

Translation from Norwegian

About Nordic Swan Ecolabelled

Furniture and fitments



Background document version 4.20

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Adjustment 9 May 2023

1 Summary

The main purpose of the revision has been to set relevant environmental requirements for furniture and fitments with a view to ensuring that the best products within their areas are eligible for a Nordic Ecolabel. There is a requirement that differentiated requirements should be imposed, but in this revision process emphasis has been placed on finding common fundamental requirements.

The possibility of imposing basic requirements on production, while at the same time reducing the number of product requirements, has been examined with the aim of simplifying the documentation relative to previous documents.

A second goal has been to harmonise the requirements in the criteria for furniture and fitments with the requirements in the new revised criteria for building panels. The same applies to the new and revised fabric, hide and leather requirements applicable under the EU Flower scheme. The development of criteria for wood-based furniture by the EU Flower has also been monitored carefully with a view to possible harmonisation.

The criteria document now contains a total of 64 requirements as opposed to the previous 76. One significant change that has resulted from the revision process is that the chemical requirements have now been centralised (with some exceptions) the criteria for chemicals are now gathered at the start of the document enabling licence applicants producers to document the necessary chemical requirements at an early stage in the application process. These requirements relate largely to the classification of chemical products and additives of chemical products in the furniture/fitment. Other important factors considered/implemented in the revision of the criteria include:

- wood raw materials, reflecting the availability of certified wood raw materials and the exemptions that exist in the current criteria.
- surface treatment adapted to various types of furniture.
- chemical products used for surface treatment.
- plastic relating to the requirement applicable to surface treatment, and the proportion of recycled plastic used.
- metal, with a view to controllability.
- chrome plating, in view of the level of requirements, and that this type of surface treatment is permitted.
- halogenated flame retardants in padding materials and fabrics.
- hide and leather, in view of the fact that they are excessively extensive and should be harmonised with possible new revised criteria for fabrics.
- properties in use and various test methods/standards need to be updated (including the forms adapted for subcontractors).

A total overview of changes made to the requirements relative to previous versions is contained in Chapter 5. Where changes have been made or where the requirements are new, the new requirements have been included in their entirety followed by a thorough discussion of the choices made. In parallel with the technical revision process continuous market assessments were conducted for various areas.

2 Basic facts about the criteria

2.1 Products that are eligible for labelling

The consultative proposal for Version 4 defines the product group as:

Furniture, fitments, doors for internal use, as well as light fittings/LED for indoor use may be Nordic Swan Ecolabelled. Furniture means seating (chairs, sofas etc.), furniture for sleeping (beds, sofa beds, mattresses etc.) and storage furniture (cupboards, bookshelves etc.). Fitments might for example include kitchen and bathroom fittings and wardrobes. Light fitting means a fitting that is integrated as parts of a piece of furniture or a free-standing lighting product (for example a lamp).

Building products (e.g. walls, stairs, covings, panels), sanitary equipment, rugs and carpets, pillows¹, fabrics, office equipment and other products, the primary functions of which are other than those of furniture, as well as furniture intended for outdoor use, are not encompassed by the definition of the product group.

Separate criteria exist for outdoor furniture, textiles and panel materials and are available upon application to one of the secretariats.

Relevant products in addition to those specified above that might be considered furniture/fitment products may be included in the product group upon request. This will apply only to products made of materials on which requirements are imposed in the criteria document. The decision on which new products may be included in the product group is taken by Nordic Ecolabelling.

2.2 The background to Nordic Swan Ecolabelling

Performing environmental assessments (e.g. with the aid of life cycle assessments) on products made up of combinations of multiple materials is a very complex process. Environmental impact will vary depending on the materials used in the individual product, so that in theory numerous life cycle analyses should be conducted, depending on the various combinations of materials used in a piece of furniture in order to gain a "correct" picture of the environmental impact. Furniture may contain anything from one to 10-20 different materials. However, many of these materials may be present only in very small quantities, i.e. less than 1%. Examples of material combinations include the following:

Material:	Quantity kg	Quantity %
Wood materials:	0.4 – 40	5 - 94
Steel:	0.7 – 16.3	2 - 64
Aluminium:	0 – 2.5	0 - 9
Plastic materials:	0 – 1.9	0 - 36
Foam/padding (sofa, chairs):	0.3 – 7.2	8 - 25
Fabrics (sofa, chairs):	0.06 – 2.4	1 - 8

¹ "Pillows can however be ecolabelled according to the criteria for furniture and fitments if they are a part of an overall furniture license, for example together with beds or mattresses, and if the padding materials are of the same type."

The environmental impact of furniture and fitments relates to the raw materials or input factors (metals, plastic, fabrics, etc.) used, to production, use and processing as waste. In the following a brief overview is provided of environmental impacts that occur during the life cycle of furniture.

2.2.1 Life cycle analyses

An Australian review of the literature (2003)ⁱ and a Norwegian review of the literature (2008)ⁱⁱ on wood and wood products seen from a life cycle perspective in which the environmental impact of wood products is assessed relative to the use of other materials such as metals and plastics, shows that few relevant studies have been conducted on furniture products. A number of other LCA studies have been performed on building materials, office buildings and housing.^{iii,iv,v,vi,vii,viii,ix,x,xi,xii,xiii,xiv,xv,xvi,xvii}

Other general conclusions drawn from the literature review are:

- The studies referred to show that wood has the lowest environmental impact compared with other materials such as plastic, steel and concrete.
- The total energy consumption (energy consumed in all processes associated with the production of the product) of wood is low compared with plastic and metal. The reason for this is that plastic and metal production are energy-intensive processes.
- The total energy consumed in the production of wood products is closely related to the energy expended in drying the wood.
- Wood from sustainable forestry operations is a renewable resource unlike plastic and metals.
- The incineration of wood for energy production must be viewed as CO₂ neutral.
- The use of other materials (even in small quantities) in the production of wooden furniture (such as metals, plastics, glue, varnish etc.) dramatically increases the environmental impact of furniture.

The Danish EPA has published a study that looks at the environmental impact of wood and wooden furniture from an LCA perspective^{xviii}. This study confirms the conclusions drawn above and also notes that the environmental impact of furniture can be reduced significantly if production waste and materials are recycled and/or incinerated to produce energy.

The mapping of the life cycle of furniture in Denmark^{xix}

In a memo (2008) produced by 2.-0 LCA Consultants and Dansk Standard on the subject of environmental issues relating to furniture and building panels, the life cycle of furniture in Denmark was mapped. An analysis was performed of the industry, "Furniture, DK", which is included in the Danish input-output database and represents furniture produced in Denmark. Using an established method of weighting, the authors concluded that the following environmental effects have the greatest impact on the Danish furniture industry: Global warming, land use and inorganic substances/particles (affect the respiratory system). The results of the survey indicate that (see also figure 1 in Appendix 1):

- **Wood products and timber** contribute some 30% to total environmental impacts except for land use, where the contribution made by wood products and timber totals 76%.

- **The electricity consumption of furniture manufacturers** totals 17% of the total contribution of furniture to global warming viewed from a life cycle perspective.
- **Metal goods** (tools, fittings, screws, bolts, seams etc. made of iron and other metals) make up some 5-15% of the total contribution for most of the environmental impacts.
- **Plastic products and synthetic rubber.** Plastic parts in the furniture account for 6-9% of the total contributions for the majority of environmental effects.
- **Fabrics and fabric products, yarn etc.** Fabrics account for some 3% of the total contributions to environmental effects, except for the contribution to aquatic nutrient salt impact, which is slightly over 10% and which can largely be attributed to cotton production.
- **Paint and printing ink** contribute 7-8% to the effect of photochemical ozone formation on humans (“Organic substances that impact on breathing”) and “The impact on photochemical ozone formation on vegetation”.
- **Wholesale trade** counts for 6-9% of total contributions. The category “Wholesale” represents the services provided by wholesalers and thereby represents warehouse buildings, transport etc. It would be difficult to reduce this category with the aid of ecolabelling criteria.

