About Nordic Swan Ecolabel

Windows and External Doors

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Nordic Ecolabelling

Content

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1 Summary

The Nordic Ecolabelling criteria for windows, window doors and external doors have been revised to generation 5. Nordic Swan Ecolabelled windows and doors must comply with strict requirements to reduce the environmental and climate impact throughout the whole life cycle. Nordic Swan Ecolabelled windows and doors have a low climate impact due to low energy losses through the windows and doors, strict requirements for the materials and chemicals used, good function and quality, long service life and contribution to circular economy through design for disassembly, use of/support of systems for material recycling and use of production waste management.

Windows and doors' ability to minimize heat loss from buildings is most important to reduce the products impact in a life cycle. Strict requirements concerning thermal transmittance (U-value), air permeability and climate testing have therefore been established.

As use of raw materials and chemicals has a large environmental impact in the production phase, Nordic Swan Ecolabelled windows and doors must comply with strict requirements for the wood, metals, isolation materials and chemicals used for the production. There are no material requirements for the glass material used in window glass/insulation glass units as the market for float glass made with recirculated glass, is still very limited.

PVC is **not** allowed as a primary material to be used in Nordic Swan Ecolabelled windows and doors.

Production of wood windows and doors treated with vacuum impregnation and/or surface treatment using organic solvents, results in emissions of volatile organic compounds (VOC) to air. Hence strict limit levels regarding VOC-emissions from solvent-based wood impregnation and surface treatment must be fulfilled.

The criteria have also been updated from a circular economy point of view with new requirements related to recycling of production spill of float glass into new float glass and requirements to improve material recycling from windows and doors by end-of-life.

Long service life will reduce the environmental impact from windows and doors significantly, and to offer a long service life, Nordic Swan Ecolabelled windows and doors must document good function and quality and have clear instructions for installation and maintenance.

For an overview of the changes in this revised generation 5, see the table in section 5.

2 Environmental Impact of Windows and External Doors

As a basis for the criteria development, Nordic Ecolabelling has performed a MECO-analysis and an RPS-analysis to evaluate the environmental impact from windows, window doors and external doors.

The purpose of the MECO-analysis (materials/resources (M), energy (E), chemicals (C) and other impact areas (O)) is to assess all the relevant environmental aspects throughout the life cycle of the windows, window doors and external doors, ref. MECO-analysis for Windows and Exterior Doors[1]. The MECO-table is attached in Appendix 1.

Nordic Ecolabelling sets requirements concerning the topics and processes in the life cycle that have a high environmental impact – also called hotspots. An RPS-analysis is used to identify where ecolabelling can have the greatest effect. R represents the environmental relevance; P is the potential to reduce the environmental impact, and S is the steerability on how compliance with a requirement can be documented and followed up.

In the table below, the summary of the RPS is given. The aspects where the assessment concludes with high or medium RPS are those covered by requirements in the criteria. Background documentation for the assessments is Life Cycle Assessments[2,3,4] (LCAs), a SINTEF Byggforsk report[5], a prestudy for window renovation[6] and the background document for the previous version of the criteria[7]. The LCAs are made for windows, but it is assumed that most of the environmental impacts for windows, are applicable for external doors.

Table: Summary of the RPS-analysis

Lifecycle stages	Area and assessment of R, P, S (high, medium or low)	Comments
Raw materials		
	Consumption of material resources due to extraction and production of materials used in windows and doors. R: High P: High S: High	RPS = high The environmental impact on natural resources and energy demand from use of raw materials is high. To reduce the environmental impact, Nordic Ecolabelling wishes to drive the trend towards more material recovery and more use of renewable materials. Nordic Ecolabelling set strict requirements to non-renewable materials. We also set indirect requirements for use of more renewable materials via a differentiated U-value

[1] MECO for Windows and Exterior Doors, Anita Øygarden Burgos, 26.09.2023
[2] LCA,"Whole Life Analysis of timber, modified timber and aluminium-clad timber windows", Dr. Gillian F. Menzies, Heriot Watt University, 2013
[3] LCA, «The influence of durability and recycling on life cycle impacts of window frame assemblies», Stephanie Carlisle and Elizabeth Friedlander, 2016
[4] «Analysing the environmental impact of windows: A review», Jean Souviron et.al. Building and Environment, 2019
[5] Project report, «Moderne trevinduer – funksjonalitet, levetid og design», Heidi Arnesen et.al. SINTEF Byggforsk, 2009
[6] "Forstudie om mulighetene for å svanemerke vindusbytte/-renovering", Nordisk Miljømerking, 25.04.2023
[7] Background Document for the 062 Criteria for Windows and Exterior Doors, Nordic Ecolabelling, 29.11.2022, version 4.15

		requirement for products made from renewable materials compared with non-renewables.
	Energy used for material extraction and production. R: High P: Medium S: Low	RPS = low The environmental impact from energy used for material extraction and production is high, but the steerability is low. See also above.
	Transportation of raw materials to the material producer. Transportation of materials to the window and door producer. And transportation of windows and doors to sales location and finally to the consumers/ installation location. R: High P: High S: Low	RPS = low Environmental impact from transportation of raw materials, materials and products is high. Unfortunately, Nordic Ecolabelling assesses the steerability of imposing requirements with regard to transportation as low.
	Loss of forest/biodiversity. R: High P: Medium S: Medium	RPS = medium It is relevant to impose criteria on wood raw material due to the environmental impact from loss of forest/biodiversity. Wood can be sustainably grown and can be sourced from areas where forestry is certified according to a certification system. Steerability is good through requirements for certification and traceability along the processing chain.
Production		
	Energy used for production of windows and external doors. R: Low P: Medium S: Medium	RPS = low As the main part of the energy consumption occurs during the use phase, rather than during production phase, Nordic Ecolabelling focuses on requirements relating to the window's or the door's thermal transmittance and air permeability. Nordic Ecolabelling believes that it is not relevant to impose direct energy requirements on the production.
	Emissions to air from solvent-based impregnation and surface treatment. R: High P: Medium S: Medium	RPS = medium Emissions to air from solvent-based impregnation and surface treatment have a clear environmental relevance and the steerability is good, which is why Nordic Ecolabelling has strengthened the requirements for VOC-emissions from the impregnation production process and keeps the requirement for emissions from the solvent-based surface treatment process.
	Emissions to working environment from chemical products like sealant, surface treatment, impregnation etc. R: Medium P: Medium S: Medium	RPS = medium Nordic Ecolabelling sets strict requirements to all chemical products used in the production to reduce exposure to health hazards from chemicals during the production phase.
Use phase		
	Energy consumption for heating due to heat transfer/loss through windows and external doors. R: High P: High S: High	RPS = high Several LCA studies indicate that heat loss during the usage phase is the most important environmental impact of windows and external doors over the course of their life cycle. The thermal surface properties of windows and external doors are important in order to ensure energy efficient buildings. The steerability is high as it is possible to set requirements for the thermal transmittance (U-value) and the air permeability for windows and external doors.

		To reduce health impact, a minimum value is also included for the daylight transmittance to ensure a minimum amount of daylight that enters through a window/window door.
	Use of chemical products (oil, lacquer and paint) for surface treatment during production causing emissions to indoor climate and exposure to health hazards in the use phase. R: Medium P: High S: High	RPS = high Nordic Ecolabelling sets strict requirements to all chemical products used for surface treatment in the production to reduce exposure to health hazards from chemicals in the use phase.
End-of-Life		
	Service life. R: High P: High S: High	RPS = high Short service life for windows and external doors has a major environmental impact. Nordic Ecolabelling sets strict requirements for durability and functional testing.
	Landfill or incineration by end-of-life instead of material recovery/recycling. R: High P: Medium S: Low	RPS = medium Large quantities of windows end up on landfill or incineration. By windows' end-of-life, sending the windows for landfill and/or incineration is today most often easier and cheaper than sending windows for disassembly and material recycling. Some recycling facilities and partnering projects exist with the aim to increase the material recycling of window materials specially for aluminium, PVC and glass. For glass, the aim is to increase the amount of glass being used again as glass packaging and/or insulation (downcycling) but also as new float glass. Nordic Ecolabelling has requirements for design for disassembly and production waste management. In this generation a new requirement is also introduced to improve the producer's support to material recycling. Customers must be informed about that windows and doors should be sent to material recycling using national waste collection systems where such system exist. And if such national system is not established, the producers must take initiative or actively support initiatives/partnering projects to establish national waste collection systems for material recycling of windows/doors.
	Contribution to the greenhouse effect due to leakage from windows of filler gases with GWP (Global Warming Potential). R: Low P: Low S: High	RPS = low The filler gases normally used for insulation in insulation glasses are argon, xenon and krypton. All are noble gases with GWP = 0. But as xenon and krypton require more energy for its production compared to argon, the requirement for filler gases is kept to stimulate to the use of argon rather than xenon and krypton.
	Reduced material recycling due to content of hazardous chemicals in the materials. R: Medium P: Medium S: Medium	RPS = medium Nordic Ecolabelling sets strict requirements to the chemical products and materials used to produce windows and external doors. This will increase the possibility to recycle materials.

3 Justification of the Requirements

This chapter explains the background for all requirements and any changes compared with generation 4 of the criteria.

3.1 Definition of the product group

Nordic Swan Ecolabelled products are windows, window doors and external doors which separates the internal climate from the external climate of a construction.

Nordic Ecolabelling's criteria for Windows and External Doors cover products pursuant to standard EN 14351-1. This means that the following products may carry the Nordic Swan Ecolabel:

- Fixed and opening facade and roof windows (manually or electrically operated).
- Window doors (e.g. balcony and terrace doors).
- External doors.

Windows, window doors and external doors not covered by the standard EN 14351-1 are not covered by these criteria.

Interior doors are not included in these criteria as they can be labelled under the Nordic Ecolabelling criteria for the product group Furniture and Fitments.

The frame, casement and door leaf in Nordic Swan Ecolabelled windows, window doors and external doors must be made from the following materials:

- wood
- metal, aluminium or steel
- a combination of these materials, e.g. wooden windows with aluminium cladding or windows with combined wooden and aluminium casement.

