rapid changes in regulations and knowledge in this field. The environmental remediation plan can then be used as the basis for price determination and implementation of the remediation process.

The environmental analysis must document:

- what hazardous waste and undesirable substances there are
- the amounts in which they are expected to occur
- their location in the building

An important question is *how extensive* the analysis should be, with regard to which area is to be surveyed and which materials/building elements and undesirable substances are to be

examined and identified. In the case of a Nordic Swan Ecolabelled renovation, at least the entire area encompassed by the renovation must be surveyed, including any shelters and safe rooms. The surveyed area must be clearly indicated in the environmental remediation plan using construction drawings and photographs. The various findings must be clearly marked and documented on the drawings and photographs. Because a Nordic Swan Ecolabelled renovation addresses the building, and not the site outside the building, the site will not be affected by Nordic Ecolabelling's requirements.

The analysis must include the substances that are harmful to human health and the environment which the national authorities and industry standards require or recommend should be identified and documented. Furthermore, Nordic Ecolabelling has its own list of additional substances and/or more stringent threshold limit values which must be identified and documented (Appendix 3 in the criteria document). The materials and building elements which are known or suspected to contain undesirable substances must be identified and documented. It is up to the environmental surveyor to assess this.

It is a balancing act between promoting increased reuse of materials and having requirements for a low content of environmental toxins in construction materials/building elements. In some cases, it can also be particularly difficult or costly to remove all building elements with undesirable substances, for example, paint and levelling plaster on concrete walls/floors or identified asbestos.

Materials or building elements with undesirable substances in concentrations that exceed the limits for hazardous waste must be removed from the building in conjunction with the renovation process (national requirements and industry standards). If it is technically feasible and desirable to reuse a building element or material, but the content of environmentally hazardous substances exceeds the threshold limit values set by Nordic Ecolabelling in Appendix 3, the following is possible:

- remove the materials/building elements
- encapsulate/enclose or render harmless the materials/building elements to prevent direct exposure

An exception may be made for uPVC windows that contain lead and cadmium stabilisers. Reuse of materials/building elements containing undesirable substances in excess of the threshold limit values set by Nordic Ecolabelling must be documented in the logbook (see Requirement O17). Other exceptions may be allowed following a risk assessment and dialogue with Nordic Ecolabelling.

Selection of substances in Appendix 3 in the criteria document

The Nordic authorities' requirements and recommendations in the industry have so far focused on an analysis of substances that can provide a basis for identification of hazardous waste, i.e. whether the concentrations of the substance can be so high that it can be classified as hazardous waste. Exempted from this are e.g. asbestos and hydrochlorofluorocarbons which are always classified as hazardous waste. If hazardous waste has been documented in an environmental analysis, the industry standard has been to recommend its removal during the renovation of the building. According to current national requirements (Nov. 2017), everything below the limits for hazardous waste can, in principle, remain in place in the building, even if the substances may constitute volatile compounds that can affect the indoor climate. In other words, there is no statutory requirement to conduct measurements of gases which may be present in the indoor environment from volatile organic undesirable substances in conjunction with a renovation process. Threshold limit values have therefore

not been established for when substances that are harmful to human health and the environment in materials that remain in the building can lead to a harmful indoor - environment or have other adverse health or environmental impacts even if it is entirely possible that they can cause adverse effects.

Significant developments are being made in the field of environmental analysis and remediation work in the Nordic countries. More regulatory requirements and industry standards are therefore expected to be introduced in the next few years with a greater focus on the risks, particularly to human health, than is the case today. This will ensure a more scientifically accurate assessment of whether certain building elements/materials must be removed to prevent indoor environment problems, even if the concentrations of undesirable substances are below the limits for hazardous waste.

The content of substances that are harmful to human health and the environment in building materials/elements that are produced today is regulated to a much greater extent than in the past. There is also greater awareness of which substances can contribute to an unhealthy indoor climate. Literature-based research studies into what kinds of substances are present in building waste in the Nordic countries have been carried out to assess which substances Nordic Ecolabelling wishes particularly to focus on, and which must be included in Appendix 3 in the criteria document. Various overview reports from authorities and other sources on substances harmful to human health and the environment in old construction materials have been assessed. These include reports from the Danish Environmental Protection Agency, Swedish Chemicals Agency, the Swedish Recycling Council's (Kretsloppsrådet) Resource and Waste guidelines for constructions and demolitions, and an environmental analysis checklist from the Association of Consulting Engineers, Norway (RIF). In addition, many years of experience from the Nordic Swan Ecolabelling of housing and nursery schools, as well as in-depth knowledge of new environmental toxins and construction products, such as windows and doors, construction panels, paints, sealants, furniture and furnishings, have provided valuable expertise and knowledge of contents and quantities of various undesirable substances in such products.

An explanation of the undesirable substances (heavy metals and organic compounds) that Nordic Ecolabelling has set its own threshold limit values for is presented in Appendix 4 of this Background document.

Reporting

All findings and results from representative material samples and analyses must be documented in the environmental remediation plan (Requirement O4). The materials/building elements from which samples must be taken, and the extent and type of analyses to be performed, must be determined by the environmental surveyor. National differences will occur in this area, for example in relation to assessments of PCBs. Where relevant findings are identified, their location must be clearly documented room by room on a detailed drawing of the building. In the building itself, it is only necessary to mark the building elements if the environmental surveyor has reason to believe that asbestos may be present (e.g. a broken or cracked pipe elbow). These elements must be marked with asbestos tape (warning tape with the word "Asbestos" written along it) as asbestos fibres can cause a serious risk to the health of persons working in the building. The waste from the remediation work must be stored with adequate safety before it is transported to the approved waste management facility. This procedure must also be documented in writing (see Requirement O4), which is not usually required in an ordinary remediation project. Hazardous waste and products containing undesirable substances must be identified with EAL codes and estimates

of the quantities must also be made. These estimates are used in the waste plan which forms part of the environmental remediation plan.

Requirements for environmental surveyors

It is difficult for Nordic Ecolabelling to require environmental surveyors to have done an environmental analysis course, since courses are not available in all the Nordic countries. There are also considerable differences in the composition, content and level of the courses offered in one and the same country, and from country to country. The most widely recognised course in Norway is run by the Association of Consulting Engineers (RIF) and is a four-day course which concludes with an examination with a minimum pass mark of 40%. It is not known whether the other countries have a corresponding course. The competency requirements for environmental surveyors are therefore more generalised, requiring the person responsible for the environmental analysis to have training and experience in the area (see Requirement O4). This means training in environmental analysis work and environmental legislation, and at least three years of relevant work experience, e.g. construction, or experience of implementing at least ten environmental analysis projects together with an experienced environmental surveyor. The surveyor must have experience of analysing the type of building that is to be renovated, and is expected to have knowledge of how undesirable substances were used in construction materials in the past, and where they occur. Furthermore, the surveyor must be familiar with health and safety risks in the workplace that an environmental analysis and remediation work will entail, and the need for personal safety and protection during the environmental analysis and the remediation work, with regard to health, safety and the environment (HSE).

O5 Moisture survey

Before the actual work of renovating the building has begun, a survey should be carried out to assess moisture damage, fungal growth, dry rot fungus, odours and water damage in the building that is to be renovated.

- The moisture survey must cover the entire building, as well as areas exempted from other requirements such as shop areas and restaurants:foundation/base, cellar or corresponding
- the building envelope (including roof)
- moisture-sensitive elements indoors and outdoors (see Appendix 4)
- interior surfaces that before the renovation were exposed to moisture (wet rooms, kitchens, showers and washrooms).

The survey shall initially, be performed visually and non-destructively.

The detailed survey must be carried out using destructive sampling, visual inspection with tape, analysis of material samples by microscopy, collection of air samples or another appropriate method. The choice of method must be appropriate to the purpose and the reason for the choice must be given to Nordic Ecolabelling.

If moisture or water damage is identified, it must be remedied/treated during the renovation process.

If any building components are identified as being at risk of moisture damage, they must be addressed during the planning stage and remedied during the renovation process.

If mould removal is necessary, the work must be carried out in compliance with national occupational health and safety guidelines, and with any requirements for remediation to be performed by a licensed/authorized contractor .

The survey can be integrated in the environmental analysis/survey (see Requirement O4) or be undertaken as a separate moisture survey. In both cases is must be performed by a competent moisture technician*.

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

- ✉ A report from the moisture survey stating whether harmful moisture or water damage has been found, if structures are considered to be well designed and an assessment of the design of any wet rooms.
- ✉ Planned corrective actions to remediate moisture damage that has been found and building components at risk of moisture damage, see Appendix 4.
- ✉ The routines for inventory with the indication of competence of designated moisture expert.
- ✉ Report from any conducted remediation.

Background

Material that has been damaged by moisture or biological fouling can affect the indoor environment, local environment or the strength and durability of the building. The negative effect of moisture damage can be lasting, in some cases, even if corrective actions are taken to reduce the moisture level. For example, this is the case with mycotoxins that remain in inactive mould and mould spores. The resulting moisture damage and damage to materials should therefore be remedied so that there be no lasting harm. Fungal spores and hyphae occur naturally in the exterior environment in large quantities. Providing the spores with moisture enables them to germinate and grow. If mould grows on interior surfaces or in the framework of the building and spores or fungal fragments spread to the indoor environment, it can cause unpleasant odours and exposure to these spores can have an adverse effect on human health.

A material may become damaged if it is exposed to a higher than intended moisture level. The release of chemical substances may increase, leading to abnormally high levels of chemical substances in the air. Moisture can also cause components in adjacent materials to react with one another and give rise to new, possibly harmful substances.

Surveys show that 29 (± 5) percent of buildings have mould, mould odour or a high moisture level[43]. The causes of damage can be new and untried materials, unsuitable designs, soil conditions, wet rooms that have reached the end of their service life and need renovating, supplementary insulation, a different source of heating and a changing climate with warmer winters and more precipitation.

Not all moisture, damp and water damage affects the indoor environment and human health, but the risk exists. If a building is to be renovated anyway, it is cost-effective to repair damage and take measures against risk of damage to building components. That is why Nordic Ecolabelling requires a moisture survey to be undertaken before the renovation work begins. The survey must include the building envelope and internal and external moisture-sensitive structures. The purpose is to identify whether there are:

[43] Så mår våra hus (the health of our houses). Report commissioned by the Swedish government on buildings technical design, etc. The Swedish National Board of Housing 2009.

- Structures where there is a risk that moisture problems may occur. If these are identified, corrective action can be taken during the renovation process.
- Moisture damage, water damage and mould growth in the building that is to be renovated. If these are identified, can they be removed or treated during the renovation process?

Appendix 4 in the criteria document lists the structures where problems may occur and which the moisture survey should therefore examine closely.

The moisture survey is normally performed in two stages. Stage one involves a visual, non-destructive inspection. A more detailed inspection is performed based on the knowledge and experience of the building surveyor, the building components that are identified as being at risk and the findings of the initial inspection. The methods used in the more detailed inspection vary, but several methods for collecting data are described in the requirement. Destructive (material) sampling may be required at this stage.

If mould removal is necessary, the work must be carried out by a licensed contractor and in compliance with national occupational health and safety guidelines. This includes that any national requirements on authorization must be fulfilled.

After hearing the requriement is supplemented with the same requirements on knowledge end experience as in moisture prevention.

7.5 Resource effective material management

Unlike all other requirements on Nordic Swan Ecolabelled renovation, requirement O7 shall also be met by any bombshelters belonging to the building,

O6 Waste plan and waste management

In Nordic Swan Ecolabelled renovation there must be a plan and procedures for management of demolition and construction waste. The plan and procedure shall have a focus on circular material flows, both in demolition and in construction phase.

The plan must state for each waste category:

- Information on whether the waste will be reused, material will be recovered, incinerated or landfilled.
- Expected quantities (data froom the remediation plan).
- The waste contractors and consignees/recipients to be used.

The waste plan must be approved by the Nordic Ecolabel before the demolition and remedation work is initiated. The waste plan is normally conducted by the person having performed the environmental analysis/survey and is part of the remediation plan (see O4).

After remediation, verification on waste and waste handling must be documented.

The waste management must include at least the fractions stated in the table below.

Table: Handling of different waste categories during demolition and construction.

Demolition
Products and materials sorted for reuse (see O3)
Hazardous waste (different types of hazardous waste are separated into different fractions)
Waste fractions with hazardous substances according to Appendix 3.
Electrical waste (different types are separated)
Wood
Plastic for recycling
Scrap and metal for recycling
Filling materials (only natural materials such as soil and stones, Separated into not-contaminated and contaminated fractions,
Combustible waste
Mixed waste for sorting
Pure gypsum for recycling (if the recycling facility is within a reasonable distance)
Asphalt is treated for recycling or as hazardous waste
Landfill (sorted)
Construction
Hazardous waste (different types of hazardous waste are separated)
Electrical waste (different types are separated)
Wood
Plastic for recycling (the largest plastic fraction must as a minimum be sorted out)
Scrap and metal for recycling
Gypsum
Packaging materials (e.g. cardboard) for recycling
Filling materials
Combustible
Mixed waste for sorting
Reuseable pallets are returned according to the return system
Landfill (sorted)

The table with the different waste fraction is what Nordic Ecolabek demands from the Nordic Swan Ecolabelled renovation. National legislation can put other demands and these shall also be fulfilled.

☒ Waste management plan that contains the data specified above.

☒ Agreements with waste contractor(s) that are able to manage with the categories in the specified way.

☒ Verification of disposed waste.

Background

The building and construction sector is often called the 40% sector. What's meant by this is that 40% of society's waste occurs in the sector, and 40% of the hazardous substances in all waste are found in building and demolition waste. In other words, it is an enormous amount of waste. About ten million tonnes of waste have been generated every year by the construction and civil engineering sector in Sweden in the past decade.[44] Ten percent of this

[44] http://www.naturvardsverket.se/Stod-i-miljoarbetet/Vagledningar/Avfall/Bygg--och-rivningsavfall/. Page accessed October 2016.

is hazardous waste. The European Union's Waste Framework Directive underlines the importance of dealing with waste in an environmentally-sound way and reducing the amounts of waste generated and its harmful impacts. Increased reuse and recycling are one way of reducing the amounts of waste generated and of closing the loop for materials. In other words, moving towards a circular economy.

Reuse and material recycling/recovery of non-hazardous construction and demolition waste should increase to at least 70 percent by weight in 2020 under the EU's Waste Framework Directive (2008/98/EC). There is therefore a high relevance to sets requirements for good waste management during the renovation process, where the aim is to sort waste to enable reuse and material recovery, minimise waste to landfill and manage waste correctly.

There is potential to make waste management more resource-efficient and circular by reducing the amounts sent to landfill or incineration in mixed fractions and increasing reuse and material recovery.

Nordic Ecolabelling has assessed the possibility of setting a requirement for a certain percentage to be sent for reuse and material recovery. The problem with such a requirement is that it can only be verified upon completion of the renovation project. This is not optimal. Other disadvantages with requirements for weight or volume percentages is that they do not take account of the value of the waste. Heavy or large volume fractions make it easy to meet the requirement. Instead, Nordic Ecolabelling has produced a requirement for a plan for waste and resource management. The plan will control which waste fractions must be included as an indirect measure of resource-efficient waste management.

A waste plan is a legal requirement in all of the Nordic countries. It is normally included in the registration that is made or to receive approval during the start-up of a project. The following data are more or less standard: waste type, expected amounts, details about the waste to be recycled, treated as hazardous waste or landfilled, and specification of waste contractors and waste consignees. This information must also be included in the waste plan required by Nordic Ecolabelling. For a Nordic Swan Ecolabelled renovation, in addition to these standard data, construction waste and materials and building products that will be reused either in the ecolabelled project or in any other project, must also be specified. With this information, the plan becomes more than just a waste management plan. It has a resource-efficiency focus too. Since the waste planis more comprehensive thatn the waste plan demanded by the authorities, it is necessary that the plan is conducted by the person having performed the environmental analysis/survey, the developer and the demolition contractor in cooperation sinve they will have different input to the plan based on what is technically feasible and desirable to reuse. See also requirement O3, plan for resource use which contains items also to be included in the waste plan.

The requirement is based on the guidelines from the Swedish Construction Federation (Waste fractions in demolition and construction, basic level)[45] that the Swedish Environmental Protection Agency (Naturvårdsverket) also refers to. The requirement comprises a two-part list: part 1 comprises the waste fractions that must be found during demolition and part 2 contains the waste fractions that must be found in construction (conversion and expansion or other modification of the building).

[45] Resource and waste management guidelines for construction for construction and demolition. The Swedish Recycling Council's (Kretsloppsrådet) guidelines, updated November 2015. The Swedish Construction Federation (Sveriges Byggindustrier).

Some of the material flows are particularly interesting. One such is concrete, because concrete and cement constitute a large percentage of the overall waste. Plastic materials is another, because it is not recycled in large enough quantities today. It can often be valuble to sort plastics in different fractions since it increase the value of the material. Thus it is accepted to only assort the largest fraction of plastic materials.

The requirement for fractions applies if the waste is generated during demolition or construction. If a certain fraction occurs in a very limited amount or not at all, this fraction is not subject to the requirement. This does not apply to hazardous waste or waste/materials containing hazardous substances.

The list of the various fractions is what Nordic Ecolabelling requires of the Nordic Swan Ecolabelled renovation. If national legislation imposes more stringent requirements with more factions, this must obviously be complied with. For instance, Danish waste legislation requires natural stone, unglazed brick, concrete, mixed natural stone, brick and concrete, mineral wool/rock wool, soil and mixed asphalt and concrete to be sorted.

O7 Follow-up of remediation plan

Remediation and demolition must be followed up and a follow-up plan must be conducted including at least the following:

- Documentation that all of the hazardous substances and hazardous waste identified and documented in the remediation plan have been removed and properly managed (see O4). The item shall also include any new findings during the remediation/demolition.
- Information on the type and amount of hazardous waste and waste with hazardous substances. Deviations from the remediation plan must be described with proper cause.
- Statement of waste code according to the European Waste Catalogue for hazardous waste,
- Details of carrier(s) and consignees of the hazardous waste and waste with hazardous substances.
- Information to show the remediation contractor has followed the procedures to safeguard human health and the environment (see O4 e).
- A copy of the documentation and forms sent to the local authority in connection with the remediation process.

✉ A report from the completed remediation process that includes the above points.

🔑 Random checks of receipts from hazardous waste consignees/recipient of hazardous waste.

Background

Remediation is the removal of hazardous materials and substances. It includes removal of surface coatings containing environmentally hazardous substances, such as PCB, lead and asbestos.

The Nordic authorities stipulate requirements for environmental remediation and waste management in renovation processes. Generally, all countries stipulate requirements for reporting renovation work to the authorities, and for producing a waste management plan. Not all countries require a waste plan to be sent to the authorities for review. This means there is potential in this respect. There are also some countries that require an environmental review or screening to be carried out before the waste plan. This part is important as an environmental analysis identifies which environmental measures are relevant for the renovation. If this environmental survey is not undertaken or is inadequate, all the subsequent requirements will has less effect. Nordic Ecolabelling sees strong potential in

ensuring that a thorough environmental survey is performed by a qualified professional. According to The Danish Construction Association's demolition department, there is no track of the environmentally hazardous substances in as many as 50 percent of the small and large demolition projects that are carried out every day in Danish buildings. This can be explained by ignorance and incorrect handling of construction waste, as well as a desire to be cheapest in order to win demolition work[46]. Rambøll was commissioned by The Danish Construction Association to examine the handling of demolition cases by 39 Danish local authorities. A report from the survey shows that there is generally no focus on the relationship between waste and the environment in the handling of demolition cases. Rambøll found that there are a number of administrative control options in current Danish legislation for ensuring demolition is performed correctly with regard to the environment and waste which are not used by the local authorities[47].

There are similar examples in Sweden in the municipality of Umeå. The focus of a project called "Hazardous waste in construction and demolition waste 2012–2014" that was conducted here was on how problematic building waste is not always handled correctly[48]. Nordic Ecolabelling wants to set a common minimum standard and ensure that the requirements that are set for remediation work on the building that is to be renovated are followed up and controlled.

This is the reason for the first two points which must be documented in the final report (see the Requirement). Since hazardous waste/undesirable substances may be present in materials/building elements from which it is not possible to take samples during the environmental analysis, it is not uncommon for materials/building elements containing hazardous waste/undesirable substances to emerge during the actual demolition process. Whether this is detected depends, in most cases, entirely on the contractor having expertise in this area and being actively on the lookout for and actively checking this, since it is not a requirement, in any the Nordic countries, for environmental surveyors to physically follow up and inspect the remediation work being carried out, as is usually done in contaminated soil projects. This requires all employees in a remediation company to be familiar with the responsibilities they have and what is expected of them during a remediation process. Based on experience of the demolition industry, there is reason to believe that, at this stage of the process, some hazardous waste and undesirable substances go undetected, and are therefore incorrectly managed after demolition, i.e. they are not transferred correctly to the consignee. It is therefore believed that there is considerable potential in the future to prevent environmentally hazardous substances from going undetected if the national authorities lay down clearer competency requirements, for both environmental surveyors and remediation contractors, for approval of remediation and waste management plans for demolition/renovation processes at the start, and if a requirement is established for the processes to be inspected one or more times by an independent third party with the expertise required for such services, which will usually be an environmental surveyor. In many cases, it will save time and money if it is the environmental surveyor who has performed the environmental analysis and written the remediation plan and is therefore familiar with the building, findings of environmentally hazardous substances and the project in general.

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[46] New and more stringent requirements increase building demolition costs. Article at http://ing.dk/artikel/nye-og-skrappe-krav-fordyrer-nedrivning-af-bygninger-165837 27 Jan 2016
[47] DANSK BYGGERI UNDERSØGELSE AF INDSATSPULJEN I 2010 OG 2011, Rambøll 2014
[48] http://www.lansstyrelsen.se/vasterbotten/SiteCollectionDocuments/Sv/miljo-och-klimat/verksamheter-med-miljopaverkan/Tillsynsv%C3%A4gledning/Milj%C3%B6skyddsdagar%202015/Bygg-%20och%20rivningsavfall%20-%20Ume%C3%A5%20kommun.pdf accessed 30 March 2016

In light of the above, it is extremely important to hire serious environmental surveyors and remediation contractors to ensure that the processes are performed in a manner that prevents environmentally hazardous substances from going undetected. Local authorities are usually able to provide references for qualified remediation contractors. In the next revision of the criteria, it will be relevant to consider more stringent requirements for reviewing and monitoring the remediation plan during the demolition processes.