“REMAINDER” consists of the remaining approx. 100 categories not listed here, since their individual contributions are very small.

These findings closely match the requirements imposed in the proposed criteria document and in previous criteria.

2.2.2 Raw materials

Several life cycle assessments have been performed on the environmental impacts associated with furniture^{xx xxi}. One general conclusion that can be drawn is that the environmental impacts of furniture will largely depend on the types of materials and additives used in the various furniture products. The environmental properties of the materials and additives themselves will vary (inter alia where they are produced, the substances used in them, etc.), but will also affect the environmental impacts that occur during the production of the furniture itself (e.g. emissions from varnishing), how the furniture functions during use (e.g. emissions from adhesives and varnish) and the problems that furniture creates as waste. Accordingly the choice of materials used will affect environmental impact at all stages of the life cycle of furniture.

Generally furniture consists of wood materials, primarily chipboard. The Swedish furniture industry has estimated that the average material content of furniture consists of 70% wood materials, 15% padding materials (largely polyurethane foam and polyester), 10% metals and 5% other materials (plastics, textiles, glass etc.) (Kretsloppsdelegationen 1997)^{xxii}. However, there is considerable variation, from untreated wooden furniture that consists more or less exclusively of solid wood to complex upholstered furniture that may incorporate 10-20 different materials.

2.2.3 Production

The environmental impacts which occur during the production of the furniture itself are related largely to emission of substances that are harmful to health and the environment in connection with the processing of materials (e.g. grinding wood), gluing and surface

treatment, as well as waste from production and packaging. In the case of wood-based waste the energy is generally used for heating the production premises. Moreover, fabric waste, waste from padding materials and packaging can constitute considerable quantities. A mapping of the mass balance in three Norwegian furnishing companies reveal that between 10 and 30% of purchased raw materials are generated as waste. Large parts of this are recycled, but even so, between 9 and 55 kg per tonne of goods produced are discarded. Considerable potential exists for reducing the amount discarded.

2.2.4 Energy and climate

Energy is used in all stages of the life cycle and the consumption of energy is directly related to climate emissions. In this context it is relevant to distinguish between energy consumption relating to the production of raw materials, energy consumption relating to the process of producing the furniture itself and energy consumption relating to both the transportation of raw materials and the distribution of the finished furniture. The primary production of metals and plastic materials and the production of raw materials for certain types of adhesive are particularly energy-intensive processes.

The energy consumed by furniture manufacturers is spread between a wide variety of processes, including ventilation, dust extraction, drying, welding, grinding, heating premises etc. Energy consumption is based on electricity, oil/gas and wood-based energy (waste from production). An analysis of the Danish industry performed for the furniture industry found that the greatest energy consumption is generally associated with heating premises. This is followed by the energy consumed in extraction (dust, solvents). The energy consumed in the processing of wooden furniture is approximately 85% of the average for the wood-processing industry. Generally speaking, the wood and furniture industry is on more or less the same level as other industry if one excludes energy-intensive industry (Baadsgaard-Jensen 1993)^{xxiii}.

The conclusions of the aforementioned life cycle assessments are not unambiguous as regards energy consumption, which probably relates to the fact that the assessments were based on differences in furniture types using different raw materials and means of transport. The significance of energy consumption relating to transport and raw materials, in particular, varies. For example, life cycle assessments of furniture with a relatively high content of metals and plastics show that the greatest energy consumption relates to the production of raw materials. Less than 5% relates to transport. Here the energy intensity of the materials has greater significance than energy consumption relating to transport and production. A life cycle assessment of a piece of wooden furniture, by comparison, shows that energy consumption relating to the transportation of raw materials and distribution of the furniture constitutes approximately 10% of energy consumed over the course of the life of the furniture. In combination with energy consumed in the production of urea formaldehyde glue (approximately 15% relating to the production of urea from ammonia) these two processes account for one-quarter of the energy consumed over the course of the life of the furniture.

Because energy consumption varies with the type of furniture and the means of transport used, it was concluded in the previous revision that it is difficult to impose specific requirements as regards the energy consumed in the production of raw materials or in transport. Raw material production takes place in different parts of the world, depending on the materials chosen and the subcontractors used. The amount of transport used will also vary depending on whether the furniture is exported. Given these assumptions,

defining environmental or energy requirements applicable to raw materials and transport is a very complicated task. Indirectly, however, requirements are imposed on energy consumed in for example the production of metals and plastics by requiring the use of recycled materials. In the case of wood-based building panels, which are one of the various ingoing materials used in furniture, requirements are imposed on energy consumption. This has been made possible by the availability of data produced in connection with the developments of criteria for building panels.

2.2.5 Use

The environmental impact of furniture during use is first and foremost a problem of indoor climate. Wooden surfaces, varnishes, glue, fabrics etc. may release various substances (formaldehyde, volatile organic compounds and miscellaneous other chemical compounds) that can cause discomfort or be harmful to the health of exposed persons. Here too the choice of materials and input factors will determine the emissions created and the problems they cause.

2.2.6 Waste

Discarded furniture forms part of households waste and is handled by the municipal refuse disposal system. In all probability most furniture waste goes to land fill or is incinerated in incineration plants, although statistics on volumes/quantities are lacking.

Kretsloppsdelegationen in Sweden have estimated that if the consumption of furniture corresponds to the amount discarded, then 250,000 tons of furniture is retired every year on the Swedish market. This is equivalent to 7-8% of household refuse. Swedish refuse contractors estimate that furniture makes up approximately 4% of household refuse in urban areas (i.e. 130,000 tons at national level). No corresponding assessments have been conducted in the other Nordic countries.

Viewed in isolation, increasing consumption of furniture will contribute to an increase in total quantities of refuse from furniture. Increased recovery and recycling of furniture will have the opposite effect. The types of material used in the furniture and the number of different materials used will affect the way in which the furniture is handled as refuse – reuse, material recovery, energy exploitation or land fill.

2.3 The version and validity of the criteria

The criteria for the ecolabelling of furniture and fitments were first adopted by the Board of Nordic Ecolabelling in October of 1992. Revised criteria were adopted on 16 February 2005. The second revision was initiated in the spring of 1997 and revised criteria were adopted on 10 December 1998. This criteria document was extended twice and was valid until March 2004. New criteria, version 3, were adopted on 19 March 2003 and are valid until 31 March 2010. New criteria must be adopted no later than 12 months before the validity period of the criteria document expires.

This document, version 4, was adopted by the Board of Nordic Ecolabelling 17 March 2011 and is valid to 30 February 2023.

2.4 The Nordic market

Furniture production in Sweden

In Sweden some 1,500 companies produce or sell furniture. IKEA is by far the largest furniture manufacturer in Sweden. Furniture is produced for a wide range of different purposes and environments, and accordingly the market has been divided up into subgroups to make it more manageable.

Office furniture and contract furniture

Kinnarps is the largest furniture manufacturer in Sweden, followed by EFG, Edsbyverken, Martela, Isku and a number of others. Two licence holders produce architect-designed interiors for public spaces, e.g. hotels and shops. These are carpentry workshops that have no standard range of furniture or interior products.

Kitchens

IKEA is the largest producer of kitchens in Sweden. In addition to IKEA there is the Nobia Group (Marbodal, HTH etc.) and Balingslöv as well as some others. At present, Marbodal is the only kitchen manufacturer that holds a licence.