PVC is **not** allowed as a primary material to be used in frames, casements and door leaves in Nordic Swan Ecolabelled windows, window doors and external doors.

Windows, window doors and external doors manufactured from primary materials other than those listed above must be assessed by Nordic Ecolabelling before they possibly can be considered for labelling. Nordic Ecolabelling will determine which new materials that possibly may be included in the product group.

3.2 Definitions

Table: Definitions

Term	Definition/explanation
Air permeability	Amount of air passing through all joints between casement or leaf and frame profiles of a test specimen caused by the test pressure.
Daylight transmittance	Daylight transmittance, expressed in %, is a measure of the amount of daylight that enters through the window.
DVV	Dansk Vindues Verifikation
External door	A door which separates the internal climate from the external climate of a construction. The main intended use is the passage of pedestrians.
External cladding	External cladding refers to wooden windows, where the external components of the window, i.e. the wooden frame and/or casement, are covered usually in aluminium. The purpose is to provide weatherproofing, increase durability and reduce the need for regular maintenance.
Float glass	Also called flat glass and typically used in window glass. Made by pouring molten glass on a bed of molten metal (mostly tin). Through this process the glass gets a uniform thickness and a flat surface.
GWP	GWP stands for Global Warming Potential. This is a measure used to compare the potency of various greenhouse gases in causing global warming over a specified time period, typically 100 years, relative to carbon dioxide (CO_2). Gases with higher GWP values have a greater potential to contribute to global warming than those with lower values.
Insulation glass	Consists typically of units with 2, 3 or 4 panes of glass separated by a space filled with gas (argon for example). The purpose of such insulation glass units is to reduce heat transfer through windows/window doors.
LCA	Life Cycle Assessment
MECO-analysis	MECO stands for materials/resources (M), energy (E), chemicals (C) and other impact areas (O). The purpose of the MECO-analysis is to assess all the relevant environmental aspects throughout the life cycle of a product.
Nanomaterials/-particles	Nanomaterials/-particles are defined according to the EU Commission Recommendation on the Definition of Nanomaterial (2022/C 229/01): 'Nanomaterial' means a natural, incidental or manufactured material consisting of solid particles that are present, either on their own or as identifiable constituent particles in aggregates or agglomerates, and where 50% or more of these particles in the number-based size distribution fulfil at least one of the following conditions: (a) one or more external dimensions of the particle are in the size range 1 nm to 100 nm; (b) the particle has an elongated shape, such as a rod, fibre or tube, where two external dimensions are smaller than 1 nm and the other dimension is larger than 100 nm; (c) the particle has a plate-like shape, where one external dimension is smaller than 1 nm and the other dimensions are larger than 100 nm.
NDVK	Norsk dør- og vinduskontroll
Primary material	The main materials in the frame, casement and door leaves, including cladding. Materials in small parts like hinges, handles, fittings, kick plates, lists, gaskets or very thin laminates/films are not seen as primary material.
PVC	Polyvinyl chloride, a chlorinated polymer/plastic.
RPS-analysis	Nordic Ecolabelling sets requirements concerning the topics and processes in the life cycle that have a high environmental impact – also called hotspots. An RPS-analysis is used to identify where ecolabelling can have the greatest effect. R represents the environmental relevance; P is the potential to reduce the environmental impact, and S is the steerability on how compliance with a requirement can be documented and followed up.
Solar energy transmittance (g-value)	Solar energy transmittance, expressed as the g-value (%), specifies how much solar radiation that enters through the window.
Steel	Steel is used about carbon steel and stainless steel.
Thermal transmittance (U-value)	Thermal transmittance, expressed as the U-value (W/m^2K), is the rate of heat transfer, for example through a window.

VOC	Volatile Organic Compound, i.e. any organic compound having at 293,15 K a vapour pressure of 0,01 kPa or more, or having a corresponding volatility under the particular conditions of use, as defined in Directive 2010/75/EU.
Water tightness	A measure of tightness to avoid water leakages during precipitation and wind.
Window door	Constructed as a window, which extends to floor level and allows access or passage for persons. Can be partially or fully glazed like balcony and terrace doors.
Wood preservative	Wood preservative means an agent used in impregnation, primer or surface treatment that makes the wood resistant to fungal attack/rot.

3.3 Description of the product and the production

Background to requirement O1

To know which environmental requirements that are applicable to a window, window door or external door, Nordic Ecolabelling needs a description of the production process and of the components, materials, chemicals, suppliers and producers of each product including the percentage by weight of each material.

A Nordic Swan Ecolabel licence that covers several types/models of windows, window doors or external doors within the same family or series can be given. This is possible because the U-value is given for the reference size of the product, and thus apply to all sizes of the same product in the series/family with the same construction as the example used in the U-value-calculations.

The percentage by weight for each material under this requirement, must be given for the reference size of the product representing the same family or series.

3.4 Energy requirements

The energy requirements cover thermal transmittance, daylight transmittance, air permeability and climate testing.

Background to requirement O2

The Nordic Ecolabelling wish to tighten the requirement of thermal transmittance. The requirement level has been tightened for wooden windows and window doors with water-based impregnation compared to the previous criteria generation. However, for roof windows and windows made from a large share of non-renewable material the limit values have been found to be too strict in generation 4. These limit values have been increased slightly in generation 5, to better reflect the market. Still, the values are very strict and only a small percentage of the market will possibly be able to fulfil these values.

Also, the classification in this requirement has been clarified for windows made with a combination of wood and the non-renewable material aluminium. Now wooden windows with a maximum of 25 weight% aluminium in the frame/casement are classified as wooden windows. Windows with more than 25 weight% aluminium are classified as non-renewable windows. The insulation glass/window glass shall not be included in the percentage calculation. In the previous criteria, generation 4, wooden windows with cladding in non-renewable materials (typical aluminium) were classified as wooden windows, while windows made with a combination of wood and non-renewable material like aluminium as

primary materials in the frame and casement, were classified as non-renewable windows. Information from window producers[19] has shown that the weight percentage of aluminium used in such frames/casements is approximately the same as used for cladding. Based on this, windows with aluminium cladding and windows with wood/aluminium in the frame/casement, will now be handled equally.

Windows, window doors and external doors play an important role in the energy consumption of buildings during their use phase. Life cycle assessments that include the use phase of windows show that the most significant impact in a window's life cycle is linked to its ability to insulate and thus save energy in the building in which the window is installed.[8] Improvements in energy performance of windows lead to reductions in heating and cooling needs during the use phase.

The thermal transmittance, the U-value, is a measurement of how well the window, window door or external door insulates against heat losses. Heat loss through windows should be minimised by optimising:

1. Window size and orientation

2. Glass type, number of glass panes and glass film

3. Frame/casement material and composition

Note that Nordic Ecolabelling can only influence point 2 and 3.

Nordic Ecolabelling requires different U-values for windows and window doors depending on the material, i.e. wood or non-renewable material. The reason for this is that there are differences in the embodied energy of different materials. Manufacturing entirely wooden windows uses least energy, while a window made of only non-renewable material uses considerably more energy.[9] Based on a holistic view of a window's life cycle energy performance, the U-value-requirement is differentiated based on material type.

There are also windows made from recycled aluminium. But even if recycled aluminium is used in window production, it will lead to extraction of new aluminium elsewhere, since there is not enough supply of recycled aluminium on the market to cover the demand. This is the basis for including recycled aluminium in the "non-renewable material" category.

In the previous criteria, generation 4, also the required U-values for wooden windows were differentiated based on the impregnation method used. Windows impregnated with the solvent-based vacuum impregnation method had to achieve a lower U-value than windows impregnated with water-based technology. However, this differentiation has been removed in this criteria generation, and the environmental impact from vacuum impregnation is instead handled by a stricter requirement for the VOC-emissions from vacuum impregnation, see requirement O17.

As a result, the U-value level for wooden windows with water-based wood preservation has been tightened, as all wooden windows are now classified in the

[8] «Analysing the environmental impact of windows: A review», Jean Souviron et.al. Building and Environment, 2019
[9] "Embodied impacts of window systems: A comparative assessment of framing and glazing alternatives" Shiiva Saadatian et. al., 2021

same category. The level of 0,84 for all facade wooden windows has been chosen based on a market overview and with inspiration from the classification system introduced by the Danish government.[10]

Since 2018, the Danish government has classified windows that meet a minimum U-value of 0.84 as energy-efficient and suitable for promotion in window replacements. Nordic Ecolabelling considers this level to be ambitious and effective in driving the market towards more energy-efficient windows, and thereby reducing energy losses from buildings.

In Denmark, there is also another energy classification system for windows ranging from A to G. This has been in place since 2011 and was developed by the Danish window association and implemented in the Danish legislation. The system is based on a method for calculating energy balance, designated E_{ref}, from windows in a fictional reference building in Denmark. E_{ref} is a function of both the U-value and the g-value ($E_{ref} = 196.4 \times g_w - 90.36 \times U_w$), and the balance must be positive to achieve Class A.[11] Class A is also, since 2021, the minimum level required by the Danish law[12] when installing windows. However, Nordic Ecolabelling still assess that requirements for the energy balance of windows cannot be implemented in the Nordic Ecolabelling criteria for windows due to several reasons. The reason is that the energy balance model is developed for the Danish climate and may not be representative of all Nordic countries. Additionally, the system is based on a reference building that is fictional, and a real building would look different and have a different energy balance. The Nordic Ecolabelling does not have any steerability of where and in which building the windows are installed.

The required U-values of 0,84 or lower for facade windows are also reasonable in relation to the taxonomy requirements. According to the taxonomy, windows must be constructed with a U-value less than 1.0.

Background to requirement O3

Daylight transmittance

The daylight transmittance requirement is kept at the same level as in previous generation of criteria. Daylight transmittance is a very fundamental property of windows since the main function of a window is to let light into the building. Daylight transmittance is a measurement of the amount of daylight that enters a building through a window, and that sufficient light is let into buildings, has a health impact.

The requirement for daylight transmittance must be met by both windows and window doors but not by external doors that have a significantly smaller proportion of window glass (if any at all).