7.6 Indoor environment

Introduction

We spend about 90% of our time indoors. Indoor environmental factors thus have a major impact on our health and well-being. A Nordic Swan Ecolabelled renovation must ensure that a healthy, safe and comfortable indoor environment is achieved.

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. 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 interior environment. Factors such as ventilation, cleaning level, air humidity, mould and airborne particles from building materials such as formaldehyde affect the occurrence of chronic rhinitis.[49]

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 requirements:

- Indoor Air Quality Plan/Management, IAQ plan).
- Radon.
- Moisture-proof construction.
- Ventilation.
- Noise environment in pre-schools and schools.
- Volatile and semi-volatile substances regulated by the requirements for chemical products, building products and construction materials which minimise emissions to the indoor environment. See Chapter 7.8. This is complemented by a requirement for measurement of TVOCs and particles in the indoor environment, as part of the Innovation requirement (O36).
- Measurement of PCB levels in the indoor air after remediation.

Nordic Ecolabelling wants to contribute to a good indoor environment by setting requirements that together ensure that good choices are made in all areas that have an impact on the indoor environment. Occurrences and impacts on the indoor environment of chemicals from emissions and other types of pollutants are described in more detail in the report "Sustainable material selection in the criteria for the Swan label renovation", for

[49] 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 interior environment), no. 4, 2012.

Husbanken, 20 November 2016[50]. The responsibility for indoor environment in the national authorities' regulations is delegated to different agencies, such as in Norway, where where it is:

- The building authorities that specify targeted requirements to ensure a good indoor environment. These requirements include provisions regulating matters that are important to health, such as ventilation, spatial volume, sound conditions, daylight, energy efficiency, moisture protection, etc.
- The health authorities that play a key role as a safety net that is to take care of public health in those cases where legislative requirements or regulations are not met and the activities can represent a health hazard. The indoor climate work conducted by the Public Health Authority is mainly linked to the Act on municipal health care services (Kommunehelsetjenesteloven). This Act, together with regulations and professional advisors and the Public Health Authority's recommended professional standards for indoor climate, form the basis for the municipal health care services to drive an appropriate and effective indoor air quality programme.
- The Labour Inspectorate oversees indoor climate matters in the workplace and for indoor environmental conditions covered by the Working Environment Act. Section 8 of the Working Environment Act stipulates that the workplace must be designed so that employees are guarantee a fully satisfactory indoor climate, where the air does not contain any hazardous, irritating or stressful contaminants.

O8 Indoor air quality

An Indoor Air Quality Plan (IAQP) must be produced to ensure that pollutants and particulate matter do not spread in the indoor air during the renovation process and to ensure that the indoor air of the completed building is safe and healthy.

The licensee must appoint a qualified indoor environment expert* to monitor and document the project for adherence to the plan.

The IAQP must include at least the elements in Appendix 5 and describe procedures and measures for:

a) Ventilation, control and elimination of pollution sources.

b) Protection of heating, ventilation and air conditioning systems from contamination during remediation and renovation work.

c) Procedures to ensure adequate venting before the building is commissioned.

National regulatory requirements and guidelines must always be followed to ensure that occupational health and safety is guaranteed and to create a safe and healthy environment inside the renovated building.

If subcontractors are hired for work that affects the quality of the indoor environment, the licence applicant must ensure that subcontractors either adhere to the licence applicant's routines or have their own routines to ensure fulfilment of the items above.

An already established IAQ plan in accordance with Greenguard, LEED or BREEAM can be used as documentation

**The indoor environment expert must have proven expertise and experience of construction technology, have knowledge of indoor environment-related problems and effects of pollutants in the indoor*

[50] Nordic Ecolabelling: "Bærekraftige materialvalg i kriterier for svanemerket renovering," (Sustainable choice of materials in criteria for Nordic Swan Ecolabelled renovations) Report to Husbanken, November 2016. This report can be ordered from Elisabeth Magnus at Ecolabelling Norway. em@svanemerket.no.

environment. The person must have at least two years' experience of indoor environment work or indoor environment assessments and at least two years' experience of projects involving the construction, planning and/or management of buildings.

☒ An indoor environment quality plan with procedures and measures that show how a) to c) are met. The plan must cover the items in Appendix 5.

☒ Statement from an appointed qualified indoor environment expert with a description of expertise and experience.

Background

It is essential to have an Indoor Air Quality Plan/Indoor Air Quality Management Plan to ensure that the indoor air is safe and healthy for those moving into the renovated building. The plan is also important for ensuring a healthy working environment for the workers inside the building during the renovation phase. As this is taken care of by regulatory provisions, however, there is no focus on it.

Appendix 5 contains a number of elements that must be included in the Indoor Air Quality Plan. The Indoor Air Quality Plan must also include procedures for the various elements, assigned responsibilities and inspection procedures during the renovation process in order for the plan to be fully comprehensive.

The most credible and comprehensive IAQ plans for indoor environment for new buildings and renovated buildings, apart from guidelines on authority requirements, are to be found in other certification bodies, such as LEED[51], BREEAM[52] and American Greenguard[53]. GREENGUARD has created a very comprehensive IAQ plan which is also intended to cover requirements in LEED. GREENGUARD has absolute and strict requirements which basically ensure a very high standard for indoor environment. LEED and BREEAM Int/NOR do not set any mandatory requirements, but allocate points for a range of different measures.

Background for the various sections of the IAQ plan

Satisfactory air quality is a prerequisite for comfort and well-being and to prevent adverse health effects among those who are employed to renovate buildings and those who occupy the buildings. It is therefore essential to design and install ventilation systems that ensure satisfactory air quality with regard to odour and pollution. The ventilation requirement in non-industrial buildings will generally be determined by pollution/CO_2 level/temperature from people and materials. It is particularly important when renovating to ensure that workers and materials are exposed as little as possible to unwanted pollutants and that pollutants are not built into the building or deposited on surfaces. When planning a ventilation solution, the building's location, remediation, use and its users' needs must first and foremost be taken into consideration in each case.

The importance of protecting building materials, heating, ventilation and air conditioning systems from pollution sources during remediation and renovation work can be important in reducing contamination and moisture that would otherwise be deposited/absorbed/condensed on building materials and other technical equipment. There are therefore requirements for this. In addition to the various certification schemes described

[51] LEED. Construction IAQ management plan. Reckson – A Division of SL Green. 2011. http://slgreen.com/reckson/pdf/IAQ-Construction-Rules-Regs.pdf
[52] BREEAM-NOR New Construction 2016. Technical manual SD5075NOR. www.ngbc.no or www.breeam.com.
[53] Greenguard. Specification Indoor Air Quality Management. GREENGUARD Environmental Institute

above (Greenguard, BREEAM, LEED) there are national guidelines and technical regulations that describes the importance of this. Guidelines for clean and dry building process can also be used. One example of this is construction details building series, like no. 501.107 from Sintef in Norway.

Procedures for adequate ventilation and replacement of air filters before occupancy are essential to ensure satisfactory indoor air quality. In new buildings and renovated buildings, emissions and particles from different building elements, materials and various surface treatments will be greatest at the start. It is therefore important to minimise this before the building is occupied.

Generally the use of relevant national regulations, various guidelines and standards (e.g. EN 13779: 2007) is required and that internal guidelines and a check list are created for the requirement that describe this in more detail. See Appendix 5.

O9 Radon

Radon concentrations in the indoor air of occupiable rooms must not as annual average, exceed each country's legislation on highest permitted concentrations of radon for new-builds and in workplaces.

The threshold limit value must be verified either with new measurements in the renovated building or more radon measurements performed before renovation. A radon measurement may not be more than 5 years old. There must also be documentation stating that the renovation does not contribute to an increased radon exposure.

National regulations and methodologies with specified standards in the field must be complied with.

✉ A measurement report stating radon concentrations, measurement points and the highest readings in occupiable rooms. Reports from radon measurements carried out before renovation must be accompanied by documentation stating that the renovation has not led to higher levels of radon.

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

Background

The purpose of the requirement is to ensure a very low radon level in Nordic Swan Ecolabelled renovated buildings. Radon can cause lung cancer. The risk of lung cancer increases with prolonged exposure and particularly in combination with smoking. Globally, radon is the second-largest reason for lung cancer after smoking. Radon gas in the air inside buildings can have several causes. The annual average inside a building also depends on user habits. For example, how often rooms are aired and ventilation settings.[54]

Measures that have been performed during renovation on heating, water, ventilation systems, window replacements, insulation improvements or drilling of holes in the base plate, cellar walls or between apartments and which have not been sealed, may often increase radon exposure. Nordic Ecolabelling therefore only accepts a radon measurement before renovation in combination with documentation either to show that the radon concentrations cannot have increased during the renovation process or in combination with short term measures of radon after renovation.

[54] Measurement of radon in housing - description of methods. Swedish Radiation Safety Authority, April 2013.

The radon concentration must be measured during the heating season. Natural ventilation creates negative pressure which draws ground-level air into the building. Natural ventilation is less efficient when there is little difference between the indoor and outdoor temperature. Radon concentrations must also be measured in buildings with mechanical ventilation during the heating season. Short-term measurements are advisory in nature and are not accepted as fulfilment of the requirement. National regulations and guidelines should be followed for measurement methods, number of measurement points, location of meters and so on.

Short term measures (normally 2-4 weeks) are only advisory and are not accepted as verification for compliance.

In 2009, WHO and the Nordic radiation safety authorities published recommendations for radon concentrations in buildings to be below 100 Bq/m3 . Under Danish law, radon concentrations in homes in all new-build projects after 2010 must be below 100 Bq/m3. In existing buildings, simple and cheap improvements should be implemented if radon concentrations are between 100 Bq/m³ and 200 Bq/m³, and more effective improvements should be implemented if the radon concentration exceeds 200 Bq/m³ (BR15). This is the most stringent Nordic legislation and Nordic Ecolabelling is aware that this level will appear very ambitious in some other countries. It is therefore accepted that the countries have different construction and building traditions, and that national laws, practices and levels of ambition also vary.

After the consultation process, Nordic Ecolabelling's requirement was changed from a maximum level of 100 Bq/m^3 to drawing attention to the requirement to comply with each country's highest permitted concentrations of radon for new-builds and in workplaces. These threshold limit values vary between 100 Bq/m³ and 200 Bq/m³ for buildings, and between 100 Bq/m³ and 400 Bq/m3 for workplaces. Levels of radon must be verified continuously through monitoring.

Table 3: The authorities' threshold limit values for radon in new buildings

	Denmark	Norway	Sweden	Finland
Maximum permitted threshold limit values	100 Bq/m^3	200 Bq/m^3	200 Bq/m^3	200 Bq/m^3
Threshold limit values for measures		100 Bq/m^3		

Table 4: Authorities' threshold limit values in existing building and workplaces

	Denmark	Norway	Sweden	Finland
Homes, schools, pre-schools and public buildings	Simple and inexpensive measures if radon concentrations are between 100 Bq/m³ and 200 Bq/m³. More effective measures if radon concentrations are higher than 200 Bq/m³.	Basically the same requirements as for new buildings. 100 Bq/m^3 is the action limit and 200 Bq/m^3 is the maximum allowed concentration.	200 Bq/m^3	400 Bq/m^3
Workplaces	Same as above.	As low radon content as possible, but maximum 200 Bq/m^3. Measures required at 100 Bq/m^3.	0.36 x 10^6 Bq h/m^3 and year, which approximates 200 Bq/m^3 for full-time work.	400 Bq/m^3

O10 Moisture prevention

To minimise the risk of hazardous moisture in Nordic Swan Ecolabelled buildings, a moisture prevention plan is required that at least includes:

a) Choice of materials and techniques that prevent moisture occurrence.

b) Weather protection and other handling of moisture-sensitive materials and building/construction elements at the construction site.

c) Ensuring that the building and relevant materials dry out sufficiently and statement of the time this is estimated to take.

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

e) A check for moisture and damp is performed by calculating or testing for moisture in concrete by drilling test holes, in built-in wood and in levelling compound in accordance with industry standards or equivalent.

f) A person must be appointed to be responsible for each element of the damp-control plan

A competent moisture expert technician* must be appointed at/by the licensee to to monitor/sign the moisture prevention plan and to document adherence to the 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 prevention plan can form part of the Indoor Air Quality Plan, see Requirement O8.

** A competent moisture expert technician must have documented knowledge and experience in construction techniques, have knwoledge of moisture and the consequences in materials and structures. In addition the expert technician must have at least 2 years' experience of moisture prevention or moisture damage assessment work and at least2 years' experience of projects involving the construction, planning and/or management of buildings.*

National industry regulations must be followed and moisture testing must be carried out in accordance with industry guidelines.

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

✉ Statement of moisture expert technician with a description of expertise and experience.

Background

Moisture in buildings increases the risk of respiratory infections and illness such as asthma, bronchitis, chronic bronchitis and respiratory irritation by 50%. The costs associated with increased illness and reduced health are considerable, but society's economic losses from reduced learning and lower productivity are even higher[55]. One third of Sweden's buildings have moisture or mould damage, with problems seen most frequently in small houses. The building elements most often subject to moisture damage are attics, foundations, wet rooms and kitchens. Exposure of building materials to moisture can lead to increased emissions of volatile chemical substances (secondary emissions). 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

[55] 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.

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 a concrete slab is dry enough. Borehole measurements should be performed.

Nordic Ecolabelling sets requirements for the use of methods to prevent damp and moisture in buildings that are renovated. There must be a damp-control plan in place that includes routines and work procedures. The damp-control plan can be included in the air quality plan (IAQ plan) or can form a separate document. The sub-requirements are the same as those in the criteria for Nordic Swan Ecolabelled new-build projects, with the addition that the plan must also include a follow-up of any damp, mould or water damage discovered in the environmental survey/analysis and remediation work that was performed earlier. The follow-up must focus on identification, management and remediation of damage so as to prevent any adverse effect on the indoor environment and air quality.

The requirement for moisture control means that a competent moisture expert technician must be appointed. This person (internal or external) shall have special skills and experience of damp control and it is their role to follow up on the execution of the plan. A person must be appointed to be responsible for each element of the damp-control plan. The role of the damp proofing specialist is to review the damp-control plan and put their signature next to each element in the damp-control plan that has been dealt with by the person appointed. The damp proofing specialist signs a statement that the plan has been implemented. It is sufficient that the organisation has a centrally-located damp-proofing specialist to provide support and verification for all Nordic Swan Ecolabelled renovation projects.

A damp proofing specialist must have documented qualifications, skills and experience of:

- building techniques
- damp and its consequences in materials and structures
- at least two years' experience of moisture prevention or moisture damage assessment work.
- at least two years' experience of projects involving the construction, planning and/or management of buildings

Nordic Ecolabelling does not require diplomas or any type of third-party verification of the qualifications and skills of the competent moisture expert technician. A Certified Moisture Testing Inspector certificate [56] or similar certification is a way of proving adequate expertise.

O11 Ventilation

The ventilation system in the Nordic Swan Ecolabelled renovated building must be inspected to ensure its correct performance before it is used. This inspection must ensure at least that:

a) The function and characteristics of the ventilation system are in compliance with current regulations so that the requirement for minimum flows is met.

b) Maintenance and other instructions are easily accessible.

c) The ventilation system otherwise functions as intended.

d) The ventilation system does not contain pollutants that could spread inside the building. (See items a and b in requirement O8 Indoor Air Quality).

[56] Certified Moisture Testing Inspector is a training course run by the FuktCentrum (Moisture Centre) for moisture control in the construction process, http://www.fuktcentrum.lth.se/kurser/diplomerad-fuktsakkunnig/

In addition:

e) School, pre-school and office buildings must have demand controlled/presence controlled ventilation in all habitable rooms covered by the renovation.

f) Renovated and no renovated parts of the building must nut have a common/shared ventilation system.

This inspection must be carried out on each building that is renovated. For apartment buildings, this can be performed for a representative selection that constitutes at least 10% of the total number of apartments, but always at least one apartment.

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. Other countries can have guidelines that fully or partly cover the requirement,

☒ 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.

☒ A description of the type of demand-controlled ventilation.

☒ Reporting on compliance with national building regulations' minimum requirements for air flows.

☒ Reporting that renovated and non-renovated sections do not have shared ventilation systems.

Background

Efficient ventilation is key to creating a good indoor climate and indoor air. There is a risk that too narrow a focus on tighter and more energy-efficient buildings can have a negative impact on air circulation and ventilation. Energy-saving measures should not be carried out at the expense of the quality of the indoor climate. Nordic Ecolabelling sets a requirement that focuses on an inspection of the ventilation system before it comes into use (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.

In schools and pre-schools, there is an increased risk of poor indoor air quality because there are larger groups of children than the building was originally planned and built to accommodate. Some of the symptoms caused by poor air quality in schools and pre-schools among both pupils and staff are concentration difficulties, headaches, allergies and asthma.

The requirement was inspired by the mandatory ventilation inspection (OVK) which has been a requirement in Swedish building regulations since 1991. Since Nordic Swan Ecolabelling does not control the operational phase, the requirement relates to the first OVK inspection that is performed. Since not all Nordic countries have an equivalent requirement for mandatory ventilation inspections, Nordic Ecolabelling does not require a ventilation inspection to be performed by qualified specialists. In cases where it is a statutory requirement (as in Sweden), the inspection takes place indirectly via the regulations of the Swedish National Board of Housing, Building and Planning which require a qualified specialist to conduct the OVK inspection.

All other Nordic Swan Ecolabelled renovated buildings than housing must also have demand controlled or presence controlled ventilation under this requirement. The reason is that there is considerable variation between presence/absence and between low/high demand in these buildings. In demand-managed ventilation, a room or premises are ventilated as much as is needed, which entails energy optimisation opportunities.

After the consultation process tha requirement on natural ventilation systems is removes, Natural ventialation require no mechanical fans and thus do not use electricity. The addition

of air intake through an open window will provide adequate ventilation. However, there is very little potential for heat recovery and filtration of input air. Natural ventilation systems can also cause draft problems, particularly during the winter.

O12 Measurement of PCB levels in indoor air

In cases where PCBs have been identified and remediated in the building during the environmental analysis/survey or in another stage before or during the Nordic Swan Ecolabelled renovation process, PCBs should be measured in the indoor air after remediation.

The air in the buildings where PCBs have previously (not in conjunction with Nordic Swan Ecolabelling) been decontaminated must also be measured to verify that the requirement has been met.

The PCB content must be below 300 ng PCB/m^3 in the indoor air.

The measurement must be conducted in compliance with "Instructions for measuring PCBs in the indoor climate". See www.pcb-guiden.dk. If othjer testa methods are used the methods must be verified by the Nordic Ecoabelling in advance. For test method requirements, see Appendix 1.

The building envelope must be intact or rebuilt tightly insulated before testing.

The requirement shall also be verified by any bombshelter belonging to the building,

✉ Analysis report showing measured PCB contents in the indoor air expressed as ng PCB/m^3 air.

Background

Indoor air free from hazardous PCBs

Nordic Ecolabelling's requirements must ensure that Nordic Swan Ecolabelled renovated buildings are guaranteed to be free of PCBs that may pose a risk to health and the environment. Nordic Ecolabelling therefore requires a test and measurements to be carried out in cases where PCBs have been identified in the environmental analysis/survey in order to determine whether any PCBs are present in the indoor air. The requirement also applies if PCBs have previously been found in the building before the Nordic Swan Ecolabelled renovation. Measurements must be taken after remediation to show the extent to which PCBs have been removed from the building.

This means that testing of indoor air is not required in the buildings where PCBs have *not* been found in connection with the environmental analysis/survey or have been previously found. However, the building envelope must be intact or rebuilt tightly insulated before samples of the air can be taken for analysis. Nordic Ecolabelling's threshold limit value of 300 ng PCB/m^3 for indoor air is the same as the level set by the Danish Health Authority as guidance when no action is required. If the level of PCBs per cubic meter of indoor air is below 300 nanograms, this is considered an acceptable level where the exposure to PCBs is not expected to pose a significantly increased risk. If the level of PCBs exceeds the threshold limit value stated in the requirement, further action must be taken to trace the source of the PCB and then remove/remediate it. The indoor air must then be tested once again to analyse PCB levels.

The level is likely to be considerably lower if there have never been any PCBs in the building. According to the Danish report "Health Risks of PCB in the Indoor climate in Denmark-Background for setting recommended action levels" published in 2013, the PCB level in these cases is less than 30 ng/m^3 in the indoor air.

PCBs in buildings

PCB is a generic name for a family of more than 200 different toxic and persistent substances: polychlorinated biphenyls. PCBs consist of two benzene rings that may have 1 to 10 chlorine atoms attached to them. See Figure 4. PCBs are persistent organic pollutants (POPs).

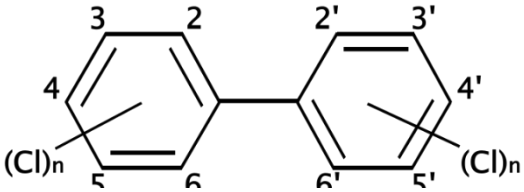


Figure 4: Chemical structure of the PCB molecule.

PCB were used from about 1950 until the mid/late 1970s in construction products (especially sealants, slip-resistant flooring and paints) to provide maximum durability and weather resistance. Although the use of PCBs has been prohibited since the late 70s, PCBs continue to be released into the environment from buildings etc. It is therefore essential to tackle the problem at the source. This means identification of PCBs where they are suspected in buildings, remediation of the contaminated materials and proper management and disposal of PCB waste.

The building sector in Sweden has been voluntarily performing environmental analysis/surveys and PCB remediation in buildings since the late 1990s. PCB remediation in buildings is now regulated by law in the Nordic countries. Yet in spite of this, not all buildings that have been surveyed and, where PCBs have been found, remediated. A Swedish study conducted in 2015 estimates that 70-85% of the affected properties will have been remediated by the end of 2016[57]. Studies of the Danish building stock have shown that approximately 10% of all buildings constructed or renovated between 1950 and 1975 still contain PCBs[58]. The PCB content in the sealants is normally approximately 10% but can be as high as 70%. A recently published survey in the European Helix project, conducted among children (6-10 years) in six European countries, showed that Norwegian children had the highest PBC levels. [59] There is thus a significant risk that not all PCBs in buildings in the Nordic countries have yet been found and removed. This means that the PBC sources are still there.