Furniture for the home

Some 400 companies produce or sell furniture for the home in Sweden. This is furniture for private homes. Nordic Swan Ecolabelled beds are produced in Sweden (Hästen and DUX). These beds are mainly sold to hotels, but are also sold to individuals.

The furniture market in Finland

In 2005 the structure of the market in Finland was as follows:

998 furniture manufacturers, of which 107 had more than 20 employees
117 kitchen manufacturers, of which 13 had more than 20 employees
347 chair manufacturers, of which 16 employed more than 20 people

Thus traditionally, the furniture industry in Finland has consisted of small companies. Today production is generally in the form of subcontracts to larger companies. The biggest furniture manufacturers in Finland are Isku, the Indoor-group (Asko) and the chains Stemma, Sotka, Maskun kaluste etc. The largest companies producing furniture for offices, schools etc. are Isku and Martela. The largest kitchen manufacturers are Novart and Puustelli.

In 2005, total furniture turnover in Finland amounted to Euro 894 million. The biggest sellers had the following market share:

Sotka: 9.4 %, Masku: 8.9 %, Asko: 8.2%, IKEA: 7.3 %, Isku Koti (Isku Hem): 6.7%,
Stemma: 6.7%, Vepsäläinen: 3.8%, Suomi-Soffa: 3.2%, Kdoin Ykk'onen: 2.9%, Jysk:
2.8%, EM chain: 1.2%, others: 38.0%

The furniture industry in Norway

The Norwegian furniture and interiors industry consists of a total of 400 companies, which produce furniture to a value of NOK 11.8 billion (2007)^{xxiv}. The furniture industry employs 8,700 man-years (2007 figure). Of total output, 29% is exported (approximately NOK 3.3 billion in 2008). Just over one-third of the industry is located in the Møre region on the West Coast of Norway, and the rest of the industry is spread evenly over Southern Norway. The companies are mainly small and medium-sized, although there

are also some large groups.

Norwegian furniture is sold through a range of different outlets: Sales to wholesaler and store chains, independent dealers, contract sales to furniture and interior projects, agents, franchise sales, internet sales etc. Norwegian furniture production can be divided into three main groupings:

Designer furniture: Norway has a number of suppliers of designer products which have garnered praise at both Norwegian and international level. The project www.insidenorway.no features outstanding Norwegian design from the 1950s and until today's blossoming of designer furniture/products.

Home furniture: This group comprises products delivered for private households. They include sofas, chairs, tables, living room furniture, wardrobes, bedroom furniture: mattresses, beds etc.; kitchen furniture and kitchen fittings, garden furniture, heritage furniture etc. This area includes panel furniture, upholstered furniture and solid wood furniture in a variety of different types of wood. In several of these areas Norwegian manufacturers lead the field worldwide.

Office and contract furniture: This group comprises products delivered to offices, shops, public spaces etc. Office chairs, panel furniture (desks, canteen furniture, conference furniture, cabinets and shelving), seating groups, sofas, fittings such as counters, interiors, courtroom furniture etc. The group includes artisan suppliers to new buildings as well as maintenance projects on old buildings in the form of interiors and furniture.

Suppliers of foam plastic, wood products, panel and metal goods deliver to these three main groupings.

Environmental requirements applicable to public sector tenders

A project was initiated in March 2007 by Grønt Senter for Innkjøp (GRIP) (Green Centre for Purchasing), the objective of which was to draft a set of recommended criteria for public sector procurement of office furniture. Following the winding-up of GRIP, the work is continuing under the auspices of DIFI (Direktoratet for forvaltning og IKT – The Agency for Public Management and E-government). The Norwegian government is due to launch an action plan for environmentally and socially aware procurement. The plan will enter into force with effect from 1 January 2008. One of the selected product areas in the action plan is office furniture.

Ecolabelling Norway is participating in this work together with representatives of the furniture industry, Møbelfakta and environmental protection organisations.

Denmark

The furniture industry in Denmark comprises of approximately 400 businesses, which produce furniture to a total value of approximately DKK 19.4 billion (2006). The Danish furniture industry employs some 16,900 people. 83% of the production (=DKK 16.1 billion in 2006) is exported, making the furniture industry the sixth largest Danish exporter.

Danish furniture is sold through a wide range of different outlets: sales to wholesale and shop chains, sales to individual furniture dealers, sales via agents, contract sales to furnishing projects, retail sales via franchise store, internet sales etc., all subject to

stringent delivery dates. Danish furniture production can be broken down into three main sectors:

Domestic furniture makes up the bulk of Danish furniture production. The niche areas include furniture for rooms for children and young people, bedrooms, dining rooms, home offices etc. Self-assembly furniture and panel furniture are other areas of expertise, and within the area of solid wood furniture in e.g. beech, ash, teak and pinewood the products offered by Danish manufacturers are amongst the best in the world.

Since the 1950s Danish designer furniture has ensured that Denmark has been a leading nation on the international furniture scene. Classic designs by renowned architects and a new generation of innovative furniture designers combine to ensure that this prominent position is maintained and renewed.

The Danish furniture industry also produces a considerable quantity of kitchen products, and the production of components of furniture by subcontractors makes up an important aspect of the industry.

In recent years the Danish furniture industry has outsourced parts of its production to subcontractors and industry-owned production facilities in low-cost countries. In addition, a number of components and ready-made furniture are purchased outside Denmark for resale.

Danish furniture production by product group, 2007	
Seating	15.7%
Office furniture	8.7%
Kitchen furniture	16.8%
Bedroom furniture	14.5%
Wooden dining room and living room furniture	13.5%
Other furniture	13.4%
Parts for furniture	7.9%
Mattresses, comforters etc.	9.5%
Total	100.0%

Source^{xxv}

2.5 Other ecolabelling and labelling schemes

Ecolabelling, type 1 is the form of labelling that makes it easiest for consumers to make a choice. Products are approved in accordance with specific environmental requirements and an independent third party verifies that the products fulfil the requirements. Ecolabelling imposes fixed requirements (threshold values) on the products. These requirements are based on a cradle-to-grave assessment and have been developed in accordance with the ISO 14 024 standard. The scheme excludes products that fail to satisfy the requirements. In the case of the Nordic Swan Ecolabel the criteria are updated in an open process involving participants such as public authorities, consumers, industry, researchers, environmental movements and the trade. The requirements are formulated with a view to promoting best production practice. Other official labelling schemes that

are members of GEN (Global Ecolabelling Network) and have requirement schemes for furniture and fitments are:

- The EU Flower. Work commenced in 2006/2007 on criteria for wood-based furniture. These were implemented in 2009.
- The Blue Angel is a German ecolabel that is operated by the Federal Environmental Agency (FEA)². Der Blue Engel has criteria for non-coated or coated composite wood panels for indoor use. These include chipboards, wood-core plywood, fibreboards, Medium-density fibreboards (MDF), Veneer plywood boards, solid wood boards, SOB boards and other types of chipboard (V 100 chipboard and chipboard for furniture manufacture and interior works). As at the present time there are 12 licence holders. The criteria focus on recycled materials and formaldehyde.
- EcoLogo³, is a Canadian ecolabel and is managed by Environment Canada. They have criteria for: "Office Furniture and Panel Systems" (miscellaneous manufacturers for these criteria 02.01.2009).
- The Eco Mark⁴, is a Japanese ecolabel managed by Japan Environment Association (JEA). They have criteria for: "Furniture Version 1.4".
- Good Environmental Choice Label⁵, is an Australian ecolabel managed by Environment and Development Foundation. They have criteria for: "Furniture and fittings" (approximately 50 licences).
- Korea Ecolabel⁶ is a Korean ecolabel and is managed by Korea Environmental Labelling Association (KELA). They have criteria for: "Wooden Office Furniture", "Chairs", "Educational Wooden Furniture", "Chairs and tables for educational institutions", "Metal furniture for the office and education facilities".
- Green Mark⁷ is a Taiwanese ecolabel managed by Environmental Protection Administration Government of the Republic of China. They have criteria for: "Wooden Furniture" and "Products made from recycled wood".
- Environmental Labelling Program in China⁸ is a Chinese ecolabel managed by State Environmental Protection Administration (SEPA). They have criteria for: "Furnitures".
- Environmental Choice⁹ is an ecolabel from New Zealand and is managed by New Zealand Ecolabelling Trust. They have criteria for "Furniture and fittings".
- The eco-label of the Czech Republic¹⁰ is an official ecolabel managed by The Czech Ministry of the Environment. They have criteria for: "Wood-based agglomerated materials and products made of them".