[10] https://www.glasfakta.dk/viden/vinduer/doere/regler-og-vejledninger/positivlister-for-energivinduer-tilskud-fra-bygningspuljen/ visited April 2024
[11] https://energivinduer.dk/ visited April 2024
[12] https://bygningsreglementet.dk/Tekniske-bestemmelser/11/Krav visited April 2024

Solar energy transmittance

Solar energy transmittance, g-value, is a measurement of how much solar energy in the form of heat, enters through a window. A high g-value means that the window allows a high level of heat radiation into the building.

During the last years, the legislation regarding windows has been updated and tightened, especially in Denmark. Now, the Danish energy balance, E_{ref} must be positive for windows installed in buildings in Denmark. The energy balance referred to in Danish legislation is a function of the U- and the g-value for a reference building in Denmark.[10, 11, 12.]

It has been evaluated whether the Nordic Ecolabelling could require a minimum solar energy transmittance level. That, in combination with the requirement for thermal transmittance, would guarantee that a Nordic Swan Ecolabelled window would fulfil legislation in Denmark. The consequence would be that producers that supply other markets with windows, would have to develop U- and g-values according to the energy balance model that is specifically developed for Danish circumstances.

How much heating contribution a window creates depends on its positioning. High g-values might result in a risk for over-heating, with increased need for cooling. Nordic Ecolabelling has therefore re-evaluated the requirement and concluded that the steerability of setting a requirement for the g-value is weak. Based on this, the requirement for g-value has been removed.

Background to requirement O4

The requirement is unchanged regarding air permeability of windows compared to generation 4 of the criteria. The requirement to air permeability and climate testing of external doors is updated according to latest standards and clarified that it must be tested in climate A and D, that best corresponds to Nordic winter climate.

If a window or door is not airtight, much energy can be lost. Also, wood is a flexible material that moves in different ways at different temperatures and humidity levels. Sealing must accommodate that movement and ensure that the window/door closes tightly. In order to ensure a satisfactory sealing in the Nordic Swan Ecolabelled products, windows shall meet the strictest class, Class 4 according to the classification system in EN 12207, which is the same level as in previous generation of the criteria and in line with NDVK's air permeability requirements[13].

An external door that has been tested for air permeability, i.e. that meets Class 4 pursuant to EN 12207, may lose its air permeability properties in a real operating environment. Doors can warp in different climates and the air permeability will be compromised unless the manufacturer has taken this into account. Due to this, Nordic Ecolabelling requires doors to undergo a differential climate testing to ensure that the air permeability properties are kept over time in different moisture and temperatures. The requirement says that "doors must be tested /…/ in combination with climate a and d* test ". This means that the air

[13] "Krav til dører og vinduer", NDVK, 2023

permeability must be measured first in climate a, and then in the end of the test period, in climate d.

3.5 Material requirements

In this section the material requirements are given for the following frame, casement and door leaf primary materials:

- Wood
- Aluminium
- Steel

Requirements are also given for the insulation materials and for filler gases used in the insulation glass units. Window, window doors and external door frames, casements and door leaves manufactured from primary materials other than those listed above must be assessed by Nordic Ecolabelling before they can be considered for labelling.

PVC is not allowed to be used as a primary material.

Smaller parts like lists, gaskets, foils etc. can be made in **materials without requirements**, i.e. plastic, rubber, composite etc. as long as they constitute less than 10 weight% of the product without glass for each specific material.

Foils covering more than 30% of the product surface, must fulfil requirement O14 Prohibited substances.

There are no material requirements for the glass material used in window and door glass/insulation glass units. Chemicals used to produce glass must fulfil the chemical requirements.

Background to the material requirements

The material requirements have been updated for the following frame, casement and door leaf primary materials: wood, aluminium and steel which are materials that are widely used to produce window and external doors[14,15,16].

Composite materials are also used to make windows, window doors and external doors. But as these materials are not easy to reuse in a circular economy, and Nordic Ecolabelling has not had any interest from external stakeholders in ecolabelling such products, Nordic Ecolabelling has decided to not develop material requirements for composite materials in this criteria generation. Followingly, it is not possible according to the new criteria generation to ecolabel windows and doors made of composite materials.

For PVC, Nordic Ecolabelling has decided to no longer allow this material as primary material in windows and door frames, casements and leaves.

[14] https://parkwooddoors.co.nz/a-guide-to-the-most-common-exterior-door-materials/ (visited March 2024)
[15] Webpages for several Nordic and European window and external door producers
[16] https://www.understandconstruction.com/materials-for-windows.html (visited March 2024)

The decision is based on the following;

- As LCAs[17,2,3,4] show that PVC compared with wood and aluminium is the material with shortest service lifetime as it cannot be repaired and the largest environmental impact in most impact categories. The ECHA investigation report on PVC[18] refers to studies that also conclude that PVC has larger environmental impact than the other window materials, but the ECHA report also refers to studies that consider the impacts of aluminium to be the highest and wood lowest, with PVC in the middle.
- Nordic Ecolabelling wanted to introduce stricter PVC-requirements in this new generation, but the feedback from producers[19] is that today's PVC requirements are too strict, especially regarding the limit value for the permitted content of lead in recycled PVC.
- Waste collection systems for material recycling of PVC is per today not established in the Nordic countries except from in Denmark.

The feedback during the consultation is that a lot of work is ongoing to improve PVC to a more sustainable material. Nordic Ecolabelling acknowledge this work and follow the ongoing initiatives and projects closely. But based on the information we have as per today on the environmental impact from the whole life cycle of PVC windows and doors, Nordic Ecolabelling have decided to not allow PVC as a primary material to be used in windows and doors in this generation of the criteria.

For window glass/float glass, Nordic Ecolabelling has evaluated whether it is possible to introduce a requirement for window glass made with a portion of recirculated glass material. Based on feedback from window producers[19] and information from float glass producers' websites[20,21,22], the conclusion is that the market for float glass made with recirculated glass, is still very limited. Nordic Ecolabelling has decided to not introduce such a requirement in this generation of the criteria but will follow the situation and ongoing projects closely to prepare for such a requirement in the next generation.

In addition to the primary materials, window and doors consist of many smaller parts. Smaller parts like lists, gaskets, foils etc. made in **materials without requirements**, i.e. plastic, rubber, composite etc., can be used as long as they constitute less than 10 weight% of the product without glass for each specific material.

Foils covering more than 30% of the product surface, must fulfil requirement O14 Prohibited substances.

[17] M. Asif, et al. Sustainability analysis of window frames, Building Services Engineering Research & Technology. (2005).
[18] "Investigation report on PVC and PVC additives", ECHA, final report, 22.11.23
[19] Meetings with licence holders and other window and door producers, autumn 2023
[20] https://www.reiling.de/en/recycling-products#progress--anchor--151, visited March 2024
[21] https://www.pilkington.com/nb-no/no/produkter/funksjonsglass/spesialglass/pilkington-mirai, visited March 2024
[22] https://www.ragnsells.com/about-us/press-media/articles/flat-glass/, "Circular solution for flat glass", news article posted on 14th of March 2024

3.5.1 Wood

The requirements are applicable to all wood raw material except for wooden plugs or other smaller wooden parts with a weight of 100g or less per unit.

Wood that are certified according to Nordic Ecolabelling's criteria for Durable Wood automatically comply with the requirements in this section.

Background to requirement O5

The requirement has been updated with the latest version of Nordic Ecolabelling's list of restricted tree species.

The requirement applies only to virgin tree species and not tree species defined as recycled material according to ISO 14021.

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

Criteria for tree species found on the list are:

a) Tree species listed on CITES Appendices I, II and III.

b) IUCN red list, categorized as critically endangered (CR), endangered (EN) and vulnerable (VU).

c) Regnskogfondet (Rainforest Foundation Norway) tree list.

d) Siberian larch (originated in forests outside the EU).

Species on the CITES list are prohibited for use in Nordic Swan Ecolabelled windows and external doors. CITES[23] is an international convention for the control of trade (across borders) of wild fauna and flora. The tree species on CITES are, dependent on how threatened they are, listed in Appendix I, II or III. Species listed in Appendix I, are highly endangered and trade with these species is totally banned. For the remaining tree species, special permits for import and export are required (Appendices II and III). CITES is regulated by EU legislation (Council Regulation (EC) No 338/97) and trees with valid CITES permits are considered to be legally harvested under EUTR (EU Timber Regulation). Nordic Ecolabelling's ban on the use of tree species listed in CITES (Appendix I, II or III) goes beyond the EU legislation. CITES regulates trade in endangered species, and there are also challenges with corruption in the trade in wild animals and plants.[24] Therefore, Nordic Ecolabelling does not want to approve species on any of the appendices.

IUCN Red Lists[25] are the world's most comprehensive inventory of the global conservation status of the planet's biological species, including trees. IUCN Red

[23] https://cites.org/eng (visited January 2020)
[24] Addressing corruption in CITES documentation processes Willow Outhwaite, Research and Analysis Senior Programme Officer, TRAFFIC, 2020: https://www.traffic.org/site/assets/files/12675/topic-brief-addressing-corruption-in-cites-documentation-processes.pdf
[25] http://www.iucnredlist.org/ (visited January 2020)

List has established clear criteria to assess the risk of extinction according to the origin of the tree species. These criteria cover all countries and all species in the world. Nordic Ecolabelling is aware that the IUCN's red list system only focuses on the extinction risk of species, and therefore is not designed for an overall assessment of whether a tree species can be provided with sustainable origin. However, the list is continually being updated and thereby is an important tool to estimate a specific tree species' conservation status on a global scale. Nordic Ecolabelling wishes to prohibit tree species listed as endangered (categories CR, EN and VU).

Regnskogfondet[26] (Rainforest Foundation Norway) is an NGO in Norway that works to protect the world's remaining rainforests. Currently, Regnskogfondet does not see any credible certification schemes working in the tropics, and therefore recommends full stop of buying tropical timber. Regnskogfondet has developed a list of tropical tree species based on tree species found on the Norwegian market. This list works as a guide to comply with Norwegian guidelines regarding non-use of tropical wood in public construction. Nordic Ecolabelling consider this a pragmatic approach for handling tropical tree species on the Nordic market.