In Denmark, it has been reported that the indoor air in buildings previously surveyed and remediated still has elevated levels of PCB. Danish PCB advisors became aware in 2012 that PCBs in capacitors and in paint actually cause indoor problems. One example is Gasværksvejen School in Copenhagen where PCB remediation had been undertaken for considerable sums of money, after which the school was declared PCB-free. Air samples taken in conjunction with renovation work showed elevated levels of PCBs. In this case, thought to be caused by PCBs in wall paint. Based on this example, Nordic Ecolabelling is of the opinion that it is always relevant to test the indoor air when PCBs have previously existed at critical

[57] Review of remediation of PBCs in sealants and flooring compounds, Rex Hus & Miljökonsult and Lilliehorn Konsult AB, 2015.
[58] Health Risks of PCB in the Indoor Climate in Denmark – Background for setting recommended action levels, 2013, Danish Health and Medicines Authority.
[59] Natur Press: EU study in six countries: Norwegian children had the highest levels of PBC in their bodies, https://www.naturpress.no/2016/11/01/eu-studie-i-seks-land-norske-barn-hadde-mest-pcb-i-kroppen/

levels in a building. This is a quality control to verify that the indoor air is not polluted by PCBs.[60] [61]

O13 Noise environment in pre-schools and schools

Pre-school buildings, schools and other education facilities must meet the noise environment class B requirement for reverberation and noise environment class C requirement for other assessed parameters. National standards or guidelines from government authorities for building acoustics must be used.

The requirement does not apply to spaces that are only occupied for short periods of time, e.g. corridors, stairwells, entrance halls, photocopying rooms, changing rooms and toilets.

National noise standards: Sweden SS 25268, Norway NS 8175, Finland SFS 5907. For Denmark, see "Vejledning om lydbestemmelser i Bygningsreglementet 2015 (akustisk Indeklima)" av Trafik- og Byggestyrelsen (Guideline on acoustic criteria in Building Regulations 2015 (acoustic indoor climate) by the Danish Transport, Construction and Housing Authority).

For safety reasons, an entire department at a pre-school is viewed as one room for the airborne sound insulation parameter.

✉ Planned noise level stating the noise class achieved for all parameters in the rooms included in the assessment. Calculation of noise level must be performed by an acoustic technician or other professional with equivalent qualifications.

🔑 Noise environment report to verify the results of planned noise class.

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.

Reverberation time is defined as the time it takes for the sound level to decay by 60dB after a sound source has been switched off. Reverberation time in measured in seconds and is a measure of the area of the equivalent sound absorption in the room. Reverberation time increases with the volume of the room and decreases with the area of the equivalent sound absorption.

The national noise environment standards (see italic text in the requirement) state different sound classes with limits, where class C is the level required by law. Noise class B is equivalent to one class better. Nordic Ecolabelling considers it particularly relevant that the reverberation time parameter must meet a good level. It therefore requires class B for reverberation time, while other parameters need to demonstrate the minimum level applied by authorities (class C). The reverberation time is differentiated in the standards and in the Danish guidelines depending on the type of space. A certain reverberation time is allowed in shared learning spaces, while a longer reverberation time is allowed in spaces for sports and music. Shorter times are generally allowed for elementary schools and pre-schools, while a

[60] Article in the Ingeniøren newspaper 20 April 2016. https://ing.dk/artikel/pcb-raadgivere-vi-kan-have-overset-pcb-i-screeninger-frem-til-2012-183656
[61] Article in the Ingeniøren newspaper 20 April 2016. https://ing.dk/artikel/pcb-hjemsoeger-skole-efter-10-mio-kroner-dyr-sanering-183551?utm_source=nyhedsbrev&utm_medium=email&utm_campaign=daglig&cx_newsletter=daglig&cx_newsletterid=182983

slightly longer reverberation time is allowed in colleges and higher education buildings. The requirement only applies only to buildings for pre-schools and educational buildings (elementary schools, high schools and buildings for higher education).

Nordic Ecolabelling has conducted a simple comparison of the maximum allowed reverberation time specified in the national standards and the Danish guidelines and it finds there is very little difference between the limits. It is thus possible and fair to require class B for reverberation time for all Nordic countries.

This requirement must be met in all rooms/spaces where people spend time. This includes classrooms, work rooms, playrooms, common rooms, wet playrooms, ateliers, canteens, rooms for rest and sleep, etc. For safety reasons, an entire department at a pre-school is viewed as one room for the airborne sound insulation parameter. The reason is that staff must also be able to hear the sound from children in other rooms.

We make an exception for the requirement for sound class B explicitly for rooms where people spend only short periods of time, even if requirements for these spaces are milder in the standard that forms the basis for sound classification. Corridors, entrances, photocopying rooms, locker rooms, sports halls and toilets are examples of such spaces.

The requirement is verified with sound environment design documents, in which the intended sound class must be stated in the report/document. To check that the results are consistent with the design, the case officer should request to be allowed to inspect the sound environment report as part of the contractor's internal control process.

7.7 Energy use and climate change

Introduction

Construction is responsible for a large part of total energy and resource consumption. It is estimated that construction operations in Europe account for about 40% of total energy and material consumption[62]. Energy requirements in the Nordic countries are generally relatively strict (cf. EU's directive on nearly zero-energy buildings). However, a large proportion of the building stock, mainly constructed in the last century, does not meet today's standards. A large part of the total building area was created before strict energy standards for buildings were introduced in the building regulations. Taking into account the general life of buildings, renovation of the existing building stock is crucial to achieving greater energy efficiency in Europe. It is expected in Denmark, for example, that a building in 2020 will use about 75% less energy than an equivalent building did in 2006 [63]. There are similar trends throughout the Nordic countries.

Overall, the potential for reducing energy consumption further for new buildings is relatively limited compared with renovation. Figures from Denmark show that even during the last economic boom, annual new builds accounted for just 1% or so of the total building stock. Similarly, demolition of buildings is generally relatively limited. The great majority of buildings standing today will also be in use in 2050.[64] A significant reduction of energy consumption in

[62] The Danish Energy Agency, Sustainable Construction, April 2015.
http://www.ens.dk/sites/ens.dk/files/byggeri/baeredygtigt_byggeri.pdf , 9 December 2015
[63] Ministry of Climate, Energy and Building, May 2014, Strategi for energirenovering af bygninger (Strategy for Energy Renovation of Buildings) page 6
[64] Ministry of Climate, Energy and Building, May 2014, Strategi for energirenovering af bygninger (Strategy for Energy Renovation of Buildings) page 10.

construction can therefore only be achieved through comprehensive energy savings in existing buildings. This is accomplished by making sensible, cost-effective energy improvements when renovation work is performed on the building. There is a great potential to reduce energy consumption quite drastically in such projects. Nordic Ecolabelling's requirements must contribute constructively to this in Nordic Swan Ecolabelled renovation projects in the future. The overall goal is to set ambitious but realistic requirements for handling a wide range of renovation projects.

Summary of energy requirements

Nordic Swan Ecolabelled Renovation shall set ambitious, but realistic requirements for energy efficiency. It is central for Nordic Ecolabelling in this context that there is a high degree of steerability for the overall energy requirements so as to ensure that Nordic Swan Ecolabelled renovations actually achieve good end results in terms of energy needs.

In Nordic Ecolabelling's criteria for Nordic Swan Ecolabelled houses, apartment buildings, pre-schools and schools, mandatory energy requirements are set for the building's energy consumption, control of lighting and energy-efficient white goods. Furthermore, points are awarded additionally for use of local energy sources, individual measurement/visualisation of hot water consumption, calculation of hot-water-circulation loss, white goods in the highest class and energy-efficient sanitary fittings. Generally, the same focus areas are relevant for renovation projects. It is also assessed whether new requirement areas are relevant and whether simplification is possible.

Generally, the following can be concluded in terms of the national regulations for renovation across the Nordic region:

- General repairs and minor maintenance do not have to meet the energy requirements set by authorities for new builds
- In the case of larger-scale renovation work or other alterations to the building (defined more precisely in the national regulations), the requirements for the building elements affected by the renovation work shall apply
- Building elements that are replaced or added must always meet the current energy requirements regardless of profitability
- Can be taken into account for the profitability when renovating. Moreover, there may be technical limitations in the building that do not make compliance with new requirements possible. Constructional factors may, for instance, make mean it is not possible to comply with the provisions in a constructionally responsible way.
- An option has been introduced in all the Nordic countries to comply with the energy regulations by means of an energy framework calculation for the building as a whole.

The authorities therefore require that renovation must meet some well-defined energy requirements. However, the starting point for the buildings and the extent of the renovation are very different. This results in very different solutions. The actual energy requirements are thus not as clear as for new builds.

It is generally considered that Nordic Ecolabelling's energy requirements should be split into two:

1. An energy requirement that relates to the energy efficiency of the building as a whole. An energy framework calculation is considered the best tool for this purpose. Nordic

Ecolabelling is aware of the uncertainty in the use of calculated values, but believes this uncertainty can be handled if a relatively strict requirements level is set.

2. Requirements for specific areas that are significant in the use phase, such as white goods and lighting. No requirements are set in this context for electrical appliances and installations, such as vending machines, water coolers, escalators, warm air hand dryers and similar appliances. It is assessed that these constitute a limited share of energy needs, and that there are no harmonised systems to establish reasonable requirements levels.

O14 The energy use of the building after renovation

After renovation, the energy use of the building must at least comply with the following:

Denmark: Energy use equivalent to 5% better then Renovation Class 2.

Sweden: Energy use equivalent to maximum permitted in accordance with the BBR 25 for new buildings.

Norway: Energy use equivalent to maximum permitted in accordance with the TEK 17 for new buildings.

Finland: Energy use equivalent to maximum 80% of the Ministry of the Environment's regulation (4/2013) on improving the energy efficiency of buildings in conjunction with repair and modification works, for the building category in question.

Locally produced renewable energy: In the Nordic countries, where locally produced renewable energy is included in the energy calculation, electricity produced by local renewable energy sources can at most lower input energy needs by 25 kWh/m² a year.

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

Exemptions or reliefs: Any exemptions or reliefs that can be found from the energy requirements in the building regulations of the different countries may not be used. This applies, for example, to special rules for second homes, timber-frame houses, temporary buildings or buildings which, due to their size, are exempted from energy requirements.

The energy calculation must be performed in accordance with:

- BE18 or equivalent in Denmark.
- BBR, BEN and National practice in the sector for Sweden, see Appendix 14.
- NS 3031 or with a programme validated in accordance with the NS EN 15265 standard for Norway.
- The Ministry of the Environment's regulation on the energy performance of buildings or the equivalent in Finland.

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

✉ Overview of the key energy initiatives that must be undertaken in the renovation process.

✉ Planned energy calculation for the renovated building. 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 calculation).

Background

It is crucial that Nordic Ecolabelling can vouch for the quality of the finished renovated building, since the labelling of a renovation project relates to the end product. To ensure a

high degree of steerability for the finished building, Nordic Ecolabelling's key energy requirements must relate to the energy demand of the finished building. There should thus be an absolute requirement for energy efficiency and not a relative improvement that all renovations must achieve. It is considered, in this context, that alternative solutions will either be too rigid or have too little steerability. Examples could be a requirement expressed as a percentage of the national legal requirements (e.g. component requirements (U-values)) or a requirement expressed in relation to the actual usage of the building (measured values). In the latter case, there may be a considerable difference between occupant behaviour and nor it is possible to plan according to final measured values in a finished renovated building.

By relating the requirement to the general legal requirements for energy needs in the building regulations, different types of buildings (e.g. offices and housing) have different requirements for energy needs in the regulations.

Generally, the energy requirement in the criteria for renovation follows the same principles as the criteria for Nordic Swan Ecolabelled houses, apartment buildings, pre-schools and schools:

- The requirement is defined relative to the current building regulations in each Nordic country.
- The requirements level in each country is differentiated so as to achieve greater flexibility in relation to national adjustments and changes in regulatory requirements. In addition, a potential opportunity for greater improvement in one country can be used even though a corresponding potential does not exist in all the other Nordic countries. Each country's requirement level is established after dialogue with national authorities and the construction industry.
- When a country adjusts its building regulations as it heads towards nearly zero energy, Nordic Ecolabelling assesses the significance of the changes to the energy requirement for the renovation and adapts any requirement level, where this is considered necessary. If significant adjustments are made to the energy rating class requirement, this will result in a national hearing.
- The requirement level for energy efficiency labelling applies generally and for all buildings that are Nordic Swan Ecolabelled. Exemptions or simplifications that may be found in the different countries building regulations cannot be exploited. This applies, for example, to special rules for second homes, greenhouses, temporary buildings, timber-built houses or buildings that are exempt because of their size.

The established level in Norway and Sweden corresponds to the legislation level for new builds (TEK17 and BBR25). For Finland, on the other hand, the requirement correponds to maximum 80 percent of the legislation level for energy efficiency in bulidings in conjunction with repair and modification works. Since Nordic Ecolabelling only accepts a calculation on the building as a whole, this will in some cases be a tightening relative to a general compliance with the individual component requirements of the regulations. This level also approximates the level in B1 in the comprehensive criteria for *EU GPP Criteria for Office Building Design, Construction and Management*[65].

[65] http://ec.europa.eu/environment/gpp/pdf/swd_2016_180.pdf, visited 14 June 2016

The requirements in Denmark for new builds (energy efficiency rating A2015) are difficult to achieve for renovations, since the phasing in of the nearly zero energy requirements are fully implemented in the legislation. The requirement for Nordic Swan Ecolabelled renovation in Denmark is instead defined to a level corresponding to the Danish voluntary level renovation class 1 in BR15. In a dialogue with Nordic Ecolabelling, the Danish Transport, Construction and Housing Authority says that the level for renovation class 2 is set roughly where you expect most buildings to be improved if you carry out a thorough renovation and update the structures to the requirements of BR15. Renovation class 1 should be regarded as a low energy class for existing buildings.[66]

These energy classes are voluntary and often not used. Therefore, only very few Danish experiences can be judged from, although it is generally accepted that both energy classes are very ambitious. This is perhaps an important reason why the voluntary energy classes are not widely used in the industry. The dialogue we have had in connection with 3 current applications has all shown that it is completely unrealistic get close to reach energy class 1 in practice. It has therefore been decided to reduce requirements from renovation class 1 to 5% better than energy class 2.

Energy efficiency of the building envelope and technology is important in order to achieve a more energy-efficient building stock. Nordic Ecolabelling therefore does not want a building to be rewarded just for an improvement such as setting up solar panels. This risks compromising, for example, the quality of the building envelope in those countries where the produced energy is included in the calculation of energy. Locally-produced energy should be rewarded, but must be proportionate to the energy efficiency of the building. In countries where locally produced energy is included directly in the energy calculation (Denmark, Finland and Sweden), it is therefore possible to include at most electricity produced by renewable energy plants equivalent to a reduction of the need for energy input of 25 kWh/m² per year in the energy framework.

This corresponds to the level in the Danish building regulations (BR15) and is considered to be reasonable in all countries. It has been decided not to propose a tightening compared with the Danish requirement level because Nordic Ecolabelling also wishes to be able to reward the use and production of renewable energy. It is considered that this requirement level can primarily be significant with regard to single-family houses and terraced houses. It is usually difficult to achieve this level with apartment buildings if the system is mounted on the building.

Requirements for energy calculation

The requirement is verified with an energy calculation. As in the criteria for Nordic Swan Ecolabelled houses, apartment buildings, pre-schools and schools, reference is made to national standards, industry practices and calculation schemes. National regulations for demarcation of boundaries (e.g. a house with a garage), input data, conversion factors and so on must be used.

If energy needs vary in different parts of a renovation project (e.g. an end terraced house and a house in the middle), the license applicant must demonstrate that all parts of the project comply with the energy requirement. In this context, it is acceptable that a worst-case calculation is performed, if there is also an explanation provided of why this part of the

[66] Written dialogue with Niels Bruus Varming, the Danish Transport, Construction and Housing Authority, 27 October 2016.

construction project is expected to have the greatest energy needs. However, Nordic Ecolabelling may always ask to see calculations for all units, where this is considered necessary.

In the case of apartment buildings, the entire building is assessed as a whole. There may well also be apartments which, not viewed in isolation, meet the mandatory requirements for energy needs, provided that the building as a whole does so.

O15 Lighting

Indoor and outdoor lighting in a Nordic Swan Ecolabelled renovated building must be demand responsive/have demand control in accordance with the specifications in the tables below.

Outdoor lighting must meet the requirement in the table below. This requirement applies regardless of whether the outdoor lighting has been replaced or been left intact during renovation.

Type of building:	Outdoor lighting
All types of buildings	Demand-responsive lighting on the building or in direct connection to the building. Demand-responsive lighting in garage, courtyard and roads/paths belonging to the building. The energy efficiency of the lighting should be equivalent to LED technology or better.
Execptions from requirement	Signs and outdoor lighting on private balconies, patios, terraces, etc.

Indoor lighting inside the building must meet the requirements in the table below when indoor lighting has been changed or installed during the renovation process.

Type of building:	Indoor lighting
Apartment buildings	Demand-responsive lighting in common spaces (entrances, stairwells, wash rooms, storage rooms, etc.).
Single-family homes	No requirement.
Buildings for pre-schools and schools	All indoor lighting must be demand-responsive.
Office space	All indoor lighting must be demand-responsive.
Execptions from requirement	Workplace lighting, worktop lighting and lighting that is fitted into technical installations and equipment. Lighting in cellular offices/offices with private rooms is exempt from the requirement. Lighting in cellular offices must instead be turned on/off with a light switch in the office room.

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

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

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

☒ Reporting light sources for outdoor lighting.

Background

Automatic demand control entails automatic light adjustment to match lighting to the requirements. Major technological advances are being made in the area of lighting, both in relation to the light sources and the systems that control the lighting. Nordic Ecolabelling wishes to ensure that the energy consumption of lighting is limited so that energy is not used unnecessarily.

In the technical background report for the EU's GPP criteria for indoor lighting,[67] it states that energy savings of up to 30–40% are possible when lighting control is installed. The control of lighting is considered to be a good investment. Typical payback time is 2 to 4 years when lighting control is installed in existing systems[68]. Furthermore, it is considered possible to achieve considerable environmental benefits for a reasonable investment when the building is to be renovated anyway. Support for this was expressed at the national workshops held by Nordic Ecolabelling during the criteria development phase. An exception is made, however, for smaller office spaces where it is difficult for presence detection lighting to pay for itself, cf Nordic Ecolabelling's dialogue with the industry.

In the case of outdoor lighting, a mandatory requirement for all light sources related to the building, including covered car parks and façade illumination, is considered to be relevant. Signage is exempted because a requirement is not considered to be consistent with the purpose of the signage and that it represents a relatively small proportion of the energy consumption.

The demand for indoor lighting for apartments, single-family buildings, schools and pre-schools complies with the requirements for Nordic Swan Ecolabelled new builds. Offices comply with the same requirements as for schools and pre-schools, since it is considered that control of lighting will be relatively easy to implement in most places. However, requirements are only set for the installations and areas that are to be modified in the renovation project.

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.

Lighting in lifts, emergency lighting and any flight marking light för airplanes does not have to be demand controlled.

Different types of demand control

- Motion sensor lighting automatically turns on when sensors detect someone entering the room. The lighting turns off some time after movement was last registered. It is ideal for use in office rooms, storage areas, toilets and cloakrooms.

[67] Green Public Procurement, Indoor Lighting, Technical Background Report, Report for the European Commission – DG-Environment by BRE, 2011. Owner, Editor: European Commission, DG Environment-C1, BU 9, 1160 Brussels.
[68] Slater A, (1987) 'Lighting controls: an essential element of energy efficiency' Building Research Establishment Information Paper IP5/87. Garston, CRC.

- Absence detection lighting has to be manually switched on but automatically turns off after a set period when no movement is detected. It is ideal for use in office rooms and classrooms.
- Presence detection with dimming. Lighting can be dimmed to save energy when rooms that are not always occupied are empty.
  This improves the feeling of security compared with if the space had been in complete darkness. It is ideal in corridors, stairwells and indoor car parks.
- Absence detection with dimming is a variation on presence detection with dimming. The lighting is manually adjusted to full strength. When the room is empty, the lighting automatically dims.
- Daylight sensor lighting ensures that the brightness in the room is always at the same level by balancing natural daylight/ambient daylight and lighting fixtures/outdoor lighting.
- A combination of daylight sensor lighting and presence or absence detection lighting.

O16 Energy-efficient white goods

New white goods that are installed must meet at least the energy requirements in the tables below.

White goods not listed in any of the tables below are exempt from the requirement. Product types that are not subject to the EU's Energy Labelling Directive (2010/30/EU) are exempt from the requirement.

Product type/category White goods consumer (Energy labelling regulation in brackets)	Lowest permitted energy class
Washing machines (1061/2010/EU)	A++
Fridges and freezers* (1060/2009/EU) for household use	
Tumble dryers (392/2012/EU)	
Dishwashers (1059/2010/EU)	A+
Ovens (65/2014/EU)	A
Combined washing machines and tumble dryers (combi-products) (96/60/EU)	

** At least energy class A is required for wine coolers. For fridges in prefabricated mini kitchens/kitchenettes the requirement of minimum energy class A+ applies.*

Product type/category White goods commercial kitchens/professional use	Requirement
Refrigerators and freezers and combined refrigerator-freezers (1094/2015/EU) for professional use	Lowest energy efficiency class B (refrigerator) and C (freezer and combined cabinet).
Dishwashers	Pre-rinsing with recirculating water or water reused from the dishwasher. Alternatively other type of techology with similar water saving efficiency
Cookers	The cooker should be an induction type stove or other type of technology with similar energy efficiency.
Boiling pans	At least 90% energy efficiency according to EFCEM's Energy Efficiency Standard for boiling pans or equivalent.

✉ For consumer product: report of all new white goods stating the type of white good and energy marking/energy efficiency class in the product sheet, technical manual or similar document.

☒ For commercial kitchen products: Report of all new white goods stating the type of white good and product sheet, technical manual or similar document showing fulfilment of the requirement.

☒ For boiling pans, test results from tests performed in accordance with EFCEM's Energy Efficiency Standard for boiling pans or equivalent.

Background

White goods for consumers

The requirement corresponds to the mandatory level for Nordic Swan Ecolabelled new builds and is considered reasonable for renovation when new white goods are installed. Criteria generation 3 was approved in March 2016 and is thus relatively up-to-date. In this context, there are no technical challenges or other special differences to take into account. For more details, see the background section in requirement O6 in the criteria for housing, apartments, pre-schools and schools.