Other lifecycle-based labels for building materials exist, especially in Germany and Austria where health and the environment are a major focus of attention. The schemes are particularly concerned with the ecology and natural materials, for example the

² The Blue Angel, the official German ecolabel. Information available from: <http://www.blauer-engel.de/en/index.php> (02.01.2008)

³ EcoLogo, is the official Canadian Ecolabel. Information available from: <http://www.ecologo.org/en/> (02.01.2008)

⁴ The Eco Mark, Japanese ecolabel. Information available from: <http://www.jeas.or.jp/english/> (02.01.2008)

⁵ Good Environmental Choice Label, an Australian ecolabel. Information available from: <http://www.geca.org.au/AELAhistory.htm> (02.01.2008)

⁶ Korea Ecolabel. A Korean ecolabel. Information available from: http://www.koeco.or.kr/eng/business/business01_01.asp?search=1_1 (02.01.2008)

⁷ Green Mark.. A Taiwanese ecolabel. Information available from: <http://greenliving.epa.gov.tw/GreenLife/green-life/english.aspx> (02.01.2008)

⁸ Environmental Labelling Program in China is a Chinese ecolabel. Information available from: <http://www.sepacec.com/cecen/> (02.01.2008)

⁹ Environmental Choice is an ecolabel from New Zealand. Information available from: <http://www.enviro-choice.org.nz/> (02.01.2008)

¹⁰ Information available from: [http://www.ekoznacka.cz/_C12572570032F2DB.nsf/\\$pid/MZPMSFIV17VH](http://www.ekoznacka.cz/_C12572570032F2DB.nsf/$pid/MZPMSFIV17VH) (02.01.2008)

German”nature plus-Seal of Quality¹¹”. Natureplus is an international organisation for future-oriented building with over 100 participants in various parts of Europe. The criteria consist of a document with basic requirements and product-specific requirements for e.g. ”Timber and Wood Materials” and ”Dry Wall Construction Boards”.

Environmental declarations provide detailed environmental information without imposing specific requirements on the products. In other words, there are no predetermined requirement levels. The utility of these declarations will depend on the knowledge of the buyer about environmental conditions relating to the product that is being purchased. At present there are no international systems for environmental declarations, although work is underway in this area. Environmental declarations require the drafting or existence of product category rules, PCRs. Examples of environmental declarations are those noted above, as well as Kretsloppsrådets Byggvarudeklarerationer¹², Sweden and EPD, Environmental product declarations¹³, Sweden. ECOprodukt¹⁴ is a Norwegian collaboration between NAL (Norske Arkitekters Landsforbund – National Association of Norwegian Architects), Byggforsk and Norsk byggtjeneste oda as. ECO Product’s point of departure is the environmental properties of the manufacturer, or corresponding information, and the organisation assesses the properties of the products in terms of indoor climate, content of substances harmful to health and the environment, resource use and greenhouse gas effect. Basta¹⁵ is a Swedish database, the aim of which is to phase out the use of chemicals with particularly hazardous properties. It was established by the four largest developers in Sweden: NCC, JM, Peab and Skanska, and the trade organisation the Swedish Construction Federation (BI). The database is based on self-assessed information provided by the suppliers who register building products that fulfil the criteria applicable. Only approved products may be registered in the database.

Environmental management systems allow companies to put their own houses in order and to set their own targets for improvements. These are management tools designed for the companies themselves and enable them to chart the environmental impact of the business and thereby draw up procedures for purchasing control and environmental information. The most important schemes are EMAS, which was developed by the European Union, and ISO 14001, which is an international standard. Externally these systems are not especially visible. The system does not allow for the exclusion of products or activities that are less favourable in environmental terms.

Various indoor climate labels are also used for furniture and fitments. Dansk Indeklima Mærkning¹⁶ is a common label for Norway and Denmark. In 2005 the Danish Indoor Climate Label took over the operation of the secretariat of the indoor climate labeling in Norway. The scheme classifies panels according to emissions of various substances. The Nordic asthma and allergy organizations also have labelling systems for materials, where emissions also are considered.

¹¹ Natureplus, organisasjon for bærekraftig bygninger. Tilgjengelig fra: <http://www.natureplus.org/en> (02.01.2008)

¹² Byggvarudeklarerationer – Kretsloppsrådets riktlinjer, BVD 3. Information available from: <http://www.kretsloppsradet.se/home/page.asp?sid=5287&mid=2&PageId=45786> (02.01.2008)

¹³ The international EPD@system. Information available from: <http://www.environdec.com/pageId.asp> (02.01.2008)

¹⁴ ECOProduct. Information available from: <http://www.arkitektur.no/?nid=122327> (02.01.2008)

¹⁵ Basta, a Swedish building materials database. Information available from: <http://www.bastaonline.se/2.4a4d22a41128e56161b80009533.html> (02.01.2008)

¹⁶ Dansk Indeklima Mærkning, Tilgjengelig fra: <http://www.teknologisk.dk/specialister/253> (05.02.2009)

In addition there are various raw material labelling schemes. For example FSC¹⁷ (Forest Stewardship Council) and PEFC¹⁸ (Programme for the Endorsement of Forest Certification schemes) operate traceability schemes that show that the wood raw material derives from sustainable forestry operations. These schemes take account only of the origin of the wood and impose ecological and ethical requirements relating to forestry. An independent control body verifies that forestry operations are conducted within the rules laid down in the FSC standard of the country in question. In addition there is a process for certifying traceability which guarantees the traceability of the raw material all the way from forestry to finished product. However, the FSC scheme imposes no requirements as to emissions, energy consumption and other environmental impacts over the course of the useful life of the product. There are three variants of the FSC label:

- FSC Pure – which means that 100 percent of the raw material is FSC certified
- FSC Recycled – which means that 100 percent of the raw material is recycled material
- FSC Mixed Sources – which means that at least 70 percent of the raw material is FSC certified while the rest of the raw material derives from other, verified origins or consists of recycled material.

There are a number of other labelling schemes used for building materials. The criteria for the schemes vary and not all of them impose requirements relating to environmental parameters. Some of these schemes are approval schemes or quality marks, for example CE-marking of building products¹⁹ and the P-mark²⁰. The CE-mark represents a passport providing free passage for products throughout the EU/EEA without further approval, adaptation or retesting. The mark functions as a signal to the national authorities that the manufacturer guarantees that the product complies with the requirements applicable to safety, health and environment and that the prescribed control procedures have been followed. The CE-mark is a self-declaration scheme without verification for most panels, although in the case of panels for construction where there is a durability requirement third party verification of the manufacturer's own control system is available, but not control of the product itself. The P-mark is the SP Group's on quality mark.