In addition, Siberian larch (originated in forests outside the EU) is on the Nordic Ecolabelling's tree list. Siberian larch is a coveted tree species in the construction industry due to its high quality. The tree species is widespread in the Eurasian northern boreal climate zone, and particularly the species Larix sibirica, Larix gmelinii, Larix cajanderi and Larix sukaczewii are widespread in the large areas of intact forest landscapes (IFL) in Russia. Siberian larch is to be seen as an indicator species for boreal IFL-areas which are important to keep intact.

Exemption from the tree list

Nordic Ecolabelling is aware that tree species originating from b), c) or d) can originate from legal and sustainable forestry. Therefore, it is possible to use tree species listed on b), c) or d) if the applicant/manufacturer/supplier can demonstrate compliance with a number of strict requirements regarding certification and traceability.

Many of the tree species on the list are grown in countries which still have large areas of IFLs. These are important to protect due to biodiversity and climate. Many of these countries also have a high risk of corruption and the national legislation related to environment, human rights and ownership to land are weak and/or not controlled by the authorities. There are different views on whether certification is good enough to meet the challenges of forest management in land with a high risk of corruption and illegal logging. For instance, relevant challenges related to this have been published by Danwatch in a number of articles in 2018 [27],[28] and by redd-monitor.org in 2019[29]. Greenpeace International has ended its memberships in FSC on the grounds that the certification body is

[26] https://www.regnskog.no/no/hva-du-kan-gjore/unnga-tropisk-tommer/tropiske-treslag (visited January 2020)
[27] https://danwatch.dk/undersoegelse/dokumentfalsk-og-millionboeder-danske-byggemarkeder-saelger-trae-forbundet-til-ulovlig-hugst-i-amazonas/
[28] https://danwatch.dk/undersoegelse/baeredygtighedsmaerke-er-ingen-garanti-for-baeredygtigt-trae/
[29] https://redd-monitor.org/2019/08/29/evicted-for-carbon-credits-new-oakland-institute-report-confirms-forced-evictions-for-green-resources-plantations-in-uganda/

no longer meeting its aims of protecting forests and human rights[30]. Other environmental organisations like WWF support certification as an important tool for sustainable forestry in these countries. However, due to the uncertainty whether FSC and PEFC certification systems are good enough in protecting important areas of biodiversity and ethical aspects like human rights and land ownership in areas with a high risk of corruption, Nordic Ecolabelling have a precautionary approach and wants further documentation about the tree species and its origin.

To document full traceability of the tree species, the applicant/manufacturer/ supplier must present a valid FSC/PEFC Chain of Custody certificate that covers the specific tree species and demonstrate that the tree is controlled as FSC or PEFC 100%, through the FSC transfer method or PEFC physical separation method. This means that Nordic Ecolabelling does not accept the FSC percentage or credit control system as well as PEFC percentage system. Full traceability of the tree species back to the forest/certified forest unit, enables the applicant/manufacturer/supplier to document that the tree species does not come from an area/region where it is IUCN red listed, categorized as CR, EN or VU. Full traceability also makes it possible to document that the tree species does not come from Intact Forest Landscape (IFL), defined by Intactforest.org in 2002[31]. Intactforest has been monitoring IFL-areas since 2000 and has developed an online up to date mapping tool that shows the extent of IFL back to 2002. The monitoring results shows that the world's IFL are being degraded in an alarming speed, and that is the reason for Nordic Ecolabelling referring back to 2002.

Plantation: Nordic Ecolabelling believe that responsibly run forest plantations can play a role in preserving natural IFLs by reducing the pressure to harvest the world's remaining natural forests. In order to secure that plantation has not replaced native ecosystems (forest/grasslands) within the last 25 years, tree species has to come from FSC or PEFC certified plantations that were established before 1994. 1994 is in line with FSCs international forest management standard (version 5.2), whereas PEFC is working with 2010.

Background to requirement O6

The requirement has been updated with the latest version of Nordic Ecolabelling's forestry requirement. The forestry requirement focuses on sustainable forestry and the traceability of the wood raw materials.

The many benefits that sustainably managed forests deliver to society include wood for materials and energy, protection against global warming, homes and livelihoods for local communities and indigenous peoples, support of biodiversity and protection of water and soil from pollution and erosion. By setting a requirement that wood raw materials must originate from certified, sustainably managed forests, Nordic Ecolabelling is supporting the move towards more sustainable forestry practices.

Nordic Ecolabelling requires a declaration of the species of wood contained in the Nordic Swan Ecolabelled product. This makes it possible to check the validity of

[30] https://www.greenpeace.org/international/press-release/15589/greenpeace-international-to-not-renew-fsc-membership/
[31] http://www.intactforests.org/world.webmap.html, visited January 2020

Chain of Custody certificates in the supply chain. The requirement for CoC certification improves the traceability of materials in the supply chain within the guidelines and control systems of the FSC and PEFC. The company's CoC certification proves how certified wood is kept separate from other wood during production, administration and storage and is inspected annually by independent certification bodies. Under this requirement, CoC certification must be held by either the applicant/manufacturer or the supplier of wood raw materials. Nordic Ecolabelling considers it is too strict to require the applicant/manufacturer to hold CoC certification. If the applicant/manufacturer has CoC certification and is able to label the finished product with the FSC/PEFC logo, there is a requirement that the certified wood raw material is allocated to the Nordic Swan Ecolabelled product. This ensures that FSC/PEFC credits are used for the Nordic Swan Ecolabelled production and that the credits are not sold twice. This will stimulate increased demand for certified wood raw materials because more certified wood raw materials must be purchased if the manufacturer wants to label other products, and not just the Nordic Swan Ecolabelled products, with the FSC/PEFC logo. It also means that a Nordic Swan Ecolabelled product can have both the Nordic Swan Ecolabel logo and the FSC/PEFC logo. However, there is no requirement for the applicant/manufacturer to have CoC certification. If CoC certification is held by the supplier, the applicant/manufacturer must have documentary evidence of purchase of certified raw material in the form of claims on the invoice or delivery note, showing that a minimum of 70% certified wood raw material has been purchased. Please note that Nordic Ecolabelling approves both the percentage system and the credit system for bookkeeping and sales of certified material.

The requirement has increased the minimum percentage to 70% for all wood species. Previously, this requirement only applied to pine, fir, birch and tropical wood. Tropical wood is now largely covered by the requirement concerning restricted tree species. Public sector tenders often require a certification percentage of 70%. The remaining percentage of wood raw materials must be FSC Controlled Wood or wood from PEFC Controlled Sources. The minimum requirement set by FSC and PEFC for the use of their logos on products is also 70%.

3.5.2 Metals

The requirements are applicable for respectively steel and aluminium.

- The steel requirements apply when steel constitutes more than 30 weight% of the total weight of the product except the weight of the glass.
- The aluminium requirements apply when aluminium constitutes more than 20 weight% of the total weight of the product except the weight of the glass.
- The metal requirements are not appliable for the following parts i.e. these parts must be included in the product weight calculation, but do not need to comply with the metal requirements:
    1. hinges, handles, fittings and kick plates
    2. other smaller parts with a weight of 100g or less per unit

Separate requirements are set for the production of steel and the production of aluminium. The requirements can either be met by having a high proportion of recycled steel or aluminium, or by meeting requirements for virgin steel production and primary aluminium production.

Background to requirements O7 and O8

The material requirements for metals have been updated in this generation of the criteria based on Nordic Ecolabelling's metal requirements and according to our latest knowledge on regulations, science reports, ongoing studies etc. The requirements have been changed to requiring either a high proportion of recycled material or fulfilling strict requirements for virgin steel production and/or primary aluminium production.

The more metal used, the larger environmental impact. Nordic Ecolabelling focus on setting requirements for windows and doors where metals constitute more than certain limit values based on weight%. The limits for when the requirements are to be met are 30% by weight for steel and 20% by weight for aluminium in the product excluding the weight of glass. The difference in limit values is because aluminium weighs significantly less than steel. Hinges, handles, fittings and kick plates and smaller parts with a weight of 100g or less per unit, must be included in the weight%-calculation for a window or door, but do not need to comply with the metal requirements and no material documentation is required for these parts.

In this criteria generation stainless steel is permitted to be used in all parts of windows and doors also window profiles and door leaves. The background is that stainless steel will usually give products/parts with better shelf life, strength and less wear and tear than ordinary steel and will no longer necessarily require more energy than ordinary steel to be produced due to improved production processes.

Using recycled metal significantly reduces the environmental impact and provides a significant climate benefit. Among other things, this is highlighted in the taxonomy work in the EU[32]. Nordic Ecolabelling is aware that the availability of recycled metal and traceability can be a challenge. But in a world with an increasing focus on circular economy, Nordic Ecolabelling believes that there will be an increased focus on this in the future. Traceability in the production chain is also a value in itself, and is important for several aspects, e.g. it provides opportunities to select suppliers based on e.g. environmental work, working conditions and quality. Demand for traceability will hopefully contribute to the industry also placing increased focus on this. For Al, Hydro has launched its own traceability certification with a minimum of 75% recycled Al, Hydro Circal.[33] In 2023 are 51.000 tonnes CIRCAL used for building systems within Hydro Building Systems globally, and the capacity will be increased to be around 250.000-350.000 tonnes per year in 2030[34]. The industry average for EU-produced Al is approx. 50% recycled, while for Al outside the EU it is approx.

[32] Taxonomy report, technical annex, EU technical expert group on sustainable finance, March 2020.
[33] https://www.hydro.com/en/products-and-services/low-carbon-aluminium/hydro-circal-75r/ (available 2019-10-17)
[34] Consultation response from Hydro Building Systems Sweden, 28.08.24

40%. The big environmental benefit comes from the use of post-consumer recycled aluminium.

The two steel production processes are Basic Oxygen Furnace (BOF) for which the input is iron ore, and Electric Arc Furnace (EAF) for which the input is mainly scrap steel. The current requirement of 20% recycled metal has no significant impact since all steelworks, including the BOF plants, meet this today. It is therefore necessary to raise the requirement to promote the use of recycled steel and traceability. In practice, this means that steel that should contain more than 20% recycled steel must be produced at plants that use EAF technology. There are steel producers using the EAF process across the whole of Europe[35]. According to the World Steel Association[36] the EU produces 58% of steel using BOF and 41% using EAF technology. Globally, approx. 70% is produced using BOF and 30% using EAF technology.