On September 12, 2018, the requirement was supplemented with so-called mini kitchen / pentry / trinite kitchen, which are sometimes included in mini-apartments, communal areas or rooms in the retirement homes. The most energy-efficient refrigerators in such factory-made mini kitchens currently on the market are energy class A + and this will be the level required by Nordic Ecolabelling.

Furthermore, it was decided to remove the product category kitchen fans from the requirement. The reason is that the current energy labeling directive for kitchen fans will lead to a worse or significantly poorer energy balance for the building. In order to reach Class A or B for power driven fans, manufacturers have significantly increased the flow and building energy consumption increases as more heated air is sucked out.

White goods for commercial kitchens

A report from the Swedish Belok client group, which is an innovation cluster within the Swedish Energy Agency, shows that the commercial kitchen's energy efficiency potential has often passed below the radar of both the property owner and the client.[69] In the report, the Property Administration Office in Gothenburg says that the kitchen in a newly-built low-energy pre-school can use as much energy as the entire property. Commercial kitchen suppliers say that they are seldom asked about their most energy-efficient equipment. This all goes to show that there is considerable energy-saving potential.

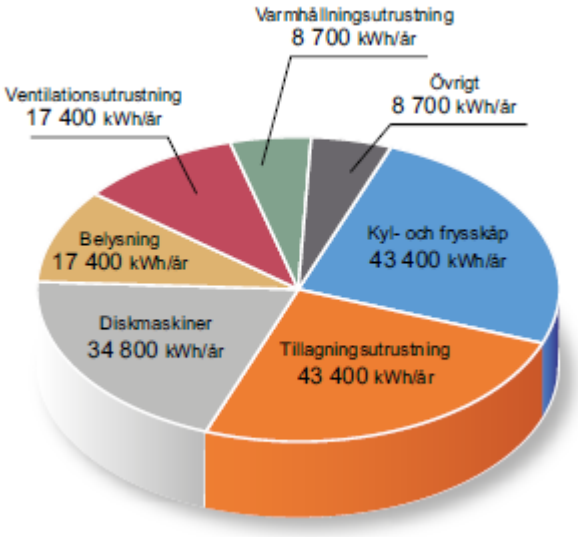


Figure 5: How the energy consumption in a normal commercial kitchen is divided between various functions. Source: "Millions can be saved on energy-efficient commercial kitchens. Shorter route from oven to mouth." BELOK, August 2015.

Cooking equipment (ovens, stoves and boiling pans), freezers, fridges and dishwashers are the highest energy users in the kitchen. See Figure 5. Nordic Ecolabelling sets requirements for fridges, freezers, dishwasher, boiling pans and cookers. As far as ovens are concerned, it is the use of the oven that has the greatest impact on energy consumption, which is why no requirements are set for ovens.

Professional refrigerators, freezers and combined fridge-freezers will also be subject to energy rating label requirements from 1 July 2016. The energy rating label scale is A^{+++} to G and at present energy efficiency class A is the best/most energy efficient class. The requirements for energy efficiency will gradually become more stringent after the introduction of the regulation. The first change will occur on 1 January 2018 and then again 12 months later. Since the energy efficiency rating of refrigerators and freezers for professional use was introduced so recently, there are no studies to show the percentage of products in each energy efficiency class in the Nordic market. Dialogues with manufacturers have shown that it is much more difficult to produce an energy-efficient freezer than it is to reduce a refrigerator's energy consumption. For this reason, the requirement is differentiated between these two products.

Nordic Ecolabelling has made the overall assessment that it is reasonable to require energy class B for refrigerators and energy class C for freezers in this generation of the criteria. The energy rating label regulation only covers refrigerators and freezers with built-in refrigeration units. This means that refrigerators and freezers with central cooling systems are not covered and are thus not subject to Nordic Ecolabelling's requirements either.

Induction technology provides cookers with superior energy efficiency. While an electric cooker is 50-75% efficient, an induction cooker is about 90% efficient. The actual induction zone doesn't become hot. Only the saucepan heats up when the electromagnetic field turns into heat in the base of the pan.

[69] Millions can be saved on energy-efficient commercial kitchens. Shorter route from oven to mouth. BELOK, August 2015.

Boiling pans are large-capacity cooking vessels that stand on the floor. There is a European industry standard to specify the energy consumption of boiling pans (EFCEM Energy Efficiency Standard for boiling pans). Nordic Ecolabelling requires a boiling pan to be at least 90% energy efficient in accordance with this industry standard. The higher the rating, the more efficient the product.

Nordic Ecolabelling does not set any performance requirements for cookers or dishwashers as there are no recognised standards for determining and assessing the energy performance of these products. On the other hand, we sets requirements for technology that is energy efficient (induction technology, pre-rinsing with recirculation system).

7.8 Sustainable products and materials

Introduction

This chapter consists of four sections. The first section covers requirements for a product list and a logbook for the building. The next section contains requirements for the chemical products that are used in the renovation of a Nordic Swan Ecolabelled building. The third section covers requirements for construction products, construction goods and construction materials. The fourth and final section contains the requirements for timber and bamboo.

The requirements for chemical products, construction products and construction supplies is fully harmonised with corresponding requirements in Nordic Swan Ecolabelled newly-constructed buildings, criteria generation 3. This means that a chemical product or a building product that is approved for use in a Nordic Swan Ecolabelled newly-constructed building is also approved for use in a Nordic Swan Ecolabelled renovation.

Nordic Ecolabelling's Construction Products Portal is the digital management tool for the review and approval of chemical products, construction products, building products and materials. The producer declares its product in the Portal and electronically fills in the appendices required to validate content according to Nordic Ecolabelling's requirements. Nordic Ecolabelling then reviews the product and its declaration. If the product meets Nordic Ecolabelling's requirements and everything is in order, the product is entered onto an approved list and is made visible for all license applicants in the Nordic region.

The requirements must be met for all buildings and building elements covered by the Nordic Swan Ecolabelled renovation. This obviously is the main building(s), plus any supplementary buildings such as a garage, storage room, decking, outdoor furniture, outdoor play equipment, etc. that are part of the Nordic Swan Ecolabelled renovation project and which are constructed, renovated or marketed with the Nordic Swan Ecolabelled renovated building.

The requirements in this chapter apply to all products and materials that are *newly manufactured* and that are added to the renovated building and any supplementary buildings. They do not apply to existing products and materials that are left or moved inside the renovated building, unless the requirement states otherwise. Requirement O30 is a requirement specifically for re-used products.

In general, the documentation requirement does not apply for ecolabelled products (Nordic Swan Ecolabel and EU Ecolabel). Ecolabelled products automatically meet the requirements and only need to be included in the list of materials/logbook with the license number, product name and manufacturer's name.

Triviality limit

The requirements in this chapter do not need to be met for the products that are used to a very limited extent, such as:

- Touch-up paint for 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.
- Products and materials for minor repairs of existing surfaces or other construction components in the building, e.g. repairs to floor coverings, acoustic ceilings or a damaged plaster wall. A triviality limit is set to a maximum of 5% of the total building area.
- Building fixtures, e.g. locks, handles, hole plates, hinges.
- Nails, screws, nuts, bolts, washers and similar fasteners.
- Plastic products such as palletising trays, plastic spacers, ground spacers, bends, sleeves, mounting boxes, roof boxes, inflow and outflow pipes for white goods, and so on.

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

7.8.1 Product overview

O17 Product list and logbook of the building

1. There must be a list of the construction products, construction goods, materials and chemical products used in the renovation.
   The product list must include the type of product/product category showing the area of use, product name and name of manufacturers plus supplier if other than the manufacturer.
   The product list must also include the products that Nordic Ecolabelling does not set requirements for: the exception is what falls in the triviality limit.
2. The renovated building must have a digital logbook comprising the products ans materials in item 1 above. The logbook shall, beyond what is stated in item 1, also state:
   - Main constituent elements (applies to construction products, construction goods and materials but not chemical products).
   - Approximate location in the building.
3. The logbook must also contain information about any unwanted substances or materials left in place which have been identified in the environmental analysis/survey, how they have been encapsulated or otherwise rendered harmless, and their location in the building.

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

✉ A product list in accordance with 1 and a digital logbook in accordance with 2 and 3. Alternatively, an integrated digital document that covers all three items.

Background

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. A logbook provides a means of organising and saving data about the construction products and materials in a building. A logbook provides a good basis of information and increases the traceability of products used and where they are located, including hazardous substances. This helps to identify hazardous compounds before renovation and demolition, so that building and demolition waste can be sorted, reused, recovered or recycled in a simpler and more correct way. A logbook also makes it easier to correctly manage hazardous waste from conversion and demolition work and to deal with any future need for stocktaking and remediation of hazardous substances.

The requirement comprises two parts. The first part, *the product list*, is primarily linked to the approval of Nordic Ecolabelling's requirements for chemical products and building products and needs to be created relatively early on during the project design stage. The product list is created in Nordic Ecolabelling's building product portal.

The second part, which covers requirements for the building's *logbook*, is not met until all work on the building has been completed. We have therefore created a two-part requirement, but the sub-requirements can be seen as a whole and handled together.

To ensure that the logbook serves all of the aforementioned purposes, it must include the names of products, a product description that reports its content and where it is located in the building. The location should be stated on a uniform basis, like other building-related documentation and drawings.

The requirement is basically identical with corresponding requirements in new Nordic Swan Ecolabelled buildings. However, the logbook must also contain information about construction components and building materials that have not been removed/remediated, but have been left where they are in the building. The reason is that the substance or material is often embedded and there is therefore no risk of spread or exposure.

7.8.2 Chemical products

Introduction

The exposure is no longer mainly in the external environment, nor in the working - environment, but in the indoor environment. And this is where the most vulnerable population group – children - spend most of the day. Nordic Ecolabelling places the utmost importance on compliance with the most stringent environmental and health requirements by the chemical products in a Nordic Swan Ecolabelled renovated building. In the criteria, the term chemical products is used to describe the same chemical products that are used to renovate a building.

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

Goods, which form, surface or design is of significance for the function of the good, rather than its chemical composition, is not chemical products. Examples of goods are concrete elements, construction boards and plastic materials. The Nordic Swan Ecolabel requirements on goods are in chapter 7.8.3.

Requirements must be set for chemical products used during the renovation process, but not for the chemical substances already found in the building. The requirements in Chapter 7.4.2 Environmental analysis/survey and remediation apply for these.

The requirements for chemical products cover what is incorporated. The requirements do not cover, for example, fuels for construction machinery, marking paint, marking tape that is removed, wood used in casting moulds[70], cable lubricant or cleaning agents. Nor do they include sealing foam, formwork oil, etc. used to seal or lubricate casting moulds.

Nordic Ecolabelling's requirements for chemical products are in harmony with the Nordic chemical and environmental authorities' phase-out substances, but Nordic Ecolabelling does not set any absolute requirements here. Some of the criteria for risk reduction substances are also included. Nordic Ecolabelling's 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. Unlike Nordic Ecolabelling, REACH has no separate regulations for nanomaterials.

Definition of constituent substances and impurities

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

Impurities are residues from production, including production of raw materials, that are found in the final chemical product in concentrations below 100 ppm (0.01% by weight, 100 mg/kg), but not substances that have been added to a raw material or the product actively and for a particular purpose, irrespective of quantity.

Examples of impurities are residues of reagents, residues of monomers, catalysts, by-products, purification chemicals and detergents for production equipment. Background levels of environmental impurities and carry-over from production lines are also classified as impurities.

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

The chemicals requirements are comprehensive. Exemptions for certain situations or certain classifications are therefore sometimes necessary. These exemptions must be specified in the requirement.

Built on site versus prefabricated

Just as in the criteria for new buildings, the basic rule is that when something that would normally be built on site is installed as prefabricated instead, the chemical and material requirements that apply are the same as the requirements for on-site construction. Since the degree of prefabrication may change over time and also vary between the Nordic countries, this list of examples can serve as a guide to what is subject to our requirements of chemical products, whether they are prefabricated or not:

- Bathrooms/bathroom modules.

[70] See requirement O27 for exceptions.

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

Windows, doors and pre-painted interiors, for example in kitchens and bathrooms, are always purchased prefabricated and are therefore not subject to the requirements for chemical products. On the other hand, there are requirements of these building products and building materials in section 7.8.3.

Pipes and wires that are incorporated into prefabricated elements, for example they are cast in concrete elements, are also covered by the requirements in Chapter 7.

The following applies to two-component products with regard to prefabrication:

- the sub-components meet the chemicals requirements, or
- the hardened product complies with the chemicals requirements if it can be documented that protective equipment is used when the sub-components are mixed, and that the ready-mixed product is applied in a closed, well-ventilated system in compliance with national regulations

At the construction site, adequate safety cannot be guaranteed with a closed system, which is why the requirements must always be met by the sub-components. There is one exemption from this basic rule which concerns service areas where two component products, not fulfilling the chemical requirements, can be used under the following circumstances:

- The service are is any of the following; fan rooms, substations, lift shafts, machine rooms, electricity centers and other areas to which unauthorized persons do not have access.
- Safety equipment is used when the sub-components are mixed.
- The hardened product is applied during well ventilation fulfilling national legislation on occupational safety and health.
- The use of safe equipment shall be documented, for example by photos.

The following applies to concrete and cement

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

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

For dry mortal, all chemical requirements in chapter 7.8.2 must be fulfilled since dry mortal is a chemical product as it contains unreacted chemical substances.

O18 Classification of chemical products

Chemical products used in Nordic Swan Ecolabelled renovations must not be classified according to the table below. The product must be classified in line with current legislation (CLP Regulation (EC) No 1272/2008 or later).

Table. Prohibited classifications of chemical products

Classification under CLP Regulation 1272/2008	
Hazard class and category	**Hazard phrases**
Toxic to aquatic organisms Category acute 1 Chronic 1-2	H400*) **), H410, H411***)
Hazardous to the ozone layer Hazardous to public health	H420
Acute toxicity Categories 1– 3	H300, H310, H330, H301, H311, H331
Specific target organ toxicity (STOT) with single and repeated exposure STOT SE category 1 STOT RE category 1	H370, H371, H372
Carcinogenic Carc 1A/1B/2	H350, H351
Mutagenic Muta. 1A/B/2	H340, H341
Reprotoxicity Repr 1A/1B/2	H360, H361, H362

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

**) Chemical anchors classified as H400 may be used when installing reinforcing bars in concrete structures in apartment buildings.*

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

****) The classification H411 is accepted for naphtha based primers for use in waterproofing assembly (flat roofs, green roofs, courtyards, terraces and similar applications). The classification H411 is also accepted for primers for expansion joints on concrete, concrete-metal and metal-metal outwardly/outside on the building and for roof adhesive/adhesive for waterproofing outwardly.*

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

✉ Safety data sheet in accordance with the 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. A requirement is therefore set for products classified as environmentally hazardous, highly toxic, toxic, carcinogenic, mutagenic or reprotoxic not to be used in Nordic Swan Ecolabelled renovations.

This requirement includes the classification of the actual chemical product. The individual constituent substances in the product are governed by subsequent requirements. The

requirement is verified by completing the attestation and submitting the current safety datasheet in the relevant country's language for the chemical products to be used.

The same exemptions found in the criteria for Nordic Swan Ecolabelled new-builds concerning chemical anchors are also found in these criteria. The same is valid for acrylic flooring, where there is an exemption for the classification of the sub-components. The exemption does not apply to all rooms. It only applies where it is really necessary, which is in commercial kitchens. Preparation kitchens with a hot-water supply are subject to the most stringent requirements in terms of anti-slip flooring, resistance to moisture, hygiene, etc. In commercial kitchens, compound flooring is usually the only surface that meets the requirements for functionality.

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

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

O19 CMR substances

Chemical substances classified as carcinogenic (Carc), mutagenic (Mut) or reprotoxic (Repr.) according to the CLP Regulation 1272/2008 or later may not be constituent in chemical products used in Nordic Swan Ecolabelled renovations. See the table below.

Table. Non-approved classifications of constituent substances in chemical products

Classification under CLP Regulation 1272/2008	
Hazard class and category	**Hazard phrases**
Carcinogenic Carc. 1A/1B/2	H350, H351
Mutagenic Muta. 1A/1B/2	H340, H341
Reprotoxic Repr. 1A/1B/2	H360, H361, H362

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

Exemptions are made for:

- Tin organic compounds that are governed by O24.
- Free formaldehyde (from formaldehyde not intentionally added or from formaldehyde-releasing substances) in the end-product ≤ 200 ppm (0.02% by weight).

- Desiccant driers classified as reprotoxic category 2 which is found in paint with alkyd-based binders are permitted up to and including 30 June 2017 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.
- D4 (Octamethyl cyclotetrasiloxane, CAS no. 556-67-2) as a residue from the production of silicon polymers ≤ 1000 ppm.
- Vinyl acetate (CAS no. 108-05-4) as a residual monomer in polymers ≤ 1,000 ppm.
- Glyoxal (CAS-no 107-22-2) ≤ 100 ppm (0.01% by weight) in the final product if the pH-value in the final product is higher than pH 8.
- Mineral oil in naphtha-based primers in waterproofing assembly (flat roofs, green roofs, courtyards, terraces and similar applications), in primers for expansion joints on concrete, concrete-metal and metal-metal outwardly/outside on the building and as roof adhesive/adhesive for waterproofing outwardly. The exemption applies provided that the mineral oil has been tested with the IP 346 method (Determination of polycyclic aromatics in petroleum fractions) showing that the mineral oil contains less than 3% DMSO extract, alternatively that it is shown that the benzene content is lower than 0,1%. This must be verified by the safety data sheet.
- TiO_2 which is added in powder form during raw material production.
- The dispersant trimethylolpropane (CAS #: 77-99-6) up to 1% by weight in pigment. Time-limited exception that applies until 2022-05-31.

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

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

Background

Substances that may cause cancer, change genetic material or interfere with reproduction (known as CMR substances in categories 1A and 1B) are prioritised substances within the EU's chemicallegislation, 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, chemical building products and pressure-treated timber.

Nordic Ecolabelling requires 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 the previous requirement concerning chemical product classification. Another consequence is that small amounts of CMR substances may occur as residues from production which do not lead to a classification of the actual product. And when Nordic Ecolabelling goes beyond the classification of the end product, exemption from the prohibition may become necessary.

Exemption from the prohibition of CMR substances

The exemptions from the CMR requirement in the criteria for Nordic Swan Ecolabelled new buildings (O17) are also included in the criteria for Nordic Swan Ecolabelled renovations.

Grinding and blasting are work steps that dust at the construction site. Dusting work is regulated in work environment regulations. In the case of grinding of eg paint where titanium dioxide (TiO2) has been added during production, TiO2 does not release into its free form. It is TiO2 in its free form that gives rise to classification that is suspected to cause cancer when inhaled.

O20 Preservatives in indoor paints and varnishes

The preservative content of indoor paints and varnishes used in the renovation work are limited according to the tables below.

The requirement on classification of the chemical product (O18) and other chemical requirements for constituent substances must also be met for indoor paints and varnishes.

Table. Concentration limits for total amounts of preservatives.

Total preservatives	Concentration limit
Paints, varnishes, base paints with tinting paste, etc, intended for indoor use	700 ppm (0.070% by weight)
Wet room piant specifically	2500 ppm (0.25% by weight)

Table. Special restrictions for isothiazolinone compounds

Type of preservatives	Concentration limit
Total amounts of isothiazolinones	500 ppm (0.0500% by weight)
2-Methyl-2H-Isothiazol-3-one (MIT*) (CAS no.: 2682-20-4)	100 ppm (0.0100% by weight)
5-chloro-2-methyl-2H-isothiazolin-3-one/2-methyl-2H-isothiazolin-3-one (CMIT/MIT in a 3:1 ratio) (CAS no.: 55965-84-9)	15 ppm (0.0015% by weight)

The term preservative refers to both in-can and dry-paint film preservatives.

For tinting systems, a worst-case calculation is made for the colour with the most tinting paste in the base paint containing the most preservatives and isothiazolinone compounds.

Note that 2,2'-dithio-di-N-methylbenzamide (DTBMA) must be included in the total amount of isothiazolinones.

* *The abbreviation MI can also be used.*

☒ Declaration from the manufacturer of indoor paints and varnishes, in accordance with Appendix 7.

☒ If preservatives are present, a calculation is required to clearly show compliance with the threshold limit values.

O21 Preservatives in other chemical products for indoor use

The preservative content of other chemical products for indoor use that are used in the renovation work is limited according to the tables below. There are no special requirements for preservatives for chemical products for outdoor use.

The requirement for product classification (O18) and other chemical requirements for constituent substances must also be met.

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

Preservatives	Concentration limit
Total amounts of isothiazolinones*	500 ppm (0.0500% by weight)
5-chloro-2-methyl-2H-isothiazolin-3-one/2-methyl-2H-isothiazolin-3-one (CMIT/MIT in a 3:1 ratio) (CAS no.: 55965-84-9)	15 ppm (0.0015% by weight)
Iodopropynyl butylcarbamate (IPBC) (CAS no.: 55406-53-6)	2000 ppm (0.2% by weight)
Bronopol (CAS no.: 52-51-7)	500 ppm

**Note that 2,2'-dithio-di-N-methylbenzamide (DTBMA) must be included in the total amount of isothiazolinones.*

☒ Declaration from the manufacturer of a chemical product for indoor use, in accordance with Appendix 7.

☒ If preservatives are present, a calculation is required to clearly show compliance with the threshold limit values.

Background

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. Preservatives are also added to some products as film preservatives i.e. to protect the final film against algal and fungal attack. This applies to wet room paint, for example. For this reason, there is a specific threshold limit value for wet room paint.

The preservative bronopol is frequently used in water-based paints and glues which is why bronopol is permitted up to 0.05% by weight.

O22 Other substances excluded from use in chemical products

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

- Substances on the EU Candidate List.*
- Substances evaluated by the EU to be PBT (persistent, bioaccumulative and toxic) or vPvB substances (very persistent and very bioaccumulative), in accordance with the criteria in Appendix XIII of REACH and substances that have not yet been evaluated but which meet these criteria.
- Substances considered to be potential endocrine disruptors in category 1 or 2 on the EU's priority list of substances that are to be investigated further for endocrine disruptive effects.**

In addition, the following substances and substance groups may not be included. There may be overlap between the substances listed below and the substances or groups of substances listed above.