EU-GPP Product sheet. The EU has (as have the Nordic countries) recently drafted guidelines for public procurement of, inter alia, furniture²¹. The so-called Green Public procurement (GPP) Product sheets impose a number of requirements intended to ensure that the products have a high environmental profile. Many of the requirements refer to the Nordic Swan Ecolabel and EU Ecolabel criteria requirements.

The Möbelfakta is a voluntary, neutral test and marking scheme for furniture (operates in Norway and Sweden).

¹⁷ FSC, Forest Stewardship Council. Information available from: <http://www.fsc.org/> (05.02.2009)

¹⁸ PEFC, Programme for the Endorsement of Forest Certification schemes. Information available from: <http://www.pefc.org/internet/html/> (05.02.2009)

¹⁹ About the European CE mark. Information available from: <http://www.euroinfo.se/ny/hem/ce-markning/skrivta/vad-ar-ce-markning.html> (02.01.2008)

²⁰ The P-mark from SP, Technical Research Institute of Sweden. Information available from: http://www.sp.se/sv/units/certification/product/p_mark/sidor/default.aspx (02.01.2008)

²¹ European Commission GPP Training Toolkit - Module 3: Purchasing recommendations. Information available from: http://ec.europa.eu/environment/gpp/toolkit_en.htm (besøkt 4. august 2009)

Byggvarudeklaration (BVD) is a type II declaration in accordance with ISO 14020. This is a self-declaration from the manufacturer in accordance with a template drafted by the industry.

3 About the revision process

3.1 The objectives of the revision process

The main purpose of the revision has been to impose relevant environmental requirements for furniture and fitments with a view to ensuring that the best products within their areas are eligible for Nordic Swan Ecolabelling. There is a requirement that differentiated requirements should be imposed, but in this revision process emphasis has been placed on finding common fundamental requirements.

The possibility of imposing basic requirements on production, while at the same time reducing the number of product requirements has been examined with the aim of simplifying the documentation required relative to previous documents.

A second goal has been to harmonise the requirements in the criteria for furniture and fitments with the requirements in the new revised criteria for building panels. The same applies to the new and revised textile, hide and leather requirements applicable under the EU Flower scheme. The development of the criteria for wood-based furniture within the EU has also been monitored carefully with a view to possible harmonisation.

3.2 Specific areas within furniture and fitments that have been evaluated

In general there was a need for a review of the structure of the criteria, both from the perspective of adapting the criteria to fitments and to assess the complexity of the criteria. It has been concluded that the term “small parts” should be defined.

In addition it was necessary to review the requirements applicable to:

- wood raw materials, reflecting the availability of certified wood raw materials and the exemptions that exist in the current criteria.
- surface treatment adapted to various types of furniture.
- chemical products used for surface treatment.
- plastic relating to the requirement applicable to surface treatment, and the proportion of recycled plastic used.
- metal, with a view to controllability.
- chrome plating, in view of the level of requirements, and that this type of surface treatment is permitted.
- halogenated flame retardants in padding materials and fabrics.
- hide and leather, in view of the fact that they are excessively extensive and should be harmonised with possible new revised criteria for fabrics.

- properties in use and various test methods/standards need to be updated (including the forms adapted for subcontractors).

A market survey conducted in parallel with the revision process provides the basis for a possible extension of the product group definition.

In the case of some of the materials used in furniture, the requirements are very extensive. This applies in particular to the requirements applicable to building panels and hide and leather. The requirements applicable to hide and leather have been taken from the criteria document for the ecolabelling of textiles, skin and leather, which is now being evaluated. One of the conclusions reached in the evaluation process is that the requirements applicable to skin and leather, which include auxiliary chemicals, are excessively extensive and should be amended when the document is revised.

3.3 About this revision

This project has extended over a considerable period of time, as a result of which there have been some changes in the makeup of the project group underway.

Area coordinator:

- Elisabeth Magnus, Miljømerking i Norge

Project manager:

- Kristian D. Nielsen/Jakob Waidtløw, Miljømærkning Danmark

National product group managers:

- Cathrine Westerlind, Miljömärkning Sverige
- Heidi Bugge, Miljømærkning Danmark
- Harri Hotulainen, SFS Finland
- Kristian Kruse, Miljømerking i Norge

External interests were involved through a small market survey (interview project), the minimum goal of which was to involve potential licence-holders and selected dealers. A total of 55 manufacturers and dealers were contacted in the Nordic countries. The purpose of the interview project was to elicit feedback on the existing criteria (for all three product groups) and to get some input on whether or not the product group definitions are accurate.

4 Discussion of the reasons for amending the requirements. An overview

In the following a description is provided of the grounds and background for all changes between version 3.4 and version 4.0. Appendix 2 presents all these changes in a table giving a summary overview.

4.1 The background to the requirements

4.1.1 The definition of the product group

The product group definition for furniture and fitments is extensive, but generally speaking seating furniture (chairs, sofas etc.) lying furniture (beds, sofa beds, mattresses etc.) and storage furniture (cupboards, book shelves etc.) as well as fitments (e.g. kitchen and bathroom interiors, wardrobes) and doors for indoor use and light fittings are eligible for Nordic Swan Ecolabelling.

Building products (e.g. walls, stairs, covings, panel materials), sanitary equipment, rugs/carpets, fabrics, office equipment and other products, the primary function of which is other than furniture as well as furniture intended for outdoor use, fall outside the definition.

Sanitary equipment means toilets, washbasins, shower cabinets and the like.

In the case of kitchen fitments/bathroom fitments no requirements are imposed with regard to parts that do not form a permanent part of the fitment. This applies to accessories such as knobs, handles, draw fitments, hangers, rods etc. In the case of wooden products, however, requirement R7 of the criteria document concerning sustainable forestry, is applicable.

Moreover, in the case of other furniture products accessories are not regarded as part of a Nordic Swan Ecolabelled product. If for example a mattress is Nordic Swan Ecolabelled and is sold together with a headboard that is not Nordic Swan Ecolabelled, then the headboard must not be marketed as part of the Nordic Swan Ecolabelled product.

Because furniture and fitments are not unambiguously defined terms, discussions will always arise about whether or not various products are encompassed by the product group definition. Furniture and fitments may have a variety of uses, for example for offices, schools as well as for ordinary households. Furniture may be free-standing or built-in and encompass uses that include storage, lying, sitting, working and eating. Coffins are not included, the same applies to blackboards, which for our purposes are classified as office or school equipment.

There are also manufacturers of steps who would be interested in a Nordic Swan Ecolabel. Steps are not considered to form part of the product group definition because they perform a function that would more comfortably fit in under the floor criteria. However, steps have not yet been included in the floor criteria.

Bean bag chairs are considered to be encompassed by the product group definition because their main function is to act as seating. There has also been some discussion about whether cushions should be included in the furniture criteria since mattresses already form part of the product group definition. As a general rule, cushions cannot be included because the product naturally falls in under the criteria for the Nordic Swan Ecolabelling of textiles, skin and leather, which are considered to be more relevant criteria for this product. However, pillows may be ecolabelled according to the criteria for furniture and fitments if they are a part of an overall furniture license, for example together with beds or mattresses, and if the padding materials are of the same type as the furniture. For example, latex- and polyurethane -foam or other filling types that meet the

furniture and fitments criteria. If the fill of the pillow is of down, feathers, wool, polyester fibres or other materials for which there are no requirements, these may be present individually in a maximum of 5 weight % of the product and in total up to 10 weight %. This is to ensure that requirement K1 is fulfilled. Pillows that are filled with down, textile fibres or for example grain may be ecolabelled according to the textile criteria.