In this version of the criteria, Nordic Ecolabelling has introduced requirements for virgin steel production and primary aluminium production. Requirements for metal can therefore be met either by including a high proportion of recycled, or that several requirements for primary metal production are met. The requirement model is based on a mandatory requirement to the steel / aluminium producer to have an energy and greenhouse gas calculation with defined reduction targets. Certification with Responsible Steel or ASI is something that Nordic Ecolabelling see as positive initiatives for a more sustainable metal production. These are independent certification systems with a focus on both economic, social and environmental aspects. For aluminium, the requirement can also be fulfilled by documenting direct emissions of greenhouse gases and energy efficiency in the electrolysis process, where the limits are based on values stated in the EU taxonomy report. Direct emissions are to be calculated according to the methodology used for EU-ETS benchmarks. Please note that these values may change based on the final outcome of the EU taxonomy work. For steel, the requirement can also be met if the steel comes from a manufacturer who has adopted new technologies that significantly reduce the climate impact from production. The technologies are similar to those stated in the EU's technical annex to the taxonomy report.

[35] http://www.eurofer.org/About%20us/About%20Steel/EuropeanSteelMap.fhtml
[36] https://www.worldsteel.org/en/dam/jcr:96d7a585-e6b2-4d63-b943-4cd9ab621a91/World%2520Steel%2520in%2520Figures%25202019.pdf

3.5.3 Insulation materials

The requirements are applicable for all insulation materials used in windows and doors like for instance XPS, EPS, mineral wool, polyuretane, polyisocyanurate, natural fiber etc.

Background to requirement O9

The requirement is tightened with a longer list of the substances/groups of substances that must not be used in insulation materials for windows and doors in quantities of 100 ppm or more.

The list is based on the general principles from Nordic Ecolabelling regarding undesirable compounds and also based on corresponding requirements for other Nordic Swan Ecolabelled construction products[37].

3.5.4 Filler gas

The requirements are applicable for filler gas.

Background to requirement O10

The requirement for filler gases is identical to the requirement in the previous generation. The filler gases normally used for insulation in insulation glasses are argon, krypton and xenon[38]. Krypton and xenon require more energy for its production compared to argon[7,39]. Based on this, Nordic Ecolabelling does not permit the use of krypton or xenon as a filler gas in Nordic Swan Ecolabelled windows or external doors.

Argon is a noble gas and does not contribute to the greenhouse effect as the GWP = 0 for all noble gases. If gases other than noble gases are used as filler gas, the gas must not contribute to the greenhouse effect. Documentation on this is required.

3.6 Chemical requirements

Introduction to chemical requirements

The chemical requirements apply to all chemical products, for example impregnation, paints, lacquers, glues, putty, fillers and sealants used by the manufacturer of the Nordic Swan Ecolabelled products and their suppliers of parts for Nordic Swan Ecolabelled products like for instance glass in windows and doors.

The requirement for nanomaterials applies to both chemical products and the glass in windows and doors.

For foils covering more than 30% of the product surface, requirement O14 Prohibited substances apply.

[37] Background Document for the 089 Criteria for New buildings, Nordic Ecolabelling, 15.05.2023, version 4.4
[38] https://www.hamiltonwindows.co.uk/double-glazing-gases/, 14.03.2024
[39] «Energy and environmental impact analysis of double-glazed windows», Energy Conversion and Management, G.Weir and T.Muneer, February-March 1998

The chemical requirements do not apply to touch-up paint or other patching products used by the manufacturer or their supplier if a small amount of damage occurs to the surface layer during manufacture, storage, transportation or installation.

Filler gas and insulation materials are not covered by the requirements in this section. Filler gas and insulation materials are instead covered by the requirements in respectively section 3.5.4 Filler gas and in 3.5.3 Insulation materials.

Chemical products that are ecolabelled with the Nordic Swan or the EU Ecolabel, do not need to document compliance with these chemical requirements.

Definitions

The requirements in the criteria document apply to all ingoing substances in the chemical product. Impurities are not regarded as ingoing substances and are therefore exempt from the requirements. Ingoing substances and impurities are defined as below, unless otherwise stated.

- Ingoing substances: All substances in the product, including additives (e.g. preservatives and stabilisers) in the raw materials. Substances known to be released from ingoing substances (e.g., formaldehyde, arylamine, in situ-generated preservatives) are also regarded as ingoing substances.
- Impurities: Residues from production, incl. raw material production, which remain in the chemical product at concentrations below 1000 ppm (0.1000% by weight). Examples of impurities are reagent residue incl. residues of monomers, catalysts, by-products, “scavengers” (i.e., chemicals used to eliminate/minimise undesirable substances), cleaning agents for production equipment and “carry-over” from other/previous production lines.

Background to requirement O11

Nordic Ecolabelling is generally committed to restricting the use of chemicals that are harmful to health and the environment, and the classification requirement prohibits the products of highest concern. The chemical requirements have been updated according to our latest knowledge on chemical regulations, science reports, ongoing studies etc.

Exemptions:

As in previous generation an exemption is given for impregnation and surface treatment classified with H411. Wood preservatives like propiconazole (CAS No. 60207-90-1) is widely used and few substitute products are available in the market. Use of propiconazole and other wood preservatives in impregnation and surface treatment, might give an H411 classification on the chemical product.

As in previous generation, an exemption is given for adhesive products containing methylene diphenyl diisocyanate (MDI). There are currently no substitute products that are widely available in the market. Hazard code H373 is

no longer exempted because it is not anymore forbidden hazard code in the requirement.

The exemption for adhesives containing formaldehyde is included for chemical products due to the new classifications for formaldehyde and that few substitutes for formaldehyde are available for use in adhesives. The exemption is only granted if the requirement concerning the content of free formaldehyde is fulfilled.

The exemption from the classification requirement for propiconazole (H360) and for IPBC (H372, H400 and H410) used in impregnation and surface treatment chemical products, is included since few substitutes for propiconazole and IPBC are available per today in the market. The exemption is only granted as long as propiconazole and IPBC are approved for use as wood preservative (PT8) according to the Biocides Regulation EU 528/2012. Based on producer's information, it is confirmed that the level of propiconazole in Nordic Swan Ecolabelled products, is well below the limit of 1000 ppm of propiconazole in the wood material which is the limit required by the EU Taxonomy.

Background to requirement O12

A ban on CMR Category 2 substances has been added to the requirement. Nordic Ecolabelling would like to restrict the use of substances that are carcinogenic, mutagenic and toxic for reproduction (CMR) to the greatest extent possible. This requirement now represents a further restriction on the classification requirement since it also applies to ingoing substances in the chemical product.

Exemptions are also needed in this requirement for methylene diphenyl diisocyanate (MDI) and formaldehyde. See more background information about this in requirement O11 Classification of chemical products.

In addition, there are exemptions for titanium dioxide (CAS No. 13463-67-7) and 1.1,1-Trimethylolpropane (TMP, CAS No. 77-99-6). Titanium dioxide is a white pigment that is used in many different types of products. 1,1,1-Trimethylolpropane (TMP) is used to coat titanium dioxide to make the titanium dioxide particles disperse more easily. About 90% of all titanium dioxide is dispersed with TMP. There are currently no replacement substances for titanium dioxide and TMP.

The exemption from the H360 classification requirement for propiconazole used as wood preservative in impregnation and surface treatment, is included due to the fact that few substitutes for propiconazole are available per today in the market. The exemption is only granted as long as propiconazole is approved for use in the Biocides Regulation EU 528/2012. Based on producer's information, it is confirmed that the level of propiconazole in Nordic Swan Ecolabelled products, is well below the limit of 1000 ppm of propiconazole in the wood material which is the limit required by the EU Taxonomy.

Nordic Ecolabelling has included the new CLP classifications to align with the European Green Deal's goal of a toxic-free environment. This inclusion reflects the need to establish hazard identification for endocrine disruptors and addresses criteria for environmental toxicity, persistency, mobility and bioaccumulation. By incorporating these classifications, Nordic Ecolabelling ensures that the criteria relate to up-to-date scientific understanding and regulatory compliance.

Additionally, the inclusion of PMT and vPvM substances is crucial due to their persistence, mobility and potential impact on water quality. Nordic Ecolabelling aims for comprehensive hazard identification and protection of the environment and human health.

Background to requirement O13

This requirement is new in this generation of the criteria and is based on the updated Nordic Ecolabelling chemical requirements.

The content of the preservatives bronopol, IPBC, CMIT/MIT and MIT is restricted via specific limit values. The content of the total amount of isothiazolinones is also limited.

Water-based paints and adhesives may contain the preservative bronopol and it is difficult to find substitutes. A limited amount of bronopol is therefore permitted although it is classified as a substance of concern and hazardous to the environment.

IPBC is a fungicide that has become more commonly used. The limit value and the exemption for wood preservatives used as an impregnation agent or primer that makes the wood resistant to fungal attack/rot (like IPBC), was originally the same as in the Nordic Ecolabelling's criteria for Outdoor furniture, but has been adjusted according to input during the consultation. The exemption from the limit value, is included due to the fact that few substitutes are available per today in the market.

Isothiazolinones are used as a preservative in many water-based products, where they act as fungicides, biocides and algal growth inhibitors. They are toxic to aquatic organisms and can cause varying degrees of allergic reactions. It has proved difficult to avoid the use of these preservatives in water-based products, which is what Nordic Ecolabelling's criteria for chemicals indirectly promote. Preservatives also play an important role in ensuring the shelf-life of the products before they are used. Alternative preservatives to isothiazolinones include formaldehyde and/or formaldehyde-releasing substances, which are carcinogenic. In this respect, isothiazolinone and CMIT/MIT are better, even though they also exhibit hazardous properties. To limit the use of these substances as much as possible, the amount of the substances is restricted.

Background to requirement O14

The list for prohibited substances includes substances that are standard to include in all product groups if Nordic Ecolabelling do not get information that they are irrelevant, as we apply the precautionary principle. In this way Nordic Ecolabelling include unknown or new problematic ingoing substances or impurities that might be present in windows, window doors and external doors.