- Short-chain chlorinated paraffins (C10–13) and medium chain chlorinated paraffins (C14–C17).
- Perfluorinated and polyfluorinated alkylated substances (PFAs).
- Alkylphenol ethoxylates (APEO) and other alkylphenol derivatives (substances that release alkylphenols on degradation).
- Brominated flame retardants.
- Phthalates.***
- Bisphenol A, bisphenol S and bisphenol F.

- The heavy metals lead, cadmium, arsenic, chromium (VI), mercury and their compounds.
- Volatile aromatic compounds exceeding 1% by weight[****].
- Organic tin compounds. Exemptions are made for dibutyltin (DBT) and dioctyltin (DOT) which are permitted in the following levels in sealing products (the primer and joint product respectively):
    - Maximum 0.5% in silane hardener systems.
    - Maximum 0.2% in other hardener systems.

Volatile aromatic compounds are the aromatic compounds whose highest initial boiling point is 250°C measured at a standard pressure of 101.3 kPa. Volatility for paints and varnishes is instead defined as when the vapour pressure of the aromatic compound is at least 0.01 kPA at 293.15°K.

Note that tributyltin (TBT) and trifenyltenn (TPT) are not permitted regardless of content or product type.

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

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

[**] See Annex 1 – Candidate list of 553 substances at: http://ec.europa.eu/environment/chemicals/endocrine/strategy/being_en.htm

[***] The phtalates DINP (CAS no. 28553-12-0 and 68515-48-0), DIDP (CAS no. 26761-40-0 and 68515-49-1) and DIUP (CAS-no 85507-79-5) are permitted in sealants and primers for expansion joints in concrete, concrete-metal and metal-metal on the outside of the building, including balconies, exterior corridors and similar structures.

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

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

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

Background

The requirement is a list of unwanted substances (a negative list) and is also included in the criteria for Nordic Swan Ecolabelled buildings, generation 3. The requirement is worded in a way that is clear but does not overlap with other requirements. This means that substances that are prohibited, for example, by the CMR requirement (O21) as a general rule, are not listed unless it is deemed to provide necessary extra clarity. This is the case with Bisphenol A (BPA) which is written as a separate paragraph, even if the substance is already prohibited in the paragraph Potential endocrine disruptors. Bisphenol S and Bisphenol F are also prohibited. Review of the literature has shown that these substances, which are abbreviated analogously to BPS and BPF, are just as hormonally active as BPA and have hormone-disrupting effects.[71]

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

Exemptions from the prohibition

Expansion joints are a special type of outdoor joint for when very large concrete surfaces are to be joined together, normally prefabricated façade elements. The most common joints both indoors and outdoors are around windows. Even if windows are mounted in concrete façade elements, this is not an expansion joint. The window is too small to require an expansion joint. Only very large window sections with metal frames mounted in concrete would require an expansion joint.

The exemption stated in requirement O20 in the criteria for Nordic Swan Ecolabelled buildings for the phthalates Diisononyl phthalate (DINP) and Diisodekyl phthalate (DIDP) in exterior expansion joints is also included here, since these types of sealants must contain these phthalates in order to meet the requirement for flexibility, etc. The Nordic criteria group decided17 October 2018 to increase the exception with DIUP (CAS-no 85507-79-5) in motion joints for outdoor use. The reason is that all technical knowledge about the substance indicates that the exposure is lower and we should not prevent anything that seems better than the already excluded phthalates. However, in the forthcoming evaluation and revision, the exception for phthalates in expansion joints will be reviewed and hopefully removed.

Before the sealant is applied, the porous surfaces must be prepared with a primer to achieve proper adhesion. The joint itself (without primer) will not have a sufficiently large contact surface if the underlay is porous, and there is a very great risk that the joint will slip, which can e.g. lead to moisture penetration. Primers for expansion joints often contain epoxy, which has low solubility. Aromatic solvents, in this case xylene and ethylbenzene, must be used to dissolve the epoxy. The product itself may not have a classification that does not comply with the Nordic Swan Ecolabelling requirements. The requirement concerning aromatic compounds is adjusted so that the concentration for primers for expansion joints may include aromatic compounds at up to 20% by weight.

The exemption for tin organic content also applies to primers included in sealant systems for porous material.

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

O23 Nanoparticles in chemical products

Nanoparticles from nanomaterial* must not be constituent in chemical products used in Nordic Swan Ecolabelled renovation, with the following exceptions:

- pigments**
- naturally occurring inorganic fillers***
- synthetic amorphous silica and calcium carbonate****
- polymer dispersions

** The definition of nanomaterial follows the European Commission's definition from 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 (SiO_2) and calcium carbonate ($CaCO_3$) with or without chemical modification.*

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

Background

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 (interior environment or the surrounding environment, seen over the entire life cycle). The requirement concerns chemical products that are used for the production of Nordic Swan Ecolabelled buildings and is harmonised with equivalent requirements in Nordic Swan Ecolabelled chemical building products. Equivalent requirements are also included in the criteria for new buildings.

The definition of nanomaterials follows the European Commission's definition of nanoparticles [72]: "A nanomaterial is a natural, incidental or purposely manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 50% of the particles in the number size distribution, one or more external dimensions are in the size range of 1–100 nm."

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

Exemption from the prohibition

The same exemptions found in Nordic Swan Ecolabelled new buildings (requirement O21) are also found in these criteria for renovation.

7.8.3 Construction products, construction goods and construction materials

The requirements apply (as pointed out at the beginning of this document) to all products, goods and materials that are *newly manufactured* and that are added to the renovated building and any suppplementary buildings. There are two exceptions to this rule. Requirement O30 is valid for re-used construction products, fittings and materials and requirement O32 which has to be fulfilled both by virgin wood and re-used wood and re-used wooden products.

The requirements do not apply to existing products and materials that are left or moved inside the renovated building,

The requirement must also be fulfilled for any supplementary building (for example garages, bicycle storage rooms, refuse depots and, sheds) and fences, wooden decking, outdoor furniture, outdoor playground equipment and similar items that is included in the Nordic Swan Ecolabelled renovation project/assignment and which is constructed, renovated and marketed with the Nordic Swan Ecolabelled renovation.

[72] COMMISSION RECOMMENDATION of 18 October 2011 on the definition of nanomaterial (2011/696/EU).

Nordic Swan Ecolabelled or EU Ecolabelled products automatically meet the requirements . State only the license number, product name and manufacturer's name.

Requirement O24 comprises two parts. First a list of the products, goods and materials to which the requirement applies. Then the chemical substances that may not be included in these are listed. The term *included* here refers to substances added by a producer or its sub-contractor and that are included in the end-product with more than 100 ppm (0.01% by weight) in the end product.

For clarity, the term construction goods is also used. This includes fittings that are not defined as construction products under the Construction Product Regulation (305/2011/EG).

O24 Excluded substances in construction products, construction goods and materials

The requirement applies to the following product categories if the renovation includes these products (see Appendix 8):

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

The following may not be included in the product categories listed above.

- A substance on the EU Candidate List***).
- Substances evaluated by the EU to be PBT (persistent, bioaccumulative and toxic) or vPvB substances (very persistent and very bioaccumulative), in accordance with the criteria in Appendix XIII of REACH and substances that have not yet been evaluated but which meet these criteria.
- Substances classified as carcinogenic, mutagenic or reprotoxic (CMR) categories 1A and 1B.
- Substances considered to be potential endocrine disruptors in category 1 or 2 on the EU's priority list of substances that are to be investigated further for endocrine disruptive effects****).

In addition, the following substances and substance groups may not be included. There may be overlap between the substances listed below and the substances or groups of substances listed above.

- Short-chain chlorinated paraffins (C10–C13) and medium chain chlorinated paraffins (C14–C17).
- Perfluorinated and polyfluorinated alkylated substances (PFAs).
- Alkylphenol ethoxylates (APEO) and other alkylphenol derivatives (substances that release alkylphenols on degradation).
- Brominated flame retardants.*****)******)
- Phthalates.
- The heavy metals lead, cadmium, arsenic, chromium (VI), mercury and their compounds.

- Bisphenol A, bisphenol S and bisphenol F.
- Boric acid, sodium perborate, perboric acid, sodium borate (borax) and any other boron compounds classed as carcinogenic, mutagenic or reprotoxic.
- Tin organic compounds.

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

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

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

*****)* *See document Annex 1 – Candidate list of 553 substances at the following link: http://ec.europa.eu/environment/chemicals/endocrine/strategy/being_en.htm*

******)* *Insulation foam, exposed to risk of ignition during the production period (at the construction site or during manufacture of prefabricated construction parts) may, when the fire protection assessment shows medium to high risk, be protected with butadiene styrene brominated copolymers as a flame retardant. Examples of risks of ignition are welding works, electricity errors, halogen lighting, concentrated sunlight and arson. The fire protection assessment must be performed by a qualified construction technician, fire risk expert or similar professional. The licensee must submit a project-specific written application for exception to Nordic Ecolabelling.*

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

- Bromine content (Br) ≤ 0.15%

- Chlorine content (Cl) ≤ 0.15%

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

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

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

☒ Construction product declaration or equivalent if such has been drawn up for the product, as a supplement to Appendix 9.

Background

The requirement comprises two parts. First a description of which construction products, construction goods and construction materials are to be included, i.e. that will verify the chemical content. The purpose is to identify the key construction goods and thereby the material within the vapour barrier, with the addition of some known problematic materials outside the vapour barrier. Table 5 presents a more detailed description of the various product groups in the requirement.

The requirements must generally apply exactly as described in section 7.8.2 Chemical products, regardless of whether the material is incorporated on site or purchased pre-

assembled in prefabricated elements. This means that irrespective of whether the carcass[73] (e.g. wall elements, façade elements, joist elements), roof trusses or bathrooms and similar are built on site or as prefabricated building elements, requirement O26 will apply.

Processed construction goods that are always purchased ready for installation, such as windows and doors, are not subject to this requirement at all.

Which substances are not permitted?

The second part of the requirements concerns a list of the properties that the substances may not contain in the construction products specified above. A list of a number of specific substances/groups of substances is then given. Although this entails a degree of "duplication", this is necessary since Nordic Ecolabelling generally wishes the limit for the occurrence of hazardous chemical substances to be set at 100 ppm. The scope may also be broader. Phthalates are an example. The phthalates DEHP and DBP and others are on the Candidate List and are thus already included under the first item. But the section concerning "phthalates" further down is far broader and prohibits the entire group of phthalates, including those not on the Candidate List.

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. Even if the item list includes prohibition of the bisphenols A, S and F, this does not entail an automatic prohibition of polycarbonate plastic. The polycarbonate plastic found in entrance ceilings, handrails, edge barriers, corrugated plastic and other products is made from the monomer bisphenol A (BPA). However, since more or less all BPAs react, the content of the final plastic is very low, often lower than 25 ppm. If any of the listed construction goods are made of polycarbonate plastic, Appendix 9 must be completed, but the bisphenol content will probably not be an obstacle since Nordic Ecolabelling's limit is set at 100 ppm.

Exemptions

These criteria contain the same exemptions for brominated flame retardants as those in the criteria for Nordic Swan Ecolabelled new-builds. There have been several cases when cellular plastic has caught fire and caused major fires at construction sites. The industry therefore needs to further reduce the risk of fire. Despite structural changes to minimise the risk of fire, efficient procedures for correct handling and storage of materials and waste, staff training and good welding work routines, [74] it may still, in some cases, be necessary to use fire-retardant cellular insulation material.

The exemption makes it possible to use flame retardant cellular insulation foam with this particular co-polymer when fire risk assessment for a project indicates a need for this. The fire risk assessment must be performed by a qualified specialist and show that there is a medium or high risk of fire. The risk can be on the construction site or in the factory that manufactures prefabricated parts/building elements. Nordic Ecolabelling assesses that the exemption will be relevant in a limited number of projects. The exemption is granted after the license holder

[73] The carcass may be made of loose timber or prefabricated building elements, often of concrete or wood. After the carcass has been built, supplementary structures are added, i.e. windows, doors, stairs, installations, painting and fittings.
[74] Sparks caused by welding, cutting, soldering and the use of high-speed rotary tools pose a risk of fire.

has submitted a written request for exemption. Exemption can only be granted for a specific project.

Because of their very high molecular weight, the new type of brominated copolymers used as a flame retardant for cellular plastic EPS and XPS do not pose the hazards to health and the environment and the risks as HBCDs[75] and the other brominated flame retardants that have been prohibited or limited.

There is also an exemption that makes it possible for conduits to contain limited amounts of brominated and chlorinated flame retardants. The content of bromine and chlorine must be verified using the ion chromatography method as specified in EN 14582 or a modified ion chromatography method as specified in EN 50642. The levels for bromine and chlorine are harmonized with the globally-developed standard for Halogen Free Material (EN 50642), which reached the final draft stage at the end of 2017. But instead of the standard's total threshold of 0.4% of bromine, chlorine, iodine and fluorine, Nordic Ecolabelling's total threshold is capped at 0.2% of bromine and chlorine together.

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

Detailed description of the listed product groups

Table 5: The Table describes the product groups that must verify requirement O24 and what is included or exempted.

Product/material and brief description	Covered by requirement O24	Not covered by requirement O24
Fixed sealing products The purpose is to seal from mainly wind and moisture, but also noise and fire. A sealing product is often placed on both sides of the insulation of walls, foundations and roofs. Sealing products may consist of various materials (cardboard, plastic, fibre-glass, etc., often as a combination).	Moisture/water barriers, vapour barriers, wind barriers and radon barriers on walls, the ground, basement and ceiling. Wet room panels and fixed sealing layer for wet rooms. Jointing strips, tape and similar sealing products used to seal seams, joints, bushings and connections. Form construction materials that remain after casting/moulding.	Roofs irrespective of materials, skylights or smoke vents on roofs.
Interior and exterior building panels May consist of many different materials: cement, fibreglass, gypsum, cardboard and carton, often as a combination.	Interior building panels for roofs, walls and floors other than wood-based panels. Exterior panels and façade panels other than wood-based panels.	Wooden panels (solid wood, laminated timber, veneer, plywood, OSB, MDF and chipboard), which instead must meet requirement O26.
Thermal, acoustic and technical insulation. Intended to prevent heat loss and condensation, and minimise noise, etc. Examples of insulation materials are	All thermal and acoustic insulation of walls, roofs and ground/foundation slabs are included, as well as insulation of basements.	Construction products if purchased in a "finished" state and contain insulation, such as windows and outer doors.

[75] The brominated flame retardant Hexabromocyclododecane is sometimes also abbreviated as HBCDD. This means there are two abbreviations (HBCD or HBCDD) for exactly the same brominated flame retardant.

Product/material and brief description	Covered by requirement O24	Not covered by requirement O24
mineral wool (stone or glass), cellular plastic, cellulose fibre and light clinker[76]. The material often contains additives for flame-proofing, dust control or mould protection. The insulation material may also be coated and finished with substances to perform a certain function.	Technical insulation is, for examples, the insulation of pipes, ducts and shafts.	Vibration-dampening webbing that is often used between building elements must not be deemed to be insulation and is exempt from the requirement.
Impregnated wood	Timber that is impregnated as protection from rot, blue stain and mould.	Pre-impregnated construction goods such as windows and outer doors. Fire protection impregnated timber
Wood composites A material that is normally a mix of wood fibre/woodmeal and (thermo)plastic (WPC). It is used for façades, boards, outdoor decking, fences, etc. The term composite should not be confused with sandwich structure.	Composite wood used to construct Nordic Swan Ecolabelled buildings and adjoining courtyards, play areas or supplementary buildings.	
Interior covering of plastic for floors, ceilings and walls.	Wet room wallpaper. Fixed sealing layers are covered by fixed sealing products - see above.	Products in service areas are completely exempt from the requirement. Service areas are fan rooms, substations, lift shafts, machine rooms, distribution boards and other areas to which unauthorised persons do not have access. The following are not service areas: all living areas and communal areas such as dressing rooms, shower rooms, stairways, entrance areas, storerooms, corridors in basements/attics, pram rooms and bicycle rooms. Shower walls are not included.
Drainage pipes, heavy current cables, electrical conduits and plastic pipes for central vacuum cleaning systems. The material for all these products is plastic - traditionally chlorinated plastics (PVC).	Pipes for wastewater, pipes for central vacuum cleaning systems and (electrical) installation pipes, i.e. conduits for electrical wiring. Heavy current 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 service areas are completely exempt from the requirement. Cable ducts are not included as they are normally placed in the ground and thus do not come within the scope of the requirements. 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. The requirement does not include heating cables, i.e. cables that emit heat when they are energized

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

O25 Nanoparticles and antibacterial additives in construction products and construction goods

1. Nanoparticles from nanomaterial may not be actively added to the glass on balconies* or the outer glass pane of windows, window doors and exterior doors. The outer glass pane is the side of the glass that comes into contact with the exterior environment.
2. Chemicals or additives, including nanomaterial** added to provide an antibacterial*** or disinfecting surface may not be used in or on:

- floors/floor coverings
- wall coverings in ceramic material or stone
- kitchen and bathroom fittings, such as cabinet doors, worktops, mirrors, shower walls, spashbacks
- white goods****
- ventilation systems for the elements that are in contact with indoor air.

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

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

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

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

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

☒ Construction product declaration or equivalent if such has been drawn up for the product, as a supplement to Appendix 10.

Background

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) over the entire life cycle.

Nanometals, of which nanosilver is the most important, are covered by the term "antibacterial". Silver ions are highly toxic for bacteria in wastewater treatment plants and aquatic organisms in our watercourses. There is concern that widespread use of silver as an antibacterial agent may contribute to the development of silver-resistant bacteria. 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).

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. The requirement also includes fittings. This includes worktops (in kitchens, wet rooms, window sills and other fixed counters installed in the building before it is occupied), splashbacks, cabinet doors, mirrors and shower walls.

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

All nanoparticles on the outer glass pane of windows and other glass, e.g. on balconies, are prohibited. The requirement does not include self-cleaning surfaces added by CVD and magnetic spraying. This means, for example, that the self-cleaning surfaces Pilkington Active and Bioclean can be used in Nordic Swan Ecolabelled renovated buildings. Self-cleaning windows produced by spray deposits are not permitted, however.

O26 Formaldehyde emissions

Wood-based products that contain more than 3% by weight of formaldehyde-based additives must meet the thresholds stated in the table below. The requirement includes the following products and materials:

- building panels (raw/untreated or surface treated)
- laminated timber
- ceiling/acoustic panels
- wooden panels and timber cladding for walls and ceilings
- mouldings, skirtings and baseboards
- panels in flooring
- panels in doors and permanent fittings*

	MDF panels**	All other types of panels
Maximum permitted emission of formaldehyde, measured in accordance with the current version of EN 717-1	0.124 mg/m^3 air	0.07mg/m^3 air

If the wood-based panel has been tested using a method other than EN 717-1 (Chamber method), the thresholds can be verified according to any of the test methods in the table in Appendix 1 or with a certificate.

Panels marketed or used solely as façade panels are exempted from the requirement.

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).

** Permanent fittings include kitchen, hall and bathroom fittings, shelving, wall sections and wardrobes. Individual fittings, such as a hat or shoe shelf, are exempt from the requirement.*

*** The threshold of maximum 0.124 mg/m^3 air for MDF panels applies through 30 June 2019. After this it can be raised.*

If legislation is introduced or tightened, and becomes stricter than Nordic Ecolabelling's requirement levels for formaldehyde during the term of validity of these criteria, requirement O26 will be adjusted.

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

☒ Analysis report, including measurement methods, measurement results and measurement frequency. It must be clearly stated which method/standard was used, the laboratory that conducted the analysis, and that the analysis laboratory is an independent third party.

☒ Certificate for products as an alternative to an analysis report.

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 has a carcinogenic effect and must therefore be limited as far as possible.

Glue systems with formaldehyde are often used for wood-based panels. The development has been towards reducing formaldehyde emissions from the finished panels. However, a study shows a tendency for the indoor air in newly-built, especially larger, houses to contain formaldehyde. In two out of 20 houses tested, formaldehyde concentrations were even found that exceed the threshold value set by the World Health Organisation (WHO)[77].

Formaldehyde emissions from building panels are communicated within the EU with the classification system defined in the harmonised standard for wood-based panels, EN 13986, where the current lowest emission class is E1, with the level of 0.124 mg/m^3 and 0.09 ppm. For the harmonised standard for wood-based panels, EN 13986, the TC112 technical committee has proposed a new class, E1plus, which has the following emission level: 0.08 mg/m^3 and 0.065 ppm. However, this class has not yet been finally accepted in connection with the discussions between the standardisation organisation and the European Commission, since it will be in conflict with many countries' national legislation[78].

An example is the Danish building regulations, which set the requirement that all building materials which can give off formaldehyde to the indoor environment must be CE-marked and fulfil the most stringent formaldehyde degasification class (E1). However, building materials are defined as materials that are permanently incorporated in structures. The provision thus does not apply directly to e.g. furniture and fittings in which MDF is primarily used[79]. There are Nordic Ecolabelling requirements concerning formaldehyde emissions in a number of different criteria, such as Building Panels, Furniture, Floors, Outdoor Furniture and Playground Equipment. The requirement level for formaldehyde for this version of the criteria is harmonised with the requirement level for Nordic Swan Ecolabelled Furniture and Fittings. It is assessed that this level is sufficiently ambitious for all of the product types for which requirements are made in construction. It is important that the requirement is ambitious, but also realistic, in terms of being able to handle all of the various different product types for which requirements are made in Nordic Swan Ecolabelled construction.

[77] Senior researcher Lars Gunnarsen and PhD student Ásta Logadóttir of the Danish Building Research Institute (SBi) at Aalborg University Copenhagen
[78] Personal contact, Gonçalo Ascensão, Programme Manager, CEN
[79] http://boligejer.dk/formaldehyd og http://bygningsreglementet.dk/br10_02_id148/0/42, accessed: 14 December 2015

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

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

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

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

For the use of other test methods and certificates, see requirement O14 in the criteria document for houses, apartment buildings and buildings for schools and pre-schools, generation 3. The guidance found here also applies to this criteria.