Light fittings must permit the use of low energy bulbs, in other words compact fluorescent tubes or LED bulbs. Fittings for fluorescent tubes and halogen bulbs do not qualify for a Nordic Swan Ecolabel.

Separate criteria exist for outdoor furniture, textiles and panel materials and are available by contacting one of the secretariats.

Relevant products in addition to those discussed above that may be considered to constitute furniture fitment products may be included in the product group upon request. This applies only to products made of materials in respect of which requirements are imposed in the criteria. All decisions on the inclusion of new products in the product group are taken by Nordic Ecolabelling.

Other materials, components or additives for which requirements are not imposed in the document may be present individually in a maximum of 5 weight % of the product and in total up to 10 weight %.

4.1.2 Overview of materials

If a licence is held for other Nordic Swan Ecolabelled products that may be present in furniture and fitments, for example textiles, then documentation of the individual requirements applicable to such products will not be required. Where many types of products are produced comprising different materials, the materials in the products may be approved in accordance with a specific list of materials. The material composition must fulfil the requirements specified in the criteria and each individual product must fulfil all requirements. If a licence is already held, an application may be submitted to include new materials in the form of an extension of the licence. Some requirements may be documented on an annual basis at factory level. For example, a furniture manufacturer may document the requirement applicable to the use of wood from certified forestry operations (R8) on the basis of the proportion used in the year's production. The following other requirements may also be documented on an annual basis: R7, R9, R11, R14, R15, R16, R27, R28, R35 and R52.

4.1.3 Environmental requirements

The whole of Chapter 2.1, requirements R2 – R6, is new. Previously all requirements applicable to chemical products were contained in the chapter concerning type of material, surface treatment of metals, textiles etc. In this consultative document, the main requirements applicable to chemical products used in production are all concentrated in Chapter 2.1.

Chemical products (R2 - R6)

The requirements in Chapter 2.1 (Chemical products) of the criteria document are requirements applicable to chemical products used in the production of furniture and in the production of ingoing materials used in furniture where the requirements are referred to from other chapters, e.g. for wood-based panels, textiles etc.

Consultative proposal:

2.1 Chemical products

The requirement includes all chemical products used in the furniture/fitment or used in the factory/production site, including surface treatment. The requirement applies to products such as glue, varnish, staining, primer, filler, oil, soap, joint filler, sealants, colour products, binding agents, pigments, bleaching chemicals and the like. Auxiliary substances such as lubricating oil and cleaning detergents are not included in the requirements. Separate requirements for textiles are included in Chapter 2.8 and exemptions are accordingly granted for the requirements in R3 and R4.

R2 Ecolabelled chemical products

Is the chemical product Nordic Swan Ecolabelled? If yes, omit the remainder of the requirements in Chapter 2.1.



Name, manufacturer and licence number for the chemical product.

R3 Classification

Chemical products used in the production of Nordic Swan Ecolabelled furniture and fitments must not be classified in accordance with the following table. Requirement R20, quantity of environmentally harmful products applied and in the case of wood-based panels exemptions are granted for classification in the hazard class environmentally harmful.

Table 2. Classification of chemical products

Classification	Associated hazard symbol and R-phrases*
Environmental hazard	N with R50, R50/53, R51/53 and/or R59.
Highly toxic	Tx (T+ in Norway) with R26, R27, R28 and/or R39
Toxic	T with R23, R24, R25, R39 and/or R48
Allergenic if inhaled and sensitising	Xn with R42 or Xi with R43
Carcinogenic	T with R45 or R49. Or Xn with R40
Mutagenic	T with R46 or Xn with R68
Toxic for reproduction	T with R60 and/or R61. Or Xn with R62 and/or R63.

* A list of R phrases and their meanings can be found in Form 1 of Appendix 2.

The classification applies in accordance with the Dangerous Substances Directive 67/548/EEC as adapted to REACH in accordance with Directive 2006/121/EC and the Dangerous Preparations Directive 1999/45/EC or with subsequent amendments and adaptations. With the transition to GHS (Globally Harmonised System) the requirements applicable to the classification of products may be converted, cf. Form 4b in Appendix 2.

Please note that the producer is responsible for correct classification.



Declaration in accordance with Form 2a in Appendix 2 by the manufacturer or raw material supplier.

Product safety data sheets/product sheets in accordance with the legislation in force in the country of application for example Appendix II of REACH (Directive 1907/2006/EC) for each product.

R4 Contents and additives

The following must not be present in/ added to the chemical product or material.¹ In the case of materials and surface treatment the requirement applies if specified in the individual sub-chapters (Chapter 2.3-2.11) of the environmental requirements in Chapter 2. The individual sub-chapters indicates how far back in the production the requirement should be documented.

- *Halogenated organic compounds² in general (includes chlorinated polymers). For example: PVC, organic chloroparaffins, fluorine compounds, flame-retardants and organic bleaching agents. The biocides bronopol and CMIT in combination with MIT is exempted and has its own limits, see below.*
- *PFOA³ (perfluorooctanoic acid and salts/esters thereof) and PFOS (perfluorooctane sulphonic acid and compounds thereof)*
- *bisphenol A*
- *the biocides chlorophenols (their salts and esters), and dimethylphumarate*
- *bronopol Cas. Nr. 52-51-7 in more than 0,05 W/W %*
- *isothiazoliner in excess of 0,05 weight-%*
- *the mixture (3:1) of CMIT/MIT (5-chloro-2-methyl-4-isothiazolin-3-one Cas. No. 247-500-7; 2-methyl-4-isothiazolin-3-one Cas. No. 220-239-6) in excess of 0,0015 weight-%*
- *alkylphenols, alkylphenolethoxylates or other alkylphenol derivatives⁴*
- *phthalates*
- *aziridine and polyaziridines*
 - *carcinogenic⁵, mutagen and reproduction damaging compounds (category I and II according to 67/548/EC) or (Category 1A and 1B according to CLP-regulation 1272/2008)*
- *pigments and additives based on lead, tin, cadmium, chromium VI, and mercury or their compounds.*
- *The content of aromatic solvents must not be present in the chemical product in quantities in excess of 1 weight %.*
- *The content of volatile organic compounds⁶ (VOC) in glue must not exceed 3 weight %*
- *No biocides must be applied to the surface of the final product or part of the final products with the intention to add a disinfective or antibacterial effect.*

¹Additives includes all substances in the product including additives (e.g. pigments) in the ingredients, non-pollutants from the raw material production process. Pollutants are traces of substances from the raw material production process present in the finished product in concentrations of less than 100 ppm (0.01w/w %, 100 mg/kg), but not substances added to a raw material or product deliberately and for a purpose, irrespective of quantity. Declaration is made by the chemical supplier based to the best of his/her knowledge at the given time, also based on information from raw material manufacturers, recipe and available knowledge on the chemical product with reservations for new advances and new knowledge. Should such new knowledge arise, the undersigned is obliged to submit an updated declaration to Nordic Ecolabelling.

²Exceptions are given to producers of mattresses and padded furniture for adhesives with additives containing polychloroprene if the emission of the rest monomer chloroprene (2-chloro-1,3-butadiene) is $\leq 1 \mu\text{g}/\text{m}^3$ after 3 days, measured with the chamber method EN ISO 16000 (see point 5, appendix 1). The exception is not valid for mattresses designed for children. Exception is also given for using epoxy acrylate in UV-curing coatings.

³Note the national legislations concerning PFOA in the Nordic countries. In Norway PFOA is regulated in «Forskrift om begrensning i bruk av helse- og miljøfarlige kjemikalier og andre produkter (produktforskriften)», §2- 32.

⁴Alkylphenol derivatives are defined as substances that shed alkylphenols during degradation.