Candidate List Substances and PBT, vPvB

The ban on substances on the Candidate List, substances that are PBT (Persistent, Bioaccumulative and Toxic) and vPvB (very Persistent and very Bioaccumulative) and the ban on substances that are considered to be potential endocrine disruptors in category 1 or 2 on the EU's priority list of substances for

further evaluation of their role in endocrine disruption are new in this revision. The Candidate List contains substances of very high concern, so-called SVHC substances.

SVHCs (Substances of Very High Concern) meet one or more of these criteria:

• Very harmful to health: carcinogenic, mutagenic, toxic for reproduction (CMR substances, category 1A and 1B), set out in REACH, Article 57 a, b, c.

• Very harmful to the environment: persistent, bio-accumulative and toxic (PBT) or very persistent and very bio-accumulative (vPvB), set out in REACH, Article 57 d, e.

• Serious effects to human health or the environment on another basis than the groups above, but that give equivalent cause for concern (e.g. endocrine disruptors and inhaled allergens), set out in REACH, Article 57 f.

SVHC may be included on the Candidate List with a view to later inclusion on the Authorisation List. This means that the substance becomes regulated (ban, phasing out or some other form of restriction). Nordic Ecolabelling prohibits Candidate List substances due to their hazardous properties. Other SVHC substances are addressed via bans on the use of PBT and vPvB substances, the classification requirements and a ban on endocrine disruptors.

Siloxanes D4, D5 and D6 are included on the Candidate List of Substances of Very High Concern in REACH. However, an exemption has been added for these siloxanes to make it clear that documentation is required to confirm that the content is below the stated limit value in any silicone used. It is possible to find chemicals containing silicone in use throughout the production chain, for example as softeners. The requirement has thus been reworded since the previous generation of the criteria because it used to only cover finishing, membranes, and laminates.

PBT (and vPvB substances) are substances defined in Annex XIII of REACH, which are generally undesirable in Nordic Swan Ecolabelled products.

Endocrine disruptors:

Potential endocrine disruptors are substances that can negatively affect the hormonal balance in humans and animals. Hormones control a number of vital processes in the body and are particularly important for development and growth in humans, animals and plants.

Changes in the hormone balance can have adverse effects, with a particular focus on hormones that affect sexual development and reproduction. Several studies have shown effects on animals that are probably due to changes in the hormone balance. Effluent discharges are one of the major sources of the presence and distribution of endocrine disruptors in aquatic ecosystems. Nordic Ecolabelling excludes identified and potential endocrine disruptors listed on the “Endocrine Disruptor Lists” at www.edlists.org, which is based on the EU member state initiative. Substances listed in Lists I, II and/or III are excluded.

Licensees are responsible for keeping track of updates to the lists so that their Nordic Swan Ecolabelled products fulfil the requirement throughout the entire validity period of the licence. Nordic Ecolabelling recognises the challenges

associated with new substances that are added to Lists II and III. We will evaluate the circumstances and possibly decide on a transition period from case to case.

The requirement applies to substances on the main lists (Lists I, II and III) and not to the corresponding sub-lists called “Substances no longer on list”. Substances that are transferred to one of the sub-lists and that no longer feature on Lists I–III are not prohibited. However, special attention is paid to the substances on List II that have been evaluated under the Cosmetics Regulation, for example, where there are no specific provisions to identify endocrine disruptors. It is still unclear how these substances will be handled at www.edlists.org after the evaluation (safety assessment of the substances included in cosmetics, for example) has been completed. Nordic Ecolabelling will assess the circumstances for the substances on Sub-List II on a case-by-case basis, based on the background information provided in the sub-list. By excluding both identified and prioritised potential endocrine disruptors that are under evaluation, Nordic Ecolabelling ensures a restrictive approach towards endocrine disruptors.

Halogenated organic compounds

Halogenated organic compounds that contain halogens such as chlorine, bromine, fluorine or iodine must not be present in the chemical products used. This includes halogenated flame retardants, chloroparaffins, perfluoroalkyl compounds and certain organic bleaching chemicals. Halogenated organic compounds have various properties that are not desirable in Nordic Swan Ecolabelled products. They are harmful to human health and the environment, highly toxic to aquatic organisms, carcinogenic or harmful to health in other ways. The halogenated organic compounds do not break down readily in the environment, which increases the risk of harmful effects from the substances. A side reaction can occur during the manufacture of epoxy acrylate which results in a small amount of chlorine remaining inside the molecule. The chlorine that is bound in the molecule is relatively stable and will not react further while polymerisation continues. The ban on ingoing substances in the form of halogenated organic compounds applies to the chlorine because it becomes part of the molecule.

Per- and polyfluoroalkyl substances (PFASs), e.g., PFOA and PFOS

Fluorosurfactants and other per- and polyfluoroalkyl substances (PFASs) constitute a group of substances that have harmful properties. Certain per- and polyfluorinated compounds can degrade to the very stable PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid) and similar substances. These substances are extremely persistent and are easily absorbed by the body[40]. The substances are found all over the globe, from the large oceans to the Arctic. PFOS have also been found in birds and fish and in their eggs. The substances in this group impact on the biological processes of the body and are suspected to be

[40] Borg, D., Tissue Distribution Studies And Risk Assessment Of Perfluoroalkylated And Polyfluoroalkylated Substances (PFASS), Doctoral Thesis, Institute Of Environmental Medicine (IMM) Karolinska Institute, Stockholm, Sweden 2013
http://publications.ki.se/xmlui/bitstream/handle/10616/41507/Thesis_Daniel_Borg.pdf?sequence=1

endocrine disruptors, carcinogenic and to have a negative impact on the human immune system[41]. PFOA, APFO (ammonium pentadecene fluoro octanoate) and certain fluoride acids are on the Candidate List due to their repro-toxicity, as well as PBT. There are new research results showing that shorter chains (2-6 carbon atoms) have been discovered in nature[42].

BHT

Butylhydroxytoluene (BHT, CAS No. 128-37-0) is new to the list of prohibited substances. BHT does not have an official harmonized classification. BHT is included in the EU member state initiative "Endocrine Disruptor Lists", List II Substances under evaluation for endocrine disruption under EU legislation.

Aziridines and polyazidirines

Aziridine and polyaziridines are classified as H350 (carcinogenic) and H340 (mutagenic) and are thus included in the ban on CMR substances. However, they are on the list of prohibited substances to make it clear that they are prohibited.

Bisphenols and bisphenols derivatives

Several bisphenols with the general bisphenol structure and 'bisphenol derivatives' which have constituents with structural properties common to bisphenols are now prohibited. Based on the potential for widespread use and available information on potential endocrine disruptors, reproductive toxicity and PBT/vPvB properties, 34 substances[43] were identified in need for further regulatory risk management in EU[44].

Organotin compounds

Organotin compounds are used in biocides and as fungicides in a wide range of consumer products. One of the most common organotin compounds is tributyltin (TBT). Several of the tin-organic compounds are banned for selected areas of use through Reach Annex XVII entry 20 and the following three; TBTO, DBTC and DOTE are on the EU Candidate List[45].

[41] 6 E.g., Heilmann, C. et al, Persistente fluorbindelser reducerer immunfunktionen, Ugeskr Læger 177/7, 30.3.2015 OSPAR 2005: Hazardous Substances Series, Perfluorooctane Sulphonate (PFOS), OSPAR Commission, 2005 (2006 Update), MST, 2005b: Miljøprojekt nr. 1013, 2005, More Environmentally Friendly Alternatives to PFOS-compounds and PFOA, Danish Environmental Protection Agency, 2005

[42] Perkola, Noora, Fate of artificial sweeteners and perfluoroalkyl acids in aquatic environment, Doctoral dissertation Department of Environmental Sciences, Faculty of Biological and Environmental Sciences, University of Helsinki, Finland 12.12.2014, https://helda.helsinki.fi/bitstream/handle/10138/136494/fateofar.pdf?sequence=1

[43] Assessment of regulatory needs: Bisphenols. ECHA – 16 December 2021: Section 2.1: Bisphenols for which further EU RRM is proposed – restriction https://echa.europa.eu/documents/10162/c2a8b29d-0e2d-7df8-dac1-2433e2477b02

[44] 2] Annex XV restriction report https://echa.europa.eu/documents/10162/450ca46b-493f-fd0c-afec-c3aea39de487

[45] https://miljostatus.miljodirektoratet.no/tema/miljogifter/prioriterte-miljogifter/tbt-og-andre-organisketinnforbindelser/) besøgt 8 august 2019

Alkylphenols, alkylphenol ethoxylates and/or alkylphenol derivates

Alkylphenol ethoxylates (APEO) and/or alkylphenol derivatives (APD) are a group of non-readily degradable surfactants that are proven endocrine disruptors. APEOs may be present in binders, dispersing and thickening agents, siccatives, foam inhibitors, pigment pastes, wax, etc. Alternatives to APEOs are available based on alkyl sulphates, alkyl ether sulphates and alcohol ethoxylates. These are readily biodegradable but also have harmful properties, being toxic to aquatic organisms and some may be bioaccumulative. However, there is an environmental gain to be made by substitution since they break down rapidly and the degradation product nonylphenol, with its endocrine-disrupting effects, is avoided.

Phthalates

The ban on phthalates has not been changed. Many phthalates are harmful to the environment and human health and should not be used in ecolabelled products for a variety of reasons. Some phthalates are on the EU's priority list of substances for further evaluation of their role in endocrine disruption, and some have already been identified as endocrine disruptors. Some phthalate compounds are also on the Candidate List. All are there because they are classified as toxic for reproduction. Some are also regulated in Annex XVII of REACH, and many phthalates are on the Danish Environmental Protection Agency's "List of Undesirable Substances" and on the Norwegian Environment Agency's "List of Priority Substances". For precautionary reasons, Nordic Ecolabelling has decided to continue to exclude phthalates as a group. An exemption is made for diisononyl phthalate (DINP) as this substance is still used in polyurethane filler/sealant used in the insulation glass units.