O27 Construction products in non-renewable material

1. Interior surface layers on floors, ceilings and walls added during renovation may not consist of or contain PVC. Exemptions are made for:
    - Watertight layers, wall film, acoustic dampening foam and other surfacing under the surface.
    - Surfaces in service areas (fan rooms, substations, lift shafts, machine rooms, distribution boards and other areas to which unauthorised persons do not have access).
2. Existing PVC surfaces (floors, walls and ceilings) in soft PVC must be removed and can not be covered by another finish material.
3. Windows, outer doors and window doors made of (hard) PVC and façade coverings made of (hard) PVC that are added during renovation must contain 30% recycled PVC. The recycled plastic resource may not contain lead or cadmium in levels exceeding 100 ppm. Plastic items ≤ 50 grams are exempt from the requirement.
4. Windows and exterior doors made of metal must comprise a certain proportion of recycled material, as stated below. The equirement concerning the proportion of recycled material does not apply to external cladding of outer wood components for the sole purpose of weather proofing or materials that account for less than 3% by weight of the window's, window door's or outer door's total weight. Nor does the requirement apply to hinges, handles, fittings, stabiliser plates and kick plates.
    - At least 40% of the aluminium in profiles or door leaves must be recycled aluminium.
    - At least 20 % of the steel in profiles or door leaves must be recycled steel. Stainless steel is not permitted.

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

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

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

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

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

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

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

✉ 3 & 4: Specification of the percentage of the material that is recycled, e.g. a construction product declaration form. Declaration from supplier that the raw material is recycled on an annual basis according to Appendix 11.

✉ 3 & 4: Declaration from the smelting works or equvalent of the percentage recycled metal on an annual basis. Declaration from the PVC supplier of the percentage recycled PVC on an annual basis.

✉ 3: For recycled plastic, a certificate to show compliance with the requirement concerning lead and cadmium according to Appendix 11.

Background

Surfaces

The requirement includes vinyl flooring and flooring containing PVC and/or PVDC as a material/component. The latter may involve cork flooring coated with a thin outer layer of PVC or textile flooring with a PVC backing. This scope is the same as in the criteria for Nordic Swan Ecolabelled floors. The requirement also includes PVC surfaces intended for walls and ceilings.

So as not to limit options for using approved *watertight layers* in wet rooms, the requirement only relates to the *surface* layer, i.e. what you see and walk on. Service areas (fan rooms, substations, lift shafts, machine rooms, distribution boards and other areas to which unauthorised persons do not have access) are exempted from the requirement and vinyl flooring may thus be installed in these spaces.

The requirement is harmonised with the criteria for Nordic Swan Ecolabelled flooring, generation 6.

Existing/old layers

In the consultation draft, existing PVC coatings/flooring that are not removed could be left in place but be covered with a new coating. It would probably normally be vinyl flooring that is kept, but with a new floor/covering laid over it. The aim is to minimise the risk of emissions of old plasticizers (usually DEHP) to indoor air. This also prevents plasticizers from floors that are washed from entering waste water treatment plants.

After the consultation process, the requirement was changed so that it is not permissible to lay one surfacing on top of another surfacing. Consultation bodies referred to instances where experience of using this method has not been good. The moisture in the flooring

adhesive is trapped, which increases the likelihood of moisture problems and secondary emissions. According to the final version of the criteria, existing PVC flooring should be removed.

Windows and exterior doors

There is great variation in the energy consumption of windows made of different materials. The manufacture of 100% wooden windows uses the least amount of energy, while considerably more energy is used to manufacture a window made entirely of aluminium. The other materials fall somewhere between these two.[80] Nordic Ecolabelling sets requirements for a certain percentage of recycled material to manage this difference in energy consumption. The requirement is fully harmonised with equivalent requirements in the criteria for Nordic Swan Ecolabelled windows and outer doors, generation 4. This means that both pre-and post-consumer material may be used to calculate the percentage 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 makes recycling impossible. It is currently not possible to use recycled fibreglass for quality reasons. 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. Nordic Ecolabelling therefore sets the requirement that the recycled plastic (raw material) may not contain levels of lead and cadmium exceeding 100 ppm, which is also in harmony with the criteria for Nordic Swan Ecolabelled windows and outer doors, generation 4. The requirement must be verified by a certificate from the manufacturer.

Stainless steel has more than twice as much embodied energy. The additives are primarily chromium and nickel, and the energy consumption involved in making it means that stainless steel is worse in environmental terms than ordinary steel (carbon steel). Nordic Ecolabelling does not want stainless steel to be used as a material in door leaves.

In this criteria document, windows and outer doors are: fixed and hinged façade and roof windows, window doors (e.g. balcony and patio doors), outer doors, hallway doors/apartment doors, exterior corridor doors, warm storage doors, cold storage doors and various gates.

However, this does not include domed skylights, which are[81] regulated by product standard EN 1873, nor does it include windows and outer doors that are resistant to fire under the EN

[80] 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.
[81] A domed skylight is installed on a flat or almost flat roof, but otherwise performs many functions of a "normal" window.

16034 standard. The requirement also includes PVC façade coverings (maintenance-free façade panels).

O28 Epoxy relining

Bisfenol-based epoxy must not be used for casting new plastic piping inside existing pipes, so called relining. This ban applies to relining of water pipes and wastewater pipes.

✉ Technical description of a relining method that verifies that the method is epoxy-free.

Background

Introduction

Most wastewater piping is renovated by replacing the old pipes, waterproofing and coating in a wet room. Relining is also carried out to repair or renovate old wastewater pipes. Relining may be an option if the piping system is in poor condition but the outer layer is in good condition, in spaces that are difficult to access or where a change of pipes would be too disruptive to the business, for example in a hospital.

During renovation, an even larger percentage of the building's domestic water system is replaced. But domestic water pipes are sometimes relined too. Relining means that a new pipe is cast on the inside of an old one. Epoxy, which can contain and emit Bisphenol A (BPA), is or has been used for relining domestic water pipes and wastewater pipes. 3,000 apartments in Sweden whose domestic water pipes have been relined with epoxy have been inspected and the findings show that BPA is present in both drinking water and hot water. The highest levels of BPA were found in the hot water. The reason is probably that the hot water is heated centrally in apartment buildings and is then circulated in a hot water loop. The hot water comes into contact with the relined pipes for longer periods of time.[82] The risks vary across the Nordic countries depending on technical building methods. The BPA found in both drinking water and hot water is probably unreacted BPA that was present from the start as an impurity in diglycerides of bisphenol (BADGE)[83] or as an amine accelerator.

BPA has hormone disrupting properties. It is suspected of having harmful effects on foetuses and young children even at very low exposure. It was decided in February 2016 to introduce a more stringent classification of BPA from Repr. 2 to Repr. 1B. BPA is found in almost all human urinary and blood samples. This suggests that low doses of the substance are entering our bodies all the time. It enters our bodies primarily through food and drink that has been in contact with polycarbonate plastic or epoxy because traces of BPA can leach from the material.[84] Drinking water is our most important nutrient. There are thus many reasons why it is important to reduce exposure to BPA as much as possible.

Relining of domestic water pipes[85]

Two-component epoxy consists of a resin and a hardener. The two components react with one another when mixed to form a hard coating (cures). They are mixed at the construction site in a machine that ensures the correct blend of the components. One-component epoxy also consists of multiple components, but these are blended at the factory and are

[82] Release of bisphenol A (BPA) in the renovation of domestic water pipes. Report from a government commission. Report no. 7/13. Swedish Chemicals Agency (Kemkalieinspektionen) 2013.
[83] 75% of all epoxy resin is based on BADGE, mainly due to good performance in relation to cost. BPA is used as a starting material in the manufacture of BADGE and can be found as a residue in the epoxy resin.
[84] Bisphenol A is mainly used to manufacture polycarbonate and epoxy plastics.
[85] Domestic water pipes are pipes in buildings intended for drinking water or hot water for consumption. Drinking water pipes are pipes that supply drinking water to a property and are not subject to the requirement.

transported to the construction site as a single material. Heat is used to cure the epoxy. Water in domestic water pipes that have been relined with one-component epoxy contains significantly lower levels of BPA.[86] A ban was placed on the use of two-component epoxy containing BPA for relining domestic water pipes in Sweden in September 2016.

Other materials used for relining domestic water pipes include silicon-based materials, which are the most common, and also cement-based materials. These do not have the negative environmental and health properties that epoxy has.

Relining of wastewater pipes

Because wastewater pipes are larger in size than domestic water pipes, some different methods are used for relining wastewater pipes. A common method is the CIPP (cured-in-place pipe) method, whereby a soft fibreglass cloth is pulled into the pipe. The cloth is saturated in epoxy that hardens when it forms a new pipe inside the old one. Another method that is used is called slip-lining. A smaller pipe is inverted or pulled into the pipe to be renovated. High density-polyethylene (HD-PE) pipes or fibreglass reinforced plastic pipes are most common. The space between the old and new pipe is filled with cement. No epoxy is used in this technique.[87]

Nordic Ecolabelling's ban on relining using epoxy

Nordic Ecolabelling prohibits the use of both one and two component epoxy as there are alternative non-epoxy methods on the market. The ban by Swedish law only applies to relining of domestic water pipes. The ban by Nordic Ecolabelling also applies to relining of wastewater pipes. Nordic Ecolabelling does not take a stance through its requirement on whether pipes for domestic water or wastewater should be replaced with new ones or if relining is an acceptable alternative. On the other hand, Nordic Ecolabelling prohibits the use of epoxy for relining as it poses a risk of increasing the spread of the endocrine-disrupting substance BPA. Subsequently, other forms of of bisphenol (e.g. bisphenol S and F) are also prohibited.

Nordic Swan Ecolabelled renovated buildings protect human health and the environment by ensuring that endocrine-disrupting bisphenol from epoxy cannot migrate to drinking water or through wastewater to sewage treatment plants from relined pipes.

O29 Copper in domestic water pipes and as façade and roofing material

New domestic water pipes installed during a renovation may not be made of copper. The exception is visible pipe laying/pipework and water fittings' connecting pipes.

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

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

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

✉ Documentation to show that the requirement is fulfilled.

[86] Release of bisphenol A (BPA) in the renovation of domestic water pipes. Report from a government commission. Report no. 7/13. Swedish Chemicals Agency (Kemkalieinspektionen) 2013.
[87] Wastewater pipe renovation using relining. Joakim Nimmerfors. Chalmers University of Technology. Dissertation 2012.

Background

In order to reduce the amount of copper that is released into groundwater, domestic water pipes in Nordic Swan Ecolabelled renovations may not contain copper. The ban does not contribute to an increased risk for galvanic corrosion. This is explained below. The requirement does not apply to closed water piping systems, as the water circulates in these.

Copper is also restricted as roofing or façade material asit is not permitted to use as a new material if it contains more than 10 percent copper by weight

The requirement is identical to equivalent requirements in the criteria for Nordic Swan Ecolabelled new buildings.

Exemptions to the requirement

- The connecting pipes that come with the water fittings are a couple of centimetres long and often made of copper.
- Visible piping, which is often the case in wet rooms.
- Domestic water pipes in service areas such as boiler rooms, substations, machine rooms, electricity centres and similar areas. The cause is that it maintenance continuously is performed in these installations and pipes need to be soldered and welded which require copper as material. Tthe exception does not imply to tap water shutes where alternative materials to copper works well.

Copper in the environment

Copper is an essential (vital) metal but is also one of the comparatively most toxic metals for aquatic organisms.[88]

The dominant sources of copper for water recipients and wastewater treatment plants are domestic water (due to the copper pipes), at approximately 4,000 kg/year and vehicle traffic, at approximately 4,000 kg/year. Buildings with copper panels contribute approximately 1,200 kg/year.[89] A large percentage of the copper that reaches treatment plants via the drainage network is embedded in the sludge. Approximately 60-80% of the copper passing into the treatment plants originates from buildings' domestic water pipes. With regard to sludge, the long-term trend is to reduce the metal content. Unfortunately, copper and zinc are exempt from this positive development. The long-term trend for copper and zinc in sewage sludge has not been reduced, and the copper content is still increasing. One reason is that copper is, to a great extent, built into the infrastructure and it is therefore not as easy to reduce the addition of copper as for e.g. mercury and silver.

In its report "Hållbar återföring av fosfor" (Sustainable phosphorus recycling) from September 2013,[90] the Swedish Environmental Protection Agency (Naturvårdsverket) states that the copper content in farmland is a slight margin from showing negative microbiological effects. The actual background copper content as a local factor varies across the country. The Swedish Environmental Protection Agency furthermore notes that specifically the addition of copper must be reduced, so that sludge can be recirculated on a sustainable long-term basis. For

Copper in Stockholm's aquatic areas, Hans Borg, ITM, Stockholm University.

[89] Koppar i Stockholms vattenområden (Copper in Stockholm's aquatic areas), Hans Borg, ITM, Stockholm University.

[90] Sustainable phosphorus recycling - Swedish Environmental Protection Agency's report in response to an assignment from the government, Report 6580, 2013.

copper, silver and zinc, the Swedish Environmental Protection Agency cannot set thresholds which are as low as would be necessary for Sweden to have no long-term accumulation in farmland by 2030. The Agency's proposed threshold is a compromise between the requirement for development towards a non-toxic environment, and business operators' requirement for a longer time frame for any transition. In summary, it is relevant for Nordic Ecolabelling to limit the spread of copper as a material in domestic water pipes and from copper panels such as building materials.

Copper in domestic water pipes

As stated above, copper in water pipes can be the dominant source of copper spread to treatment plants. The Swedish Water & Wastewater Association states that 75% of the volume of copper to Swedish treatment plants is from homes' domestic water systems. Over the years, different materials have been used for domestic water pipes, such as galvanized steel, copper, brass and stainless steel. It may be necessary during a renovation to combine different metallic materials. In some circumstances, such blends of materials, where the metals have different potential, can lead to galvanic corrosion. Galvanic corrosion refers to the damage caused when the less noble metal (anode) starts to corrode but the more noble metal (cathode) is often better protected against corrosion. The greater the potential difference, the greater the risk of corrosion. But the potential difference between the metals is only an indication that corrosion can occur. Other key factors are the area ratio for the cathode and anode, water composition, etc.[91]

The risk of galvanic corrosion is low in drinking water. For many years, combinations of stainless steel, copper, copper alloys and brass have been successfully used for both cold and hot water in pipes, fittings and tanks without damage. If, for instance, new stainless steel pipes are to be connected to old galvanised steel pipes, it is usually enough to create a gap between the metals, for example, using a transition element. The combination of copper in an older pipe and stainless steel is significantly less critical because there is very little potential difference between copper and stainless steel.[92]

Copper as a roofing and façade material

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. However, there are examples of it being used in single-family homes and apartment buildings. To reduce the spread of copper to the environment, it is not permitted to use copper as a new roofing or façade material during renovation. This requirement also includes products for roofs and façades, such as roof drainage products (e.g. drain pipes and gutters), exhaust air hoods, eaves netting, roofing profiles and similar products. Copper plate already on roofs or façades or in roof products does not need to be removed and replaced by other materials during the renovation.

O30 Requirements for reused construction products

Reused construction products, fittings and materials origining from other projects or the recycling market must comply with one of the following requirements:

1. **Construction products, fittings or materials that should be reused and are included in Appendix 13:** No further documentation of the content of undesirable substances is required.

[91] Stainless Press-fitting System. Damstahl. 2003.
[92] Stainless steel in contact with other metallic materials, Euroinox. The European Stainless Steel Development Association, 2011.

2. **Construction products, fittings or materials that should be reused and are not included in Appendix 13:** The presence of undesirable substances as per Appendix 3 must be verified.

If tree species on Nordic Ecolabelleing's list of prohibited tree species are reused, requirement O32 must be fulfilled.

☒ 1: Verification that the product, fitting or material is included in Appendix 13.

☒ 2: Analysis report for substances as per Appendix 3.

Background

Recovery means re-using a product, which is not waste, to serve the same purpose for which it was originally intended. In order to achieve the EU's 2020 target of recycling, reusing or recovering at least 70% of non-hazardous construction and demolition waste, it is essential to increase material recovery during the renovation process. Reuse is resource-efficient and is fundamental to achieving a circular economy. However, the recovery process must not result in a spread of undesirable substances in the recycling and reuse flows, because that would lead to a risk of them recirculating in the ecosystem and posing a hazard to the health of humans. Nordic Ecolabelling's requirement achieves a balance between these needs. The requirement must facilitate material recovery and also guarantee that the construction products and materials that are reused do not contain any undesirable substances above a certain threshold.

In the building condition assessment (Requirement O3), the licensee must assess what should be preserved and what should be reused in the building. This is done prior to renovation. The requirement lists a number of building products and materials that must be assessed for preservation and reuse. Later in the process, but still before renovation begins, the building must be surveyed for the presence of undesirable substances and hazardous waste (Requirement O4). A qualified environmental surveyor inspects the building for the presence of asbestos, PCBs, hydrochlorofluorocarbons, cadmium, mercury, etc. When material containing any of these has been located and marked, it is either removed as hazardous waste, cleaned up on site or, in exceptional cases, encapsulated in such a way that it is considered not to constitute a hazard. A survey performed by a qualified professional will thus guarantee that the products that are to be reused in the building do not contain undesirable substances.

However, Requirement O30 applies for the products and materials that the licensee wishes to reuse from other buildings or from materials recovery companies. This requirement basically consists of two steps:

Step 1 is a "Yes to reuse list". No additional requirements for controls of undesirable substances are made for products on this list, which can be found in Appendix 13. Construction products, fittings and materials in Appendix 13 are, on good grounds, considered not to be controversial and not to contain any of the listed undesirable substances.

The Yes to reuse list must be restricted as we must be careful about what we accept outright. At the same time, there has to be a practical option that encourages material recovery since, unfortunately, this does not occur by itself. The list includes:

- Interior walls from office and commercial spaces (glass sections, both with and without frames).

- Grating and wrought iron (e.g. spiral staircases, accessibility ramps, storeroom latticework and door grilles)
- Interior doors, both wood and glass (but not leaded glass).
- Wooden flooring and interior wooden panels from which the old finish has been removed
- HVAC ware (WC bowls, washbasins and utility sinks)
- Products carrying ecolabels (Nordic Swan Ecolabel and EU Ecolabel).

Nordic Ecolabelling will assess any other products and materials that are suggested for inclusion on the list.

Step 2 is a procedure for testing for undesirable substances, as it will not be possible to "simply" accept many construction products, permanent fittings and materials that are to be reused, i.e. are included in Appendix 13. In the case of these products, it is necessary to test for the presence of undesirable substances as per Appendix 3 in the criteria. This is the appendix that forms the basis for what must be identified and analysed in the environmental analysis/survey.

Since Step 2 of the requirement can be resource-intensive, it is important to start by generally assessing whether the product that is being considered for reuse has the potential to meet the requirement. The following are examples of products and materials that may have problems meeting the requirement. This is because there is too great a risk that they contain undesirable substances from the manufacturing process, that they have been contaminated by sealant, putty, adhesive, or there is a risk that they have severe moisture damage.

- Roofing felt and roofing sheets
- Pipe insulation
- Tiles, clinker and other glazed materials (as they may contain heavy metals)
- Flooring made of PVC, linoleum, cork and other semi-hard materials
- Insulating material
- Insulated thermal windows with sealant
- Electric cables
- Impregnated timber
- Products that have been in contact with or still have joint compound, putty or adhesive on them, with the consequent risk of migration to the product.

O31 Resource-efficient material selection

To promote resource-efficient and climate-efficient material selection, at least three of the following measures must be taken:

1. Each product category where at least half of the need for the product category is covered by the Nordic Swan Ecolabelled products or by EU Ecolabelled products. See Appendix 15 for a product category overview. This measure can be repeated. It then counts as additional measures.
2. At least 20% of the building elements/materials (except the façade) stated in O3 as reusable, are reused either in this or another project.
3. At least 50% of the façade is retained or reused for a different purpose in either this or another project.
4. At least 20% of the need for the product category is covered by reused products listed in Appendix 13 or has verified presence of undesirable substances as per

Appendix 3. See requirement O30. This is valid for products origining from other projects or the recycling market.

5. Life cycle design/design for reuse. At least five major components* must be life-cycle designed (from planning to execution, with a description of dismantling/removal and options for reuse or recycling).
6. Wood or other renewable material is used in frame/load-bearing structures or as a maintenance free façade**.

** Components include concrete elements, interior walls, roof coating and fixtures.*

*** Façades that under normal conditions do not require treating or other maintenance using chemical products for at least 10 years.*

✉ Documentation showing that at least three of the above measures have been taken. The documentation must include the information specified for the relevant item/measure.

Background

1. Ecolabelled products

The building materials contribute environmental impacts such as energy consumption, resource consumption and impacts with hazardous chemicals and negative impacts on biodiversity. To promote resource-efficient and climate-efficient material selection, these criteria provide an option to meet parts of the requirement by selecting Nordic Swan Ecolabelled products or EU Ecolabelled products. This corresponds to the requirement in the criteria for new builds (single-family homes, apartment buildings, pre-school and school buildings) where points are awarded for the use of ecolabelled products.

2 & 3. Reuse within the project

With the requirement for reuse, Nordic Ecolabelling want to an assessment of the potential for reuse, which is to be examined in O3, shall be nothing more than a theoretical exercise. Those who can refer to actual results by using building elements or materials that, at an early stage, are assessed as having potential for reuse or reused in another renovation project. Reuse in the same project may be difficult due to storage capacity requirements, etc. It is important to encourage greater reuse to reduce such barriers. It is therefore considered positive in this version of the criteria if others will pay or otherwise guarantee reuse in another project.

4.Reuse of construction products

It is possible to contribute to greater reuse of materials both at the demolition and the renovation stage. For example, every year, thousands of tonnes of serviceable construction materials are thrown out of our offices. Tenant turnover in office buildings is high. New tenants often want to give their new office a personal touch when they move in. Interior doors, glass walls and lighting may be in good condition but often end up as waste when an office is renovated. Product groups that are particularly suitable for recycling on a large scale have been identified in a recently presented project undertaken in partnership by IVL (Swedish Environmental Research Institute), Kompanjonen, Folksam and Vasakronan. There is great demand for these products which are standardised, easy to disassemble and reuse. Furthermore, they usually contain very low levels of hazardous substances which should not circulate in the ecocycle. The report have formed the basis for the products on the Yes-to reuse list in Appendix 13.

Nordic Ecolabelling wants to encourage reuse of building products, fittings and materials from other buildings or from the recycling market. Recycled materials that meet Requirement O30,

i.e. controls on the presence of undesirable substances, may therefore be counted in this sub-requirement in O31..