⁵ Exceptions are given for formaldehyde impurities in new produced polymer. For a formaldehyde requirement, see requirements K5

⁶Organic solvents are defined as solvents with a boiling point of $<250^\circ\text{C}$ at 0.013 kPa.



For each chemical product/raw material present in the furniture or surface treatment must be submitted from the chemical supplier in accordance with Form 2a in Appendix 2.

R5 Free formaldehyde

The quantity of free formaldehyde chemical products used in the production of Nordic Swan Ecolabelled furniture/fitments must be up to 0.001 weight % (10 ppm) in unhardened glue. There is an exception for glue products with new produced polymeric, where it is permitted up to 0.1 weight % (1000 ppm) free formaldehyde.



Declaration in accordance with Form 2a of Appendix 2 by the manufacturer or raw material supplier.

R6 Nano particles

Nano metals, nano minerals, nano carbon compounds and/or nano fluoride compounds must not be actively added to chemical products unless documentation can be provided to show that they would not entail environmental or health problems.

For these purposes, Nano particles are counted as microscopic particles where at least one of the dimensions is less than 100 nm. Nano metals include nano silver, nano gold and nano copper.



Declaration in accordance with Form 2a of Appendix 2 from the manufacturer or raw material supplier.



Documentation on the nano particles used, clearly showing fulfilment of the requirement.

General explanation of R3 and R4.

In this revision, many of the individual requirements applicable to chemical products as well as to the content of and additives to chemical products, are gathered together in requirements R3 and R4 so that the requirements are not repeated in full in each subchapter of the document. An internal evaluation conducted in 2006 found that it might be useful to impose some basic requirements as regards production and thereby reduce the total number of product requirements. The purpose and goal of this has been to simplify and emphasise the criteria for manufacturers and applicants. The aim of this change has also been harmonisation with new/future criteria such as chemical building products, windows, small buildings etc.

As in the past, these requirements must be documented and declared using forms contained in Appendix 2. A new form (Form 2a) has been drafted for chemical products (R3) and the content of and additives to chemical products (R4).

R3 Classification.

Explanation of R3.

Relative to earlier, classification of environmentally harmful, toxic and very toxic substances is required. This classification is in accordance with updated and current regulations.

The proposed requirements for the classification of chemical products for furniture and fitments corresponds to equivalent requirements in the criteria for the Nordic Swan Ecolabelling of chemical building products, but is less comprehensive/strict. For example, products classified as dangerous to the environment without N are permitted. In addition, certain exceptions have been included.

The European Union has recently drafted guidelines for public procurement of, inter alia, furniture. The "Furniture Green Public Procurement (GPP) Product sheet²¹" mentioned earlier imposes a number of requirements designed to ensure that the products have a high environmental profile. Many of the requirements refer to the Nordic Swan Ecolabel/EU Ecolabel requirements and they have many of the same classification requirements as the consultative proposal for new criteria for the Nordic Swan Ecolabelling of furniture and fitments. It is important to note that in the GPP Product Sheet the EU has also opted to include classification requirements for toxic, very toxic and environmentally dangerous products. In comparison, the Nordic Swan Ecolabel

requirements are in general more extensive, fundamental and have a higher environmental profile.

The proposed classification requirement excludes the most problematical products within the product types in question.

It is important to note that exemptions from the general chemical requirements (Chapter 2.1) apply for textiles (Chapter 2.8). Here, separate requirements have been retained which take in requirements as to chemicals. Textile production involves a long product chain with, in some cases, numerous subcontractors, and it has been concluded that it would be more useful and less bureaucratic to retain the individual chemical requirements in the textile requirements in Chapter 2.8. In the case of padding materials and textiles, requirements are imposed as to classification of toxic or very toxic substances. As noted earlier, the classification of toxic and very toxic substances is new to this version of the criteria. The proposed chemical requirements of padding materials and textiles are based on the Flower requirements for mattresses and textiles. In the case of the production of padding materials, the document emphasises that an exception applies to isocyanates classified as Xn with R-42 and Xi with R-43, since isocyanate forms an important component in the production of polyurethane (R32). In order to fulfil working environment provisions, particularly with regard to the use of isocyanates, Form 7 requires declaration to be given on whether the process is closed and that the applicable official requirements in this area are followed.

Taken as a whole, the new proposal for general chemical requirements represents an increase in stringency in some areas, particularly as regards the classification of toxic and very toxic substances. In the case of very toxic and toxic substances (Norwegian regulations) input substances must be included in the summation if the concentration of the substance is greater than or equal to 0.1 weight % for non-gaseous substance mixes and greater than or equal to 0.2 volume % for gaseous substance mixes. If specific concentration limits are given in the substance list, these must be applied for the purpose of calculation. Generally, very toxic substances less than 3 weight % and toxic substances less than 25 weight % are not encompassed by the classification requirement. These calculations depend on the applicable rules, the substance mixture and any classification limits in the substance list. For further information see the regulations on the classification, labelling etc. of dangerous chemicals (FOR 2002-07-16 No. 1139), last amended 2005^{xxvi}. Reference is made to the same source for questions on the interpretation and calculation of classification of the other hazard classes specified in Table 2. There has also been a small general increase in the stringency applicable to environmentally harmful products that are dangerous to the environment in some of the chapters. The classification limit for environmentally harmful products with N in Table 2 is 25 weight %, 2.5 weight % or 0.25 weight %. However, most products have a classification limit of 25 percent. Note that R52 is not included in Table 2. It is however included for padding materials and textiles which have stricter classification requirements for environmentally harmful substances than specified in the general chemical requirements in Table 2 in R3.

In the case of padding materials and textiles the classification and documentation requirements have been increased in the form of the submission of datasheets for the relevant requirements. This represents a small but relevant increase in the stringency of the chemical requirements. For further information see the individual chapters.

Adhesive (formerly R65-R69 in Chapter 2.9

Specific requirements for adhesive have now been removed in the consultative proposal for the criteria document since the requirements are largely safeguarded in the general chemical requirements (R3-R6). One key difference is that a triviality threshold of 50 g wet glue in the finished furniture product no longer applies. This means that there will be a requirement as to classification of environmentally harmful substances for all glues. However, the classification rules are relatively high, at the same time as which environmentally friendly glue options are available on the market. In the case of environmentally harmful substances for glue > 50 g the general chemical requirements may represent a reduction in stringency since Table 2 does not contain R52 and products labelled only N. However, a number of new hazard classes are introduced in Table 2 and overall this represents a small increase in stringency as regards the classification of glue and the requirements concerning glue in finished furniture products. The new requirement, R4, Additives, corresponds to the previous requirements (R68 and R69), but certain substances have been added to the list.

The formaldehyde limit applicable to free formaldehyde in glue, has been increased in stringency for 0.5 weight % to 0.3 weight % since developments are moving in the direction described in R13. The previous requirement (R68) of less than 5 weight % of organic compounds is included in R4. As regards the use of glue containing isocyanate, this will not be encompassed by the general chemical requirements (Xi43). Emissions of isocyanate compounds or associated rest products will be minimal from glues after hardening resulting in minimal exposure from products. It is important to underline that ecolabelled furniture always must comply with government regulations, including working environment regulations, which is of great importance when using products containing isocyanates. It is important to note that an exception applies to the use of isocyanate in the production of polyurethane.

A brief background on glue

Furniture manufacturers use glue for different purposes. As a consequence they also use different types of glue.

For gluing plastic foam, either to wooden parts or to other plastic foam parts, glue that is not subject to a classification requirement is widely used. Where a 2-component glue is used, one part may be classified as environmentally harmful.

In the case of lamination, four types of glue may be used: two based on formaldehyde (urea resins and melamine-urea resins), one based on polyvinyl acetate (PVAc glue) and one based on isocyanates (EPI glue). Several of these products contain substances that are undesirable in terms of health and environment.