Additives based on lead, tin, cadmium, chromium (VI) and mercury and their compounds

Nordic Ecolabelling restricts heavy metals because they are toxic to humans and other organisms, both on land and in the aquatic environment. Mercury, cadmium and lead are toxic to the human nervous system, kidneys and other organs, and the metals can accumulate in living organisms. Chromium (VI) is classified as very toxic, CMR and harmful to the environment.

Background to requirement O15

Nanomaterials are a diverse group of materials under the size of 100 nm. Due to their small size and large surface area nanoparticles are often more reactive and may have other properties compared to larger particles of the same material. Further, different sizes, shapes, surface modifications and coatings can also change their physical and chemical properties. Nanoparticles can cross biological membranes and thus be taken up by cells and organs. One of the main concerns are linked to free nanoparticles, as some of these – when inhaled – can reach deep into the lungs, where the uptake into the blood is more likely.

There is concern among public authorities, scientists, environmental organisations, and others about the insufficient knowledge regarding the

potential detrimental effects on health and the environment[46],[47],[48]. Nordic Ecolabelling takes these concerns seriously and applies the precautionary principle to exclude potentially hazardous nanomaterials from products.

Pigments:

Pigments are finely ground, insoluble particles that are used to give products a specific colour. There are no substitutes that can fulfil pigments' function as colourants in paints, coatings etc., and many pigments consist partly or entirely of nanoparticles. Thus, nano-sized pigments are exempted. Clear evidence-based conclusions of the safety of nano-pigments cannot be drawn, but "exposures to nano-sized pigments that are integrated into polymer, paint or coating matrices are not thought to be significant, and the risks to consumers from such uses are low", according to a literature study commissioned by ECHA[49].

Nordic Ecolabelling does not consider titanium dioxide nanoparticles as pigments, and nano-TiO_2 is therefore not exempted.

Fillers:

Naturally occurring fillers from for example chalk, marble, dolomite and lime are exempted from registration according to appendix V, point 7 in REACH as long as these fillers only are physically processed (milled, sieved and so on) and not chemically modified.

Synthetic amorphous silica (SAS):

Synthetic amorphous silica (SAS) is an intentionally manufactured silicon dioxide (SiO_2) form that has been used in industrial, consumer and pharmaceutical products for decades. SAS is a nanomaterial, under the European Commission definition and is exempted from the requirement due to a lack of alternative substances.

Calcium carbonate ($CaCO_3$):

Calcium carbonate is found, for example, in sealants used in window manufacture.

Ground Calcium Carbonate (GCC) is formed directly from the grinding of limestone to a powder. GCC can be produced using two different processing methods that are dry or wet. Each method produces different finishing products that suit different applications. Precipitated Calcium Carbonate (PCC) is produced chemically and precipitated as a powder and is produced through a

[46] UNEP (2017) Frontiers 2017 Emerging Issues of Environmental Concern. United Nations Environment Programme, Nairobi. https://wedocs.unep.org/bitstream/handle/20.500.11822/22255/Frontiers_2017_EN.pdf?sequence=1&isAllowed=y
[47] Parliamentary Assembly of the Council of Europe (2017 (2013)) Nanotechnology: balancing benefits and risks to public health and the environment.http://assembly.coe.int/CommitteeDocs/2013/Asocdocinf03_2013.pdf
[48] SweNanoSafe. Nationell plattform för nanosäkerhet.https://swenanosafe.se/ (2020-05-06)
[49] Hynes J, Novotný T, Nic M, Kocurkova L, Prichystalová R, Brzicová T, Bernatikova S (2018) Literature study on the uses and risks of nanomaterials as pigments in the European Union. European Chemicals Agency.

carbonation process between fast lime and carbon dioxide. It is a synthetic mineral that allows more flexibility in adapting its size, shape, particle size distribution compared to GCC. The chemical composition between GCC and PCC is the same though. GCC can be seen as naturally occurring. Although PCC is chemically manufactured, there is no indication that unmodified PCC would have a higher toxicity than GCC[50].

Polymer dispersions:

Polymer dispersions can technically fulfil the nanomaterial definition. The EU Commission has recommended that solid nanomaterials dispersed in a liquid phase (colloidal) should be considered as nanomaterials[51] [52] [53]. Non-solid (i.e. liquid and gaseous) particles are excluded from the definition.

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

Aluminium oxide:

Aluminium oxide is added to the powder coating as an "anti-lump" agent and as a fluidizing agent to improve the function of the electrostatic powder coating and thereby facilitate application. The aluminium oxide can be nanostructured as it is required for the function that the alumina has a small particle size.

3.7 Emissions to air

In this section requirements regarding VOC emissions from solvent-based wood impregnation and solvent-based surface treatment are given.

Background to requirement O16

The requirement has been tightened compared to generation 4 of the criteria.

Wood can be damaged by bacteria, fungi, insects or other bugs. These organisms can cause rot, discoloration or mechanical damage. There are several methods for wood preservation of wooden windows and doors that are used at the Nordic market.

[50] https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7135
[51] European commission, COMMISSION STAFF WORKING PAPER, Types and uses of nanomaterials, including safety aspects, SWD(2012) 288 final. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2012:0288:FIN:EN:PDF
[52] Communication from the commission to the European parliament, the Council and the European Economic and Social Committee, Second Regulatory Review on Nanomaterials, COM(2012) 572 final. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0572
[53] EU Commission recommendation on the definition of nanomaterial (2022/C 229/01) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0614(01)&from=EN

The methods are:

- vacuum impregnation with organic solvents,
- water-based impregnation, applied by dipping, flow-coat or similar,
- use of heartwood,
- use of the 2ØKO-system (90% heartwood in combination with water-based treatment),
- use of heat-treated wood.

Pressure impregnation with copper-based wood preservatives are normally not used for carpentry above ground, like windows and doors. As in previous generations of these criteria such impregnation methods are not allowed in Nordic Swan Ecolabelled windows and doors.

Regardless of wood preservation technology, surface treatment with one or several layers of surface treatment/paint are used. The surface treatment may also contain biocides.

There are considerable variations in the views on wood preservation techniques between different producers in the Nordic countries. Several window producers have, through the years, switched from solvent-based vacuum impregnation to other technologies, to decrease the environmental impact and reduce the production time.

Vacuum impregnation is normally performed using organic solvents. The product used most often consists of 90% organic solvent, usually turpentine, and 10% active substance/biocide. Vacuum impregnation using organic solvents results in emissions of volatile organic compounds (VOC) to air. These VOCs are primarily a mixture of aliphatic hydrocarbons and contribute to the formation of low-level ozone, a substance that is harmful to health and the environment. The use of VOCs also involves working environment risks. Thus, it is important to minimize the emissions of VOC from vacuum impregnation facilities.

The Nordic Ecolabelling does not exclude any specific wood preservation technology but set strict requirements for vacuum impregnation. The reasons are:

- VOC emissions are only one environmental impact among many from window and door production, see section 2. Several LCA studies indicate that heat loss during the usage phase is the most important environmental impact over the course of the life cycle[4].
- The Nordic Ecolabelling's screening of the market has shown that windows where the vacuum impregnation technology is used, generally has a long warranty time, which is an indication of a long durability of the products.
- Vacuum impregnation is an effective and proven technology for sapwood.
- Heartwood is a good option, but during Nordic Ecolabelling's dialogue with manufacturers it has been clear that there are challenges with the availability of heartwood. Therefore, well protected sapwood is needed on the market to meet the demand of wood windows.

The Industrial Emission Directive[54] sets up limit values for solvent-based wood protection. The limit values apply for facilities using more than 25 tonnes of solvents per year. The limit values are implemented in different national legislation in slightly different ways in different countries.

Table: Emission limit values according to DIRECTIVE 2010/75/EU. According to the directive emission of volatile organic compounds from installations shall not exceed the emission limit values in waste gases and the fugitive emission limit values, or the total emission limit values.

Activity (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission limit values (percentage of solvent input)	Total emission limit values (kg/m^3)
Wood impregnation (>25)	100	45	11

The Nordic Ecolabelling requirements for windows and doors, set stricter requirements for VOC-emissions than the legislation by two means:

- A broader area of application: The requirement must be fulfilled by all facilities using solvent-based technology and not just the larger plants under the scope of the EU Directive.
- Stricter limit value than the regulation: Total emissions of maximum 6 kg/m^3 treated wood compared to 11 kg/m^3 treated wood according to legislation.

The limit value is set as total emissions per m^3 treated wood. Total emissions are the sum of emissions in the waste gases and fugitive emissions. To reach the limit set in Nordic Swan Ecolabel criteria, 6 kg per m^3 treated wood, and still have sufficient wood protection according to the NTR B-class, technology for cleaning of waste gases must be installed.

Background to requirement O17

The requirement is the same as in generation 4 of the criteria, but it is clarified that it is only applicable for solvent-based surface treatment. There can be some emissions of VOC also from water-based surface treatment. However, since VOC emissions from water-based solutions are much lower, Nordic Ecolabelling has decided that the requirement does not need to be documented for those cases. In this way, Nordic Ecolabelling promotes water-based solutions, by simplifying the certification process.

The requirement is stricter than the legislation since:

- The area of validity is broader. The requirement must be fulfilled by all facilities using solvent-based surface treatment and not just the larger plants that fall under the scope of the EU Directive 2010/75/EU.

[54] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

- The limit value is stricter than the regulation; 60 mg C/m^3 waste gases compared to 100 mg C/m^3 waste gases in the EU Directive.

3.8 Circular economy requirements

This section describes requirements with the intention of increasing the circularity of windows and doors by increasing the recycling of materials by the end-of-life of these products. This includes a requirement for recycling of float glass into new float glass.

Background to requirement O18

The purpose of the requirement is to facilitate the recycling of materials used in windows and doors by the end of these products' service life. Today, a large quantity of windows and doors in the Nordic countries end up in landfill or for incineration[6,55]. Another purpose of the requirement is to facilitate replacement and refurbishment/repair, such as the replacement of an insulation glass unit during the lifetime of the window/window door.