5. Life-cycle design/Design for reuse

To make it easier to reuse building elements, life-cycle design should be used more actively in the planning. More specifically, it's about setting aside time in the planning, although this can result in higher costs compared to current conventional practice. Important aspects to assess are the materials and durability and longevity of building goods, opportunities for flexible and removable solutions (such as mechanical attachment rather than the use of glue), the use of standard dimensions and modular design, limited variation in material usage and materials that are easy to separate, and also avoid surface treatments that make reuse and recycling more difficult.

To meet this part of the requirement, at least 5 major components must have gone through a life cycle design. Information should also be attached to material showing how the components are used and how the components are to be dismantled/replaced, with options for further reuse or recycling. Concrete elements, interior walls, roof coating and fixtures are examples of components that may be relevant. As mentioned earlier e.g. cement elements are more suitable for reuse than cast in-situ concrete.[93]

Life cycle-design/design for reuse makes it possible to create products that will be commercially attractive even after they have served their purpose in the first phase of use. At the same time, the products must be positive for health and the environment in the future by meeting the other requirements of the material criteria. Regular design does not often place a focus on multiple reuse of the products. This is partly because the market does not demand this. It is therefore important to encourage this by stating, for example, that dismantling, removal and other material handling is planned.

6.Wood in carcass/load-bearing structures and maintenance-free façades

If the carcass (load-bearing structures, walls and floors) is made of wood or other renewable material as part of the renovation, this action is considered to be completed. The same applies if the façade is made of maintenance-free wood or other maintenance-free renewable material. Maintenance-free refers to façades that under normal conditions do not require treating or other maintenance using chemical products for at least 10 years.

If the volumes of concrete in housing construction decrease and more wood is used as a construction material, it will lead to reduced environmental impacts. A recent Swedish report shows that an apartment building with a wooden carcass reduces the carbon footprint by more than half compared with an apartment building with a concrete carcass.[94] A recently published dissertation[95] shows that wood panelling façades have a significantly lower impact on the environment from an LCA perspective than other façade materials, such as fibreboard, fibre cement board and plaster.

[93] Leland, B et al. 2008: «Planning for reuse and recycling.» Report funded by Husbanken and Byggemiljø, RIF 2008. ISBN 978-82-91510-87-3.
[94] The building's climate impact. Life cycle calculation of the climate impact for a newly constructed apartment building with solid wood carcass; M. Larsson; M. Erlandsson; T. Malmqvist and J. Kellner: IVL (Swedish Environmental Research Institute) in partnership with the Swedish Construction Federation. June 2016.
[95] Environmentally sustainable materials for residential properties. Karin Lindeberg and Karolina Koch. Dissertation 2016. Lund's University of Technology.

7.8.4 Timber, bamboo and fibre materials

The requirements apply to all products, goods and materials that are newly manufactured and that are added to the renovated building and any suppplementary buildings. Requirement O32 also applies to wood and wood products that have been reused.

The requirements do not apply to existing products and materials that are left or moved inside the renovated building,

The requirement must also be fulfilled for any supplementary building (for example garages, bicycle storage rooms, refuse depots and, sheds) and fences, wooden decking, outdoor furniture, outdoor playground equipment and similar items that is included in the Nordic Swan Ecolabelled renovation project/assignment and which is constructed, renovated and marketed with the Nordic Swan Ecolabelled renovation.

Nordic Swan Ecolabelled products automatically meet the requirement. Only the manufacturer, licence number and product name must be stated.

O32 Tree species that may not be used in Nordic Swan Ecolabelled renovations

Tree species listed on Nordic Ecolabelling's list of prohibited tree species (see www.nordic-ecolabel.org/wood/) may not be used in Nordic Swan Ecolabelled renovations, with exemption for reuse. If tree species from the list of prohibited tree species are reused, 100 % of the need must be covered by reused wood. No new wood/wooden products from prohibited tree species must be supplied.

Unlike the rest of the requirements in this chapter, this requirement also covers timber and wood that is used in construction but is not incorporated into the building, for example wood in casting moulds.

✉ Declaration of compliance with the requirement from the licence applicant. Appendix 12 must be used.

✉ If wood/wooden products are reused, the origin (site/building) must be documented. It must also be documented that 100 % of the need are covered by the reused wood/wooden products, thus no new wood from the list of prohibited tree species must be supplied.

Background

Nordic Ecolabelling requires that a number of tree species are not permitted for use in Nordic Swan Ecolabelled renovation and conversion work. The requirement only applies to virgin forest tree species and not tree species defined as recycled materials (see the definition of recycled materials in the requirement for wood raw materials O33).

The list of protected tree species is available for viewing at www.nordic-ecolabeliing.org/wood/. The applicant shall provide a declaration of compliance with the requirement that protected tree species are not used in Nordic Swan Ecolabelled products. Appendix X may be used. Nordic Ecolabelling may demand more documentation for a specific tree species. For more details about the background for the requirement, see Nordic Ecolabelling's criteria document for houses, apartment buildings and buildings for schools and pre-schools, generation 3.

It has emerged that tropical wood is used in casting moulds for building construction. On Rainforest Foundation Norway's website, it says that teak, meranti and other tropical species are used in plywood in casting moulds. Wood used in the construction phase is therefore also included in the requirement. The materials requirement normally only applies to what is "built into" the Nordic Swan Ecolabelled renovated building.

Tree species on Nordic Ecolabelling's list of prohibited tree species may be reused from other projects/buildings or from the recycling market under if the following are met:

- The whole (100%) of the need of re-used wood(wooden products must be covered so that there is no need adding new products/new wood from prohibited tree species to obatin a uniform design.
- The re-used wood must be traced back to the building where it was previously used.

O33 Wood raw materials

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

- roof trusses
- frames and joists
- interior wall panels and ceilings
- roof underlays and panels for walls and floors
- exterior façades
- timber for balconies, terraces, decking and verandas

Chipboard, MDF and similar materials are not included.

Names of species

The licence applicant must state the names (species name) of the wood raw material used in the Nordic Swan Ecolabelled renovation.

Chain of Custody certification

Suppliers of wood raw materials must be Chain of Custody certified by the FSC scheme or the PEFC scheme.

Suppliers who only supply construction elements made of recycled material do not need to have Chain of Custody certification. Definition of recycled material, see below.

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

Certified wood raw material

At least 70% of the wood raw material must be certified as recycled material by the FSC scheme or the PEFC scheme.*.

The remainder of the raw material in the above listed building elements must be covered by FSC/PEFC's Chain of Custody certification or be classified as recycled materials*.

The requirement must be documented as the amounts of timber purchased on a project basis.

* *Recycled material/recycled resource is defined according to ISO 14021.*

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

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

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

- ☒ Name (species name) of the wood used in the listed building elements.
- ☒ Valid Chain of Custody Certificate under the FSC or PEFC schemes from suppliers. Suppliers who only supply recycled material do not need to have Chain of Custody certification.
- ☒ Documentation to show that the requirement for the proportion of certified or recycled material is met by a calculation of the total purchased volumes on a project basis. Volume can be reported as purchased volume or weight, but the units may not be combined. The requirement applies either as a total per building element or combined for the listed building elements. Copy of invoice(s) to confirm the proportion of certified timber purchased for the building/project. If a building product is labelled with the PEFC or FSC logo, it automatically meets the requirement and is documented by means of a photograph.
- ☒ In the exceptions when the licence applicant has a non Chain of Custody certified supplier, the supplier shall present invoice(s) for the current wood raw material from the Chain of Custody certified supplier and the valid certification which must be in accordance with the invoice(s). The invoice must state volume certified wood raw material. The licence applicant must have a documented agreement with the supplier which describes how the supplier guarantees that the specified, certified wood raw material on the invoice is delivered to the applicant. The agreement shall also include that the supplier is obliged to report to the applicant if the wood raw material supplier is exchanged. Nordic Ecolabelling can ask for further information.

Background

Nordic Ecolabelling requires information to be provided about which tree species are used in Nordic Swan Ecolabelled products. The requirement makes it possible to check the Chain of Custody certificates in the supply chain (whether the stated tree species is covered by the Chain of Custody certificates in question) and provide information for future forestry-related requirements. If recycled material is used in the Nordic Swan Ecolabelled building, particularly in the form of fibre raw materials, it is not always possible to specify the species name of all wood raw materials used. In this case, the requirement for documentation of recycled material must be complied with.

A record must be kept to prove compliance with the requirement for a percentage of certified timber or recycled material. The percentage of certified material must be documented on an invoice or delivery note (paper or e-invoice) with certification codes for the certified company/companies from which the wood raw material was purchased. It must be clearly stated on the invoice or delivery note which parts of the delivery are certified (there must be a claim/material category, e.g. FSC MIX 70% and FSC 100% relating to the product in question on the invoice or delivery note, when it comes to FSC certified goods). A valid label with the relevant scheme's logo on the actual product or on an unbroken package, in which the wood product (or a batch of wood products) are sold, may also be used to demonstrate compliance with the requirement. On this may be listed a certification number or licence code, that provides information about the authorised trader who sold the product in question as being certified. The certification schemes have different rules regarding labelling and logo use. Should there be any doubt, it is advisable to consult the websites of the schemes for detailed information on the rules.

For more details about the background for the requirement and the various terms used, see Nordic Ecolabelling's criteria document for houses, apartment buildings and buildings for schools and pre-schools, version 3.2.

O34 Durable/resistant wood for outdoor use

Wood treated with heavy metals and/or biocides must not be used in Nordic Swan Ecolabelled renovation work.

The requirement does not apply to wood in class B according to the Nordic Wood Preservation Council's classification system or a corresponding classification.

Exemptions from the general ban may be made for:

- wood in contact with fresh water or salt water
- wood in direct contact with the ground
- wood in load-bearing structures where a certain strength is required
- wood above ground where there is a significant risk of rot, i.e, risk classes 4 and 5 in accordance with EN 335.

Regardless of any possible exemption, durable wood for outdoor use must fulfil required O24, Unwanted chemical substances.

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

The purpose of the requirement is to limit the use of pressure-treated wood in class M, A and AB, because heavy metals and biocides are used in the treatment process.

Nordiska Träskyddsrådet (NTR) (Nordic Wood Preservation Council) has drawn up an industry standard to define the Nordic wood preservation classes within the framework of current European standards and is a Nordic implementation document for EN 351.

✉ To use an exemption from the general ban, the need for pressure-treated timber must be documented in writing, stating the reason. An approval decision by Nordic Ecolabelling must be obtained.

Background

The purpose is to greatly restrict the use of pressure-treated wood, because the process involves that the wood being treated with heavy metals (copper) and biocides. The general prohibition does not apply to wood that has been treated in accordance with NTR class B (or equivalent) for outdoor joinery, such as windows and doors. To make the requirement practical, a small number of exceptions from the general ban on treated wood are listed.

Pressure-treated 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 6: Relation between European standards and the Nordic implementation, NTR.

Area of use	NTR	EN 350-1	EN 335-1
Timber for use in permanent contact with 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 treated 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, a modified version 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

7.9 Other sustainability initiatives

O35 Sustainability initiatives

To promote further sustainable measures and initiatives in the Nordic Swan Ecolabelled renovation, at least one of the following points must be implemented.

1. Energy-efficient construction sites. Measures taken for a more energy-efficient construction site with reduced environmental impacts. The measure must be calculated and show at least a 25% reduction in energy consumption and/or greenhouse gas emissions compared with standard solutions.
2. Renewable energy. Local renewable source of energy (photovoltaic, solar heating or heat recovery in wastewater) is installed. This should cover at least 10% of the building's electricity requirement, 10% of domestic hot water requirement or 10% of the heating requirement.
3. Eco-system services and adaptation for climate change. Measures enhancing eco-system services and measurese for adaption for climate changes are taken in the renovation project.

   Examples are green roofs/green façades (at least 25% of the total roof or façade area), local management of storm water, recirculation of grey waste water, creation of opportunities for urban cultivation and preservation of natural and cultural values of the site.
4. Social sustainability. Social sustainability/social investment measures undertaken as part of the renovation project. Examples are dialogue with local residents, new social areas, meeting spaces, appropriate lighting that enhances safety in the area,

initiatives to increase employment or other types of special focus on socially disadvantaged or discriminated groups. For example,

5. Air quality. Measurements of emissions in the indoor environment to ensure they are below the threshold limit values in the following table. The measurements will be carried out after all the construction work has been completed and after the building has been aired and before occupancy.

Compounds to be measured	Limit value	Test standard
TVOC (total volatile organic compounds)	≤ 300 µg/m^3	ISO 16000-6 or ISO 16017-2 (8 hours average)
Formaldehyde	≤ 50µg/m^3	ISO 16000-3 or ISO 16000-4 (30 minutes average)
Particulate matter/dust	PM10 ≤ 50 µg/m^3 PM 2.5 ≤ 15 µg/m^3	ISO 7708 or equivalent (8 hours average)

Other measures than those listed below may be acceptable upon approval of Nordic Ecolabelling.

☒ 1. Description of energy measures on the construction site. Calculation of reduction of energy consumption and/or emissions of greenhouse gases.

☒ 2. Description of the type of premises, renewable source of energy and the percentage of the energy requirement expected to be covered. Household or business electricity should not be included. For energy requirements, see the energy calculation in requirement O13.

☒ 3. Description of measures undertaken for eco-system services or climate adaptation.

☒ 4. Description of measures undertaken to strengthen social sustainability.

☒ 5. Analysis report with measurement methods, measurement results and measurement frequency. It must be clearly stated which method/standard was applied, the laboratory that conducted the analysis, and that the analysis laboratory is an independent third party. If the threshold limit value is exceeded, relevant measures must be documented and implemented.

Background

This requirement, comprising optional parts, aims to place the focus on other areas that are important to sustainable renovation, but which are not subject to mandatory requirements.

Energy-efficient construction sites

A pilot project was implemented in practice at four construction sites in western Sweden in 2010-2011.[96] The report shows that the method that was tested in the different construction projects offers good potential to reduce energy consumption at construction sites taking relatively small measures. For example:

- Lighting accounts for approximately 30-40% of electricity consumption at a normal construction site. Diode and xenon lights are satisfactory alternatives to traditional construction site lighting from a work perspective. They have an efficiency potential of about 80% compared with traditional lighting.
- Heating and portable cabins account for approximately 30-40% of electricity at a normal construction site. Energy-efficient portable cabins have better insulation and

[96] Energy Efficient Construction Sites: energy savings in the construction phase in the workplace. IMCG report 2011.

windows with higher U-values than traditional cabins. They also have a heat recovery system or a heat pump. Some older cabins have been converted to a better energy performance standard. New cabins, so-called Eco-cabins, come with energy-efficiency measures in place. Other ways to promote an energy-efficient construction site is to heat cabins with district heating rather than traditional electric heating. The main reason is to reduce emissions of carbon dioxide.

- Concrete carcass drying accounts for approximately 30%. Concrete can instead be dried using a hot water areometer driven by district heating or a pellet-fuelled boiler.

In Norway, there are contractors that contribute to fossil-free building sites by using electrically-powered loaders, excavators and other plant machinery at construction sites. This contributes to a better working environment and less pollution. The use of fossil energy is also reduced by using biofuels, electricity or hydrogen, even if the local pollution is not necessarily reduced when using biodiesel.[97]

It is important that energy efficiency is not undertaken in conflict with the drying of concrete. It can be suitabel to have differnet values to benchmark energy use, whether drying of concrete occurs during summer or during winter time.

Local renewable sources of energy

The aim of the requirement is to encourage more installation of energy sources and energy consumption from sources that are not installed as standard. The requirement is focused in the same direction as the EU's Directive on energy performance of buildings (2010/31/EU). The Directive's definition of "energy from renewable energy sources" is broader, however, than the energy sources that Nordic Ecolabelling accepts in this requirement. Swedish BBRS describes in more detail that the location must be "on the building or in its immediate vicinity". This means, for example, that solar cells or panels located on an adjacent building may be approved provided the system's production is included in the renovated building energy calculation.

For further details about the accepted types of energy, please see the background section in requirement P1 in the criteria for homes, apartment buildings, pre-schools and schools, generation 3.

Eco-system services and adaptation to climate change

Biodiversity and natural processes perform a myriad of tasks on which we humans depend for our survival and well-being. Eco-system services is a term that attempts to capture all the products, services and values that we get from nature. The air we breathe, the water we drink, the food we eat, medicines, fuels, pollination and also the intellectual and emotional values we get from nature. All of this can be included in the eco-system services.

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 reduced risks of flooding or at least less serious consequences of torrential rain. Green roofs channel the water flow to the storm

[97] Anne Marit Melbye and Torfinn Belbo: ZERO-notat om fossilfri anleggsplass, Version 1, 5 September 2016, https://www.zero.no/wp-content/uploads/2016/09/ZERO-notat-om-fossilfri-anleggsplass-v1-1.pdf

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.

Local management of storm water is when conditions are created to take care of the storm water (rain, spray and melt water) on and around the building and the hard surfaces that are part of it. Measures which in different ways are aimed at creating local infiltration instead of channelling the water off to the stormwater drainage system.

It is important and possible to take the natural and cultural values of the site into account in a renovation process. Older trees and other established vegetation on older sites are often of great value and contribute to several eco-system services. By investing in eco-system services in conjunction with renovations of buildings can also contribute to improved ecological, social and cultural values.

Social sustainability

Some areas are particularly socially vulnerable and have an older stock of property. The structures and functions of the area are designed for the community as it was when originally built. A construction project and renovations of properties can be used to address local challenges in the community. A renovation process affords opportunities for designing housing and areas according to present-day needs and wishes, with a focus on the safety, well-being and comfort of local residents. The actual construction period can also be used to contribute positively to a local labour market, with people who are out-of-work being given an opportunity to become involved in the project.

The aim of a dialogue with local residents is to involve them at an early stage of the project, by taking their wishes and views into account and strengthening the relationship between the residents and property owners, clients and contractors. Common sustainable solutions can be achieved through dialogue with the occupants of the building and those most familiar with the building and the local area. Dialogue should be an integral part of the renovation process so that people feel involved and informed. It affords numerous benefits, such as increased comfort and satisfaction, reduced anxiety and stress and reduced vandalism.

Other social investments may involve creating work placements in the renovation project to reduce unemployment and alienation in the community. A carefully-planned work placement system, often in conjunction with the client and other local stakeholders, will provide experience and expertise and improve opportunities for permanent employment. The participating companies' and organisations' social sustainability initiatives will be strengthened with a focus on inclusion and diversity. Local input and involvement brings tremendous benefit and value to the community.

Air quality/Testing for emissions in the indoor environment

IVL (Swedish Environmental Research Institute) has conducted a project (SMILE) to examine the quality of the air inside Swedish low-energy buildings.

- The mean value for air circulation in single-family buildings was lower than in apartment buildings (0.33/h compared to 0.47/h). 80% of the residential units were below 0.5/h.
- The mean concentration for nitrogen dioxide was 6 µg/m³ in single-family buildings and 10 µg/m³ in apartments. Formaldehyde was 22 µg/m³ in single-family buildings

and 13 µg/m³ in apartments. TVOC was 236 µg/m³ in single-family buildings and 143 µg/m³ in apartments.

- Significantly higher levels of formaldehyde and TVOC were found in houses and apartments built between 1955 and 1980. Furthermore, the concentrations were lower in both older and newer buildings.
- The concentrations were higher in buildings in rural areas compared with buildings in urban areas and in houses with natural ventilation than in houses with mechanical ventilation.
- Relatively low values compared with those recommended by WHO and various authorities in relation to emission levels and comparable with other studies in the Nordic region.

Although various studies have found low contamination values, higher levels may still occur at completion of brand new and renovated buildings. This is related to the fact that the emission rate of contaminants in materials and building elements is highest during the implementation stage of construction and it decreases over time. The requirement has been set a reasonable level to ensure a good indoor environment and other certification schemes such as BREEAM, LEED and Greenguard are considered in this context.

Tests must be performed for all different habitable rooms. Where rooms are otherwise identical, a minimum of three room tests will be accepted. In that case, it must be documented that all building materials in each room are the same and substantiated that all building activities were completed in the same period of time. If work has been performed in parts of the building defined as habitable rooms after completion, new tests must be documented afterwards.

7.10 Information for property managers and residents/users

O36 FDU documentation

There must be overall general information and specific operation and maintenance instructions for the Nordic Swan Ecolabelled renovation and the renovated building. The aim is to ensure that the property manager, users and residents are familiar with the building, know how technical installations operate and the need for service and maintenance, and the most appropriate measures from an environmental viewpoint.

Where relevant, the information must describe normal operation, maintenance and service, whether special expertise or authorisation is required, and whether special products are needed for the purpose.

If special products are recommended, they must meet the requirements for chemical products, building products, construction supplies and materials in the criteria (chapter 7.8), or be ecolabelled with the Nordic Swan Ecolabel or the EU Ecolabel.

The information must include the following, where it is relevant and has been included in the renovation process:

a) The building's heating, ventilation and comfort cooling (if any) systems. The information must explain how to set the systems to achieve maximum energy efficiency and optimum indoor climate. The information must state where thermostats are located and how they are used, time intervals for service, cleaning and filter replacement.

b) Maintenance and control of electrical installations, including energy meters.

c) Systems for energy efficiency/ energy-saving measures and operational optimisation.

d) The importance of demand controlled/presence controlled ventilation as a mean to reduce energy consumption.

e) Water consumption and water-saving measures and features.

f) Results of radon tests.

g) Surface treatment of the façade and other weather-exposed wooden parts such as terraces, veranda, wooden railings, etc.

h) Care and maintenance of windows, including solar protection.

i) Maintenance of roof surfacing, including cleaning of gutters and drainpipes.

j) Cleaning and maintenance/surface treatment of floors, walls and worktops.

k) A description of equipment such as white goods, WCs, light fittings, etc.

l) Information about waste sorting, recycling and waste management.

✉ Overall general information about the building and specific manuals, operation and maintenance instructions as stated in item a) to l) above.

Background

The requirement for operation and maintenance instructions is expected to provide environmental benefits and increase the chance of the building maintaining the good environmental status it had when it was constructed.

Good, clear information is essential for ensuring that systems, technical installations, equipment, vital building elements and materials are cared for and maintained over time in a way that ensures reliable performance, good energy efficiency and a long service life. Therefore, before the building is taken into use, there must be written instructions for the performance of care and maintenance.