Background to requirement O19

The requirement is new in this generation 5. Focus on recovering value by collecting products by end-of-life to be material recycled, re-manufactured or refurbished, are fundamental for circular economy. In theory, the expected value from circularity is undeniable. However in practice in the Nordic countries, initiatives and partnering projects to establish national waste collection systems for material recycling of windows and doors are few, but the interest is increasing in the window industry[19,22,55,56] due to several benefits such as stronger customer relationship, reduction of environmental impacts by material recycling and lower cost due to secondary material supply and alternative supply of critical raw materials like glass.

When national waste collection systems are established for windows, these systems should be used and supported to increase the material recycling specially of float glass from old windows. If no such systems are available, the producers should themselves take initiatives or actively support initiatives/partnering projects to establish some sort of system for collecting windows and doors for material recycling and/or re-manufacturing. This will reduce the amounts of windows and doors ending up on landfill or for incineration.

Background to requirement O20

Enabling the production waste to be recycled and processed for material recovery relies on good waste planning to ensure systems for sorting of the production waste/spill.

Production of glass is related to environmental aspects as energy use and consume of sand which is a limited raw material[6]. Based on this, the requirement has been updated with specific requirements for material recycling of float glass. Waste/spill of float glass from the insulation glass production, must be sent for

[55] Meeting with Sverre Valde, CEO at Ruteretur AS, March 2024
[56] Meeting with Jon Lille-Schulstad, Director of Business Development at Ragn-Sells AS, January 2024

sorting and possible recycling into new float glass if national glass recycling waste systems exist, and waste/spill of float glass from the window/door production, must be as a minimum recycled into new glass.

3.9 Durability and functional requirements

Background to requirement O21

The purpose of the requirement is to ensure that Nordic Swan Ecolabelled products have satisfactory durability of parts exposed to the elements over time, since durability is a good indicator that the products will have a long service life. It should be noted that wood structures that are protected by metal (e.g. aluminium clad wooden windows) are not considered to be exposed to the elements.

For wooden windows, there are several different methods to treat the wood to ensure good durability. The producers are free to use their systems, as long as the durability can be documented through testing. The requirement thus lists several options to document durability, depending on method used.

However, the wood treatment systems used must comply with other requirements regarding for example chemicals and VOC-emissions.

NTR standard

The Nordic Wood Preservation Council (NTR) is a co-operation body for the Nordic industry associations in the field of wood protection. NTR has developed a common Nordic standard for impregnated wood which is supplemented with a system for approval of wood preservatives and quality control of impregnated wood[57].

Wood treated through impregnation with wood preservative is divided by the Nordic Wood Preservation Council (NTR) into four classes: NTR M, NTR A, NTR AB and NTR B. The classification is based on EN 351-1 and is linked to the use classes defined in EN 335. For windows and doors only the class NTR B is relevant.

Heartwood

Thanks to its natural content of preservatives, heartwood has a natural resistance to rot. However, to guarantee the durability, some wood preservation is normally used. The requirement is set according to the Danish window association's requirements for the 2ØKO treatment system.[58]

Preservative treated wood not classified in accordance with NTR

Windows and doors are defined as use class 3.1 according to EN 335. The test methods required in this requirement are the same tests required for wood in use class 3.1 in the overall standard for wood preservation EN 599-1.

[57] https://www.ntr-nwpc.com/om-ntr/om-ntr
[58] https://www.vinduesindustrien.dk/professionel/de-tekniske-bestemmelser-for-dvv-1

According to EN 330 The Nordic Ecolabelling also requires a separate statement from the laboratory or another independent body, that states that the treatment is effective against rot for the defined purpose (windows and doors).

The requirement accepts either EN 113-1 or CEN/TS 839 as test method for showing effectiveness of the treatment system.

Background to requirement O22

The requirement has been updated from the previous generation. In the previous generation, the Nordic Swan Ecolabelled windows and doors were required to meet one of the established, relevant certifications in the Nordic region, such as SFDK, NVDK, DVV, the FI quality mark or the P-labelling. This was required to ensure that the products were functional and of good quality. However, some of these certifications like SFDK, the FI quality mark and P-labelling do not longer exist for windows and doors.

Nordic Ecolabelling considers thermal transmittance, air permeability and water tightness to be the parameters that are most important for the function and quality of all windows and doors under all conditions.[13] Other parameters may be relevant in specific cases and under particular circumstances, but Nordic Ecolabelling aims to set a minimum requirement for technical function that all products must fulfil. The requirements for thermal transmittance and air permeability can be found in the energy requirements section, while the requirement for water tightness is specified separately in this requirement.

Water tightness is crucial for the durability of the product since a combination of wind and rain can squeeze water into openings and cavities, damaging the materials. Also, climate change increases the challenges of rain and wind, which is why it's essential to have strict requirements for water tightness.[59]

Background to requirement O23

A Nordic Swan Ecolabel product must have a good quality, and together with requirements related to durability, warranty is a factor that signals the product's lifetime and says something about what the customer can expect from the product. However, warranty should not be equated with longevity alone. Longevity is affected by many factors, including correct installation and correct and sufficient maintenance of the product.

A warranty can be designed in many different ways, but Nordic Ecolabelling set as a minimum requirement that states which parameters must be included.

The requirement has been tightened compared to the previous criteria generation for external doors where the warranty of function has been increased to 10 years compared to 2 years in the previous generation.

[59] https://gemini.no/2024/01/gjorde-1130-tester-pa-norske-vinduer-dette-fant-forskerne-ut/?utm_source=RSS+Nyhetsbrev&utm_campaign=a1ba419932-RSS_CAMPAIGN_ALT&utm_medium=email&utm_term=0_de4d883975-a1ba419932-73667128

Background to requirements O24 and O25

To enable a long service life for windows, window doors and external doors, which is an important environmental aspect, there is a requirement concerning customer information about recommended maintenance. And to improve material recycling and to ensure the environmentally best handling of windows and doors by end-of-life, there is a requirement regarding information on how the product should be handled at the end of its life.

To help the customers to select the optimal window/window door in order to achieve good heating economy and a good indoor climate, the producers must inform their customers on how the U- and g-values should be chosen based on the positioning of the window/window door. In addition, the licensee must inform the customer of the importance of sun screening solutions in order to avoid an increased need for cooling.

Correct installation of windows and doors is essential to avoid heat leakage from a building and also to avoid moisture from rain and snow damaging the wall construction and the window/door frames. To avoid poor installation work, there is a requirement concerning installation information for windows and doors.

4 Licence Maintenance

The purpose of the licence maintenance is to ensure that fundamental quality assurance is dealt with appropriately.

Background to requirement O26

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

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

Background to requirement O27

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

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

5 Changes Compared to Previous Generation

Table: Overview of changes to criteria for generation 5 compared with previous generation 4

Requirement generation 5	Requirement generation 4	Same requirement	Change	New requirement	Comment
O1 Description of the product and the production	O1	X			Clarifications made.
O2 Thermal transmittance	O2		X		Tighter limits for wood windows with water-based impregnation. Limits are now the same for wooden windows regardless of impregnation method. Less tight limit values for windows in non-renewable materials. Limit of g-value removed.
O3 Daylight transmittance	O3	X			
O4 Air permeability and climate testing	O4		X		Changed for external doors. Test for climate testing in accordance with latest version of EN 14351-1. Air permeability test shall be done in combination with climate test.
O5 Tree species with restricted use	O10		X		Updated in accordance with Nordic Ecolabelling's principles concerning tree species.
O6 Traceability and certification of wood	O11	X			Same requirement level, but slightly updated wording.
O7 Production of steel	O5		X		The material requirement for steel can now be fulfilled with recycled steel or strict requirements to virgin steel.
O8 Production of aluminium	O5		X		The material requirement for Al can now be fulfilled with recycled Al or strict requirements to primary Al.
O9 Excluded substances in insulation materials	O12		X		More substances are prohibited.
O10 Requirements for filler gas	O9	X			

O11 Classification of chemical products	O14		X		Updated according to Nordic Ecolabelling's latest knowledge. Updated list of exemptions.
O12 Classification of ingoing substances	O15		X		Updated according to Nordic Ecolabelling's latest knowledge. Updated list of exemptions.
O13 Preservatives				X	New list of prohibited preservatives.
O14 Prohibited substances	O16		X		Updated list according to Nordic Ecolabelling's latest knowledge.
O15 Nanomaterials	O17		X		Chemically modified calcium carbonate is not exempted.
O16 Emissions to air from wood impregnation	O18		X		Emission limit tightened.
O17 Emissions to air from surface treatment	O18		X		Only need to be fulfilled if solvent-based surface treatment is used.
O18 Design for disassembly	O13	X			
O19 Material recycling				X	New requirement related to material recycling.
O20 Recycling of float glass and production waste management	O19		X		It is now specified that glass spill must be sent for recycling.
O21 Durability of exposed wood parts	O20		X		The requirement is clarified, and CEN/TS 839 and EN 152 added as test methods. Statement from independent party must be sent in.
O22 Functional requirements	O21		X		National standards are no longer required. Limit for water tightness has been added.
O23 Warranty	O22		X		Longer warranty for external doors is introduced (10 years instead of 2 years).
O24 Customer information	O23		X		Information regarding shielding of doors and end-of-life handling is added.
O25 Installation information	O24	X			
O26 Customer complaints	O28	X			
O27 Traceability	O31	X			

Appendix 1 MECO-table

	Raw material	Production	Use	End-of-life
Material	Consumption of material resources due to extraction and production of materials used in windows and doors			Short service life Landfill by end-of-life in stead of material recovery/recycling Leakage from windows of fillers gases with GWP (Global Warming Potential)
Energy	Energy used for material extraction and production	Energy used for production of windows and doors	High energy consumption for heating due to high heat transfer/loss through windows and doors and due to low solar energy transmittance for windows.	
Chemicals and emissions		Emissions to air from impregnation and surface treatment Emissions to working environment from chemical products like sealant, surface treatment, impregnation etc.	Use of chemical products (oil, lacquer and paint) for maintenance purpose causing emissions to indoor climate	Emissions to air from combustion of waste/materials from windows and doors Reduced material recycling due to content of hazardous chemicals in the materials
Other	Transportation of raw materials to the material producer. Transportation of materials to the window and door producer. And transportation of windows and doors to sales location and finally to the consumers/installation location. Loss of forest/biodiversity			