7.11 Quality management of the renovation process

O37 Management of requirements for products and materials

The licensee must ensure fulfilment of the requirements in Chapter 7.8. If the licence applicant uses subcontractors, it must be documented that the subcontractor is aware of and adheres to the requirements.

Construction products, 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 O18 to O34 are fulfilled for the entire construction process.

✉ If subcontractors are hired, their routines or agreements for compliance with requirements for products and materials must be reported.

Background

Experience from the licensing of Nordic Swan Ecolabelled new buildings has shown that this requirement is important and is therefore being introduced into the criteria for renovations too. The requirement is intended to ensure compliance with the requirements for products and materials at different stages of the process and between the various parties involved. Many questions may arise during the process. How will communication be conducted? 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?

O38 Information to those involved in the renovation process

Employees, including supervisors, site managers, sub suppliers and subcontractors involved in the renovation process must have relevant knowledge to be able to ensure compliance with the requirements in conjunction with Nordic Swan Ecolabelled renovation projects.

Parties that require information on how hazardous waste and 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 for information is also included in the criteria for Nordic Swan Ecolabelled new buildings. The only difference is that this requirement also includes information on the management of hazardous waste in a language other than the applicant country's language.

O39 The contractor's self-monitoring

The contractor must have a documented self-monitoring programme in place throughout the renovation process to safeguard quality and compliance with the requirements of Nordic Ecolabelling.

As a minimum, self-monitoring must include routines for:

a) completed environmental analysis/survey and environmental remediation, including management of any unforeseen/missed substances that are hazardous to health or the environment that were discovered later on during the construction phase
b) moisture damage, mould and fungal growth
c) plan for Indoor Air Quality/IAQ plan
d) how waste and resource plans have been followed (O3 and O6) and whether the plan has resulted in reuse of construction supplies and materials
e) management of construction and demolition waste at building sites
f) moisture/damp prevention
g) routines for the performance of pre-inspection of the building before independent third-party control/final inspection.

If the items stated below have been included in the renovation they must be included in the self-monitoring:

h) air permeability
i) measurement of PCB levels in indoor air
j) secure execution of water installations
k) radon protection
l) electrical installations
m) ventilation
n) heating system

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

If the licence applicant uses subcontractors, it must be documented that the subcontractors are also aware of and comply with the routines.

✉ Description of the self-monitoring routines/system.

✉ Results of the self-monitoring performed for the first Nordic Swan Ecolabelled project must be submitted to Nordic Ecolabelling and thereafter on request.

🔑 It is possible that further self-monitoring results will be inspected on-site.

Background

The purpose of this requirement is to ensure compliance with the requirements in this criteria document (listed areas) and compliance with the quality requirements for the building. It is not possible to draw up a general check list that fits all types of buildings and building processes. Nordic Ecolabelling may not be the inspecting party either. The requirement focuses on internal control procedures/system. Nordic Ecolabelling conducts random sampling of self-monitoring results. This is usually in conjunction with site inspection visits, but the results can be requested for review at other times too. It may be appropriate to request a sound environment report to further verify internal control of sound environmental performance.

As a minimum, self-monitoring must include the elements listed in the requirement. The requirement has many similarities with the corresponding requirements in the criteria for Nordic Swan Ecolabelled new buildings, expanded with procedures for missed substances that are hazardous to health or the environment, moisture damage, mould and fungal growth survey, IAQ plan and measurement of PCBs in indoor air.

Moreover, the requirement includes a follow-up of how waste and resource plans have been followed and whether the plan has resulted in reuse of construction supplies and materials. The aim is to ensure that the waste and resource plan is followed throughout the renovation project. Many stakeholders, both internal and external, are often involved in the project and it is therefore important to follow up that waste and resources are managed in an optimal way throughout the project. It is assessed that there is potential for improvement. If the services of subcontractors are used, for example for demolition work, there must be routines in place that ensure that these subcontractors are informed that this is a Nordic Swan Ecolabelled renovation and that compliance with the waste and resource plan is required.

O40 Inspection of the renovated building

The completed renovation project must be inspected to ensure that all quality requirements have been met. If only part of the building has been renovated, the inspection must include at least the renovated part(s).

The inspection must be performed by an independent third party with relevant expertise.

If the final inspection reveals defects, an action plan must be put into place and the defects must be rectified as agreed between the parties.

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.

✉ Inspection report.

✉ Documentation to reinforce the independence and competence of the person performing the inspection.

Background

The purpose of the final inspection of the completed building is to identify and document any quality breaches, non-conformities and building defects. The building regulations of a country may have a more stringent requirement than Nordic Ecolabelling's requirement. The

inspection protocol may also have an important legal status that is not of any significance to the Nordic Swan Ecolabelling.

The requirement is the same as equivalent requirements in the criteria for Nordic Swan Ecolabelled new buildings.

7.12 Quality and regulatory requirements

Quality and regulatory requirements are general requirements that are always included in Nordic Ecolabelling's product criteria. The purpose of these is to ensure that fundamental quality assurance and applicable environmental requirements from the authorities are dealt with appropriately. They must also ensure compliance with Nordic Ecolabelling's requirements for the product throughout the period of validity of the licence.

O41 Documentation

The licensee must save and archive the documentation that is sent in with the application.

🔑 On-site inspection.

O42 Documentation of the renovated buildings

The licensee must have a list of Nordic Swan Ecolabelled renovated buildings. The documentation must be stored by the licensee for at least five years after completion of the work.

🔑 On-site inspection.

O43 Planned changes

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

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

O44 Unforeseen non-conformities

A written report of any unforeseen non-conformities that affect Nordic Ecolabelling requirements must be reported to Nordic Ecolabelling in writing, without delay and logged.

✉ Routines describing how unforeseen non-conformities in writing and without delay will be handled.

O45 Complaints

There must be routines in place for documenting, reporting and handling any complaints/claims that arise during the renovation process and concerning the Nordic Swan Ecolabelled renovated 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.

O46 Laws and regulations

The licensee must ensure compliance with all relevant applicable laws and provisions at all production sites for the Nordic Swan Ecolabelled renovated buildings. e.g. with regard to safety, working environment, environmental legislation and site specific requirements/concessions.

✉ Duly signed application form.

8 For the next generation of the criteria

The following areas will be taken into account in the drafting of the next version of the criteria for Nordic Swan Ecolabelled renovation 2.0:

- Daylight in a renovated building
- Noise environment (residential and office buildings)
- Reuse of concrete
- Limits for tinorganic compounds
- Water usage
- Routines to measure air permeability (if the renovation has included measures in the building envelope.
- Stricter follow up on remediation plan during demolition process.

Appendix 1 Comparison of the criteria for new buildings and renovations.

The table below is a comparison of the requirements in the criteria for Nordic Swan Ecolabelled single-family homes, apartment buildings and buildings for pre-schools and schools (called new buildings here), generation 3 and the criteria for Nordic Swan Ecolabelled renovation, generation 1.

Criteria for		Requirement title in accordance with criteria for renovation 1.0 Comments in relation to criteria generation 3 for new buildings
Nordic Swan Ecolabelled renovation (102)	New Nordic Swan Ecolabelled buildings (089)	
O1	O1	Overall description of the building The requirements are basically the same in both criteria documents.
O2	O2	Responsibility for Nordic Swan Ecolabelling The requirements are basically the same in both criteria documents.
O3	---	Building condition assessment and plan for resource use There is no equivalent requirement in the criteria for new buildings.
O4	---	Environmental analysis/survey and remediation plan There is no equivalent requirement in the criteria for new buildings.
O5	---	Moisture survey There is no equivalent requirement in the criteria for new buildings.
O6	P13	Waste plan and waste management The requirements differ considerably. Under the points requirement for new buildings, points are awarded for material recovery or reuse of a certain percentage of construction waste. However for Nordic Swan Ecolabelled renovations, there is a mandatory requirement for certain specified waste fractions to be included in the demolition and construction process.
O7	---	Follow-up of remediation plan There is no equivalent requirement in the criteria for new buildings.
O8	---	Indoor air quality There is no equivalent requirement in the criteria for new buildings.
O9	09	Radon In new buildings, a risk analysis must show if and which radon prevention measures are required. However, it must be verified by new or previous measurements that the radon concentration in a Nordic Swan Ecolabelled renovated building fulfills the national legislation.
O10	O10	Moisture prevention Any measures taken to correct damp, mould, moisture or water damage identified during the environmental survey phase in a Nordic Swan Ecolabelled renovated building (see Requirement O5) must be followed up. The requirements are otherwise identical.
O11	O11	Ventilation Requirements are largely identical. In addition verification is required that the national threshold limit values for air circulation are met.
O12	---	Measurement of PCB levels indoors There is no equivalent requirement in the criteria for new buildings.
O13	O12	Noise environment in pre-schools and schools The requirement is not as stringent as the requirement that applies for new pre-school and school buildings (O12). Only reverberation time must meet

Criteria for		Requirement title in accordance with criteria for renovation 1.0 Comments in relation to criteria generation 3 for new buildings
Nordic Swan Ecolabelled renovation (102)	New Nordic Swan Ecolabelled buildings (089)	
		sound class B. Other parameters in the standard/authority's guidelines must meet class C.
O14	O4	The energy use of the building after renovation In the criteria for new buildings, the energy consumption of the building must be a certain percentage lower than the maximum allowed by national building regulations.
O15	O5	Lighting Requirements are practically identical. Outdoor lighting for renovated buildings must be LED or achieve the equivalent energy efficiency. A requirement for indoor lighting in offices has been added.
O16	O6	Energy-efficient white goods The energy efficiency class requirement for white goods for consumers is the same. Energy efficiency requirements for commercial kitchen products (professional use) have been introduced. These are not included in the criteria for new buildings.
O17	O15	Product list and logbook The requirements are identical.
O18	O16	Classification of chemical products The requirements are identical.
O19	O17	CMR substances The requirements are identical.
O20	O18	Preservatives in indoor paints and varnishes The requirements are identical.
O21	O19	Preservatives in other chemical products for indoor use The requirements are identical.
O22	O20	Other substances excluded from use in chemical products The requirements are identical.
O23	O21	Nanoparticles in chemical products The requirements are identical.
O24	O22	Excluded substances in construction products, construction goods and materials Requirements are practically identical.
O25	O23	Nanoparticles and antibacterial additives in building products and construction supplies Requirements are practically identical.
O26	O14	Formaldehyde emissions The requirement levels are identical. The requirement has been expanded to include permanent fittings relevant for offices.
O27	O24 + parts of O25	Construction products made of non-renewable materials PVC as a floor/covering and as a material in windows and exterior doors have been combined into one requirement. The requirement also includes PVC façade coverings. The requirement also includes windows and exterior doors in metal.
O28	---	Epoxy relining There is no equivalent requirement in the criteria for new buildings.
O29	O26	Copper in domestic water pipes and as façade and roofing material

Criteria for		Requirement title in accordance with criteria for renovation 1.0 Comments in relation to criteria generation 3 for new buildings
Nordic Swan Ecolabelled renovation (102)	New Nordic Swan Ecolabelled buildings (089)	
		The requirements are identical.
O30	---	Requirements on reused construction products There is no equivalent requirement in the criteria for new buildings.
O31	P9	Resource-efficient material selection This requirement has been partly inspired by the points requirement in Nordic Swan Ecolabelled new buildings. Some aspects are new.
O32	O27	Tree species that may not be used in Nordic Swan Ecolabelled renovations The requirements are identical.
O33	O28	Wood raw materials The requirements are identical.
O34	O29	Durable/resistant wood for outdoor use The requirements are identical.
O35	P1 and parts of P14	Sustainability initiatives This requirement has been partly inspired by the points requirement in Nordic Swan Ecolabelled new buildings. Some aspects are new.
O36	O41	FDU documentation Corresponds to O41 Operation and Maintenance Instructions. The requirements are not completely identical, particularly regarding energy and water.
O37	O31	Management of requirements for products and materials The requirements are identical.
O38	O32	Information to those involved in the renovation process Requirements are practically identical.
O39	O33	The contractor's self-monitoring Several of the paragraphs that should be covered by internal control are the same. Some new paragraphs have been introduced where relevant for renovation.
O40	O34	Inspection of the renovated building The requirements are identical.
O41	O35	Documentation The requirements are identical.
O42	O36	Documentation of buildings The requirements are identical.
O43	O37	Planned changes The requirements are identical.
O44	O38	Unforeseen non-conformities The requirements are identical.
O45	O39	Complaints The requirements are identical.
O46	O40	Laws and regulations The requirements are identical.
The first generation of the criteria for Nordic Swan Ecolabelled renovation does not contain the following requirements:		
No requirement	O7	Possibility of sorting at source
No requirement	O8	Waste sorting station

Criteria for		Requirement title in accordance with criteria for renovation 1.0 Comments in relation to criteria generation 3 for new buildings
Nordic Swan Ecolabelled renovation (102)	New Nordic Swan Ecolabelled buildings (089)	
No requirement	O13	Daylight
The first generation of the criteria for Nordic Swan Ecolabelled renovation does not contain any points requirements: A selection of the points requirements for new buildings is included as measures in the requirement O26 Innovations. Those that are not included are listed below.		
No requirement	P2	Individual metering of domestic hot water
No requirement	P3	Calculated HWC losses
No requirement	P4	White goods in the best energy classes
No requirement	P5	Energy-efficient sanitary fixtures
No requirement	P6	Cement and concrete with a reduced energy and climate impact
No requirement	P7	Timber structures
No requirement	P8	Noise environment in small houses and apartment buildings
No requirement	P11	Wooden mouldings from certified forestry

Appendix 2 Analysis of relevance, potential and steerability

The appendix is written in Swedish and may be obtaind from Nordic Ecolabelling: sara.bergman@svanen.se

Appendix 3 Certification schemes for buildings

The appendix is written in Danish and may be obtaind from Nordic Ecolabelling:
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Appendix 4 Substances for which Nordic Ecolabelling has establish limits

In this Appendix the unwanted/hazardous substances for which Nordic Ecolabellering has established threshold limits, and an explanation to the limit values.

1. Substances subject to Noridc Ecolballeing threshold limits

Heavy metals

Threshold limit values have only been established in Appendix 3 for the heavy metals lead, cadmium and mercury. The reason why Nordic Ecolabelling has set threshold limit values for these heavy metals is that they are pre¬sent in large quantities in construction ¬materials. For other heavy metals, it is only necessary to comply with reg¬ula¬¬tory re¬quirements or industry standards, for example zinc in paint, which must be managed in compliance with national regulatory requirements and guidelines. In principle, lead and other heavy metals do not represent an actual indoor climate -problem provided that the heavy metals are fixed, e.g. lead in lead ¬joints or in painted sur¬fac¬es. Lead does not usually constitute a health and safety ¬risk in the workplace until the renovation/remedia¬tion work be¬gins and the materials containing the he¬avy me¬ta¬ls are being removed. Materials with lead, cadmium and mercury compounds that exceed the thres¬hold limit values in Appendix 3 must be removed. Exempted from this are uPVC windows for which lead and cadmium stabilisers have been used.

In Appendix 3, Nordic Ecolabelling has set the requirement that products with metallic mer¬cury or EE waste with metallic mercury, such as thermo¬meters and pressure gauges, must be removed in con¬junction with a renovation, since there may be a risk of mercury ¬vapour release if they are crushed or broken (normal industry ¬standard). This also applies to other equivalent products.

Volatile/semivolatile organic compounds

No specific threshold limit values have been established for volatile organic compounds (VOC) in Appendix 3. This is because the materials in a building that is to be renovated normally already have a long use ¬phase which makes it likely that volatile substances, such as formaldehyde, styrene, isocyanates etc. have already been emitted. Many of the less volatile substances (semivolatile organic compounds, SVOC) that will produce emissions over a longer period of time are listed in Appendix 3. Some of the selected substances are found today in house dust, for example, and may be present in construction ¬products, as phthalates, intermediate chain length chlorinated paraffins and brominated flame retardants . Many other substances are present in house dust, but several of them are believed ¬mainly to come from consumer ¬products brought into houses via furniture, electro¬nic equipment, toys, etc. and thus not via construction materials/building elements. Various organic fluorine compounds which are also associated with serious health and environmental problems are not listed because they are hardly observed in building products. In the report "Undesirable substances and sustainable building, a follow-up project under LOUS" produced by the Ministry of Environment and Food ¬of Denmark, insulat¬ion electric wires are mentioned as the only product where fluorine compounds are used in building ¬materials.

Other organic environmental toxins

Nonylphenols and octylphenols or organotin ¬compounds (dibutyltin and dioctyltin) are not ¬usually included in an ordinary environmental ¬analy¬sis because it has not been widely known in the industry that these comp¬ounds are present in construc¬tion ¬materials.

However, Nordic Ecolabelling requires an environmental analysis of nonylphenols and octylphenols in this version of the criteria as they may be present in paints, flooring, adhesives and seal¬ing materials. However, it is not presumed that these compounds will be governing factors with regard to decisions about how a material or a building element must be managed, i.e. it is presumed that they will contain other undesirable substances that will determine how they are manag¬ed.

Nor¬dic Eco¬labelling is aware, after working with the Nordic Ecolabelling of windows and other construction products, that these may occur in various types of construction ma¬terials/building elements, including paints, windows and flooring. The Norwegian Environment Agency in Norway has also reported this. A requirement to conduct an environmental analysis/survey for the content of these compounds has not been set in this version of the criteria document. However, this will be assessed in conjunction with the next revision when we should have more experience of the content of these substances in building products.

1. Substances subject to regulatory requirements

All substances which, according to national authorities, can be classified as hazardous waste, if concentrations are high enough, must be managed in compliance with national regulatory requirements, guidelines and industry standards. This applies to arsenic, copper, chrome, PAH etc.

Neither authorities nor Nordic Ecolabelling have set threshold limit values for asbestos and ozone -depleting substances, such as refrigerants and foam-blowing agents (CFCs, HCFCs and HFCs). These substances are normally classi¬fied as hazardous waste regardless of analysis/concentra¬tion according to regulatory ¬requirements and industry ¬stan¬dards. However, the presence of these substances must be identified, and any ¬occurrences must be documented in line with other substances in Appendix 3. In principle, both asbestos and ozone ¬depleting substances must be removed from the building in conjunction with a renovation process since they are classified as hazardous waste.

Radon emitting materials

Materials that emit radon are not usually included in an ordinary environmental analysis. Nevertheless, Nordic Ecolabelling has decided to require that materials which can emit radon are identified and documented, because such materials are not desirable in a Nordic Swan Ecolabelled building due to the adverse effects of exposure to radon. This only applies to materials that are visible in conjunction with the reno¬vation, or which for some reason can be presumed to be present in the building. Identification of any other unknown occurrences, for example radon emitting solids or rock beneath the building, is not required. However, it is most likely that they will be captured during the radon measurements that must be conducted (see Requirement O9).

2. Background for setting threshold limit values

The threshold limit values in Appendix 3 are set on the basis of the threshold limit value when the con¬tent of a certain substance in the ground or waste is considered to be clean/contaminat¬ed (normative value), the threshold limit values for hazardous waste, which hazards the compounds pose to human health and the environment, national guidelines and legislation, and industry standards. The threshold limit values set in Appendix 3 are higher than normative ¬¬values (except for PCBs for internal reuse and Danish normative values), but lower than the limits for hazardous waste. If national requirements, guidelines or industry standards have lower threshold ¬limit values for any undesirable substances than the

limits set by Nordic Eco¬labell¬ing, these should be complied with in the country in question. An explanation of how the threshold limit ¬values for certain substances are set is provided below.

Lead, cadmium and mercury

The threshold limit values for cadmium and mercury ¬com¬pound¬s have been set lower than for lead compounds since the normative values for cadmium (0.5-1.5 ppm) and mercury (1 ppm) are one to two factors lower than for lead (40-100 ppm).

Copenhagen's Local Authority requires decontamination of concrete that has lead-based paintwork/plaster if the lead content is more than 40 ppm (normative value = limit for clean/contaminated in Copen¬hagen's Local Authority), which is lower than the Norwegian normative value for lead at 100 ppm. This will result in smaller amounts of slightly contaminated concrete for which Copenhagen's Local Authority has limited landfill space.

Organic compounds

The threshold limit value of 1,000 ppm for the content of organic com¬pounds, such as bro¬minated flame ¬retardants, phthalates, chlorinated paraffins and nonylphenols and octylphenols, ¬ is consistent with the ¬limits for substances on the REACH Candidate List. The limit for hazardous waste for these compounds is approximately 2,500 ppm.

Nordic Ecolabelling has not set threshold limit values for PCBs in cables, windows or electronic components. In a standard environmental analysis, chemical analyses of PCBs are rarely carried out for these types of products as they are often difficult/not scientifically or physically appropriate. If there is reason to suppose that PCBs are present in these types of products (the environmental surveyor is expected to kn¬ow this), the removal of the products from the building is recommended and they should be classified as hazardous waste without sampling and analysis. This is normal procedure in line with industry standards.

Threshold limit values of 0.1 ppm for internal reuse and 1 ppm for external reuse have been set for PCBs in other products. Gas emissions ¬of PCBs can lead to contamination of the indoor air. It is therefore natural for indoor threshold limit values to be more stringent than for building elements/materials reused outdoors. PCB emissions outdoors will not pose a risk. However, the outdoor threshold limit values have not been set higher because there is no desire to increase the risk of spreading PCBs to the outdoor environment.

PCB content is considered to be clean/contaminated (normative value) at a threshold limit value of 0.01 ppm in Norway and 0.1 ppm in Denmark. The normative value is thus one factor more stringent in Norway. The Norwegian Environment Agency has published a draft regulation on disposal of concrete and brick waste in which it proposes a threshold limit value of 1 ppm for paints, grout, levelling compounds and plaster, and 0.01 ppm for concrete and brick (consistent with the normative values). A higher content is permitted in paints, grout, levelling compounds and plaster because overall this constitutes a substantially smaller volume, and hence amounts of PCBs, than concrete and brick and the total amount of PCBs in concrete and brick. In Den¬mark, a threshold limit value of 2 ppm has been set for reuse of certain selected ready cleaned-up products made of natural stone (e.g. granite and flint), unglazed brick (wall and roof tiles) and concrete. This is consistent with the threshold limit values in the Danish Waste Product ¬Order from 2016. This is two whole fac¬tors higher than the Norwegian threshold limit value for concrete and brick. This may be because Denmark has greater challenges with landfill space for slightly contaminated concrete than Norway has. Generally, it can be said that Norway has somewhat more stringent requirements for PCBs than Denmark.