For gluing wooden components water-based dispersion adhesive is used. These products are largely not subject to a classification requirement. In cases in which 2-component glues are used, one part may be classified as allergenic.

In the following a discussion is provided of application quantities and organic solvents used in surface treatment⁷. See also the discussion of the use of glue at the end of the explanation of the formaldehyde requirement R13.

Polyvinyl acetate (PVAc) adhesive with a water content, PVAc binding agents and organic solvents (normally 3% butyl or ethyl acetate). The quantity added is normally 120 g/m². During curing, water and approximately 3.6 g/m² solvent evaporate.

UF resins contain urea formaldehyde, if applicable extenders, catalysts and water. What is termed the “free formaldehyde” component of the adhesive is approximately 0.1 to 0.5% of the mass were most is bound during the curing process. The amount applied is approximately 100 g/m².

EVA glue contains ethylene-vinyl acetate copolymer, water and in some cases up to 3% organic solvents (normally ethanol and toluene). The quantity applied is approximately 90 g/m². During curing, the water evaporates, as does approximately 2.7 g/m² solvent, if used.

R4 Content of and additives to chemical products

This requirement is new and replaces a number of individual requirements contained in the various individual chapters previously. Perfluorooctanic acid (PFOA), perfluorooctanesulphonic acid (PFOS) and bisphenol A are substances that were not previously encompassed by the criteria. Chapter 2.8 for textiles contains separate requirements applicable to the content of and additives to chemical products and is accordingly not encompassed by the requirement.

Explanation of R4:

Instead of listing the same substances in each chapter, these substances have now been collected together. This makes for more clarity and enables problem chemicals that will conflict with the criteria to be identified at an earlier point. In addition, this requirement, together with the classification, will encompass the most relevant chemical requirements. As in the past, this must be declared in a separate updated form (Form 2a). PFOA, PFOS and bisphenol A are included in the criteria since these are problem substances which may be relevant in the case of furniture and fitments (see the discussion under the explanation of these substances on the following page). In Norway, the Climate and Pollution Agency has proposed a considerable tightening-up with regard to these substances^{xxvii}. The other compounds in R4 are described in detail in previous background documents.

Exceptions to the requirement

There is an exception for the requirement for use of glue with polychloroprene addition to mattress and box upholstered furniture manufacturers during the period 10 May 2012 to 30 February 2016, if the issue of adhesive residual monomer chloroprene (2-chloro-1,3-butadiene) is $\leq 1 \text{ mg} / \text{m}^3$ after 3 days as measured by the chamber test EN ISO 16000 (see Appendix 1 section 5). The exemption does not apply to children mattresses. This exception is made when there currently are no adhesives without addition of polychloroprene, which can fulfill the function with respect to the gluing of textile and padding material for mattress and upholstered furniture.

Exception is also given for using epoxy acrylate with chlorine in UV-curing coatings. Exceptions are given for formaldehyde impurities in new produced polymer. For a formaldehyde requirement, see requirements K5

Halogenated organic compounds^{xxviii}: Organic compounds containing halogenated compounds such as chlorine, bromine, fluorine or iodine must not be present in ecolabelled furniture and fitments. Halogenated organic compounds encompass a wide range of substances harmful to health and environment, they are very 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 that the substances

will have harmful effects. The requirement is therefore imposed that halogenated organic compounds must not be present in furniture and fitments. This means, inter alia, that halogenated flame retardants, chloroparaffins, perfluoroalkyl compounds, PVC and certain organic bleaching chemicals must not be present in Nordic Swan Ecolabelled furniture and fitments. However, trace elements in accordance with the description provided in Form 2a of the criteria document are permitted.

Bisphenol A^{xxxix}

Bisphenol A, cas. No. 80-05-7, is used as a monomer in, inter alia, the following relevant areas and products: Various plastic and epoxy mixes, various building parts, paint, varnish, glue (binding agents, hardeners) and polyol in the production of polyurethane. Bisphenol A can be released into the environment from the production process and the substance has shown endocrine (hormonal) effects in both fish and in snails. The main source of terrestrial exposure is the spread of sludge from sewage treatment plants. Environmental risk-reducing measures are necessary in several areas of use. For consumers, there is no direct exposure, although polycarbonates and epoxy resins containing bisphenol A are present in many consumer products. A Norwegian study has revealed major variations in freely available bisphenol A in various products on the market, ranging from 10 mg/kg free quantity monomers to approximately 2500 mg/kg. Potential consumer exposure may occur if residual monomers are available or if the polymer is damaged or broken down, for example in epoxyresin-based paint, plastic wood and glue. Emissions to the environment from products during their useful life or as waste, may cause indirect exposure to humans.

The substance is classified as harmful for reproduction and it is not known for certain when satisfactory data on neurotoxicological effects will be available. Bisphenol A causes endocrine disruption. Simultaneous exposure to multiple endocrine disturbing substances may result in additive effects, which are not captured by current risk assessments. The substance fulfils the criteria for the generational goal (based on the endocrine disruptiveness/reproduction toxicity of the substance and the fact that it is found in the environment and biota in Norway). This substance satisfies all the criteria for using the precautionary principle. Relative to the provisions of the EEA Agreement and the WTO regulations the regulation of bisphenol A in consumer products is considered to be justified and given the particular effects of the substance on health and the environment combined with the particular risk that the substance represents as regards health and the environment when it occurs in consumer products.

Perfluorinated and polyfluorinated alkylated compounds (PFAS)

Perfluoroalkyl substances, also called perfluoroalkyl surfactants or perfluoroalkyl acids (PFAS) is a term used for a group of chemical compounds containing a completely fluorinated alkyl chain and a group giving the compound a certain solubility in water. This group of compounds is fundamentally different from most other chemicals, since it is neither lipophile nor hydrofile, but generally binds to particle surfaces. The compounds are used primarily because of their excellent surface properties and their water and fat repelling properties. They are used in various industrial and consumer products, inter alia where low surface energy, high chemical and thermal stability, low refractive index, high electrical insulation properties and high ability to withstand corrosion and external effects are important. Important product types include floor wax and polish, paints and varnish, degreasing and cleaning products, impregnation products for textiles and leather and fire-extinguishing agents.

Perfluoroalkyl substances are very persistent, (stable) and break down very slowly. As noted in the introduction, these compounds show little lipo and water solubility and accumulation occurs in that they bond with surfaces of particles or tissue. They bind two proteins and are found at higher levels in apex predators. A Nordic screening study showed PFAS compounds in all the sample types examined and the highest was found in marine mammals. The report concluded that PFAS is found in considerable concentrations in the Nordic environment.^{xxx, xxxi}.

The most focused PFAS-compound perfluoroktylsulphunates (PFOS) is toxic to waterborne organisms, birds and bees^{xxxii}.

APEO^{xxxiii,xxxiv,xxxv}

Alkylphenolethoxylates (APEO) and alkyl phenol derivatives, i.e. substances that release alkyl phenols when degrading, must not be used in ecolabelled furniture and fitments. APEOs may occur in: binding agents, dispersants, thickening agents, siccatives, foam inhibitors, pigment pastes, wax etc. APEOs have a number of properties that are problematical for health and the environment. APEOs are not readily degradable according to standardised tests for ease of degradability, they have a tendency to bioaccumulate, they are found in high concentrations in waste water sludge, the degradation products of APEO, alkyl phenol and APEO with one and two ethoxy groups, are highly toxic to aquatic organisms and some alkyl phenols are suspected of causing endocrine disruption – alkyl phenols and bisphenol A are amongst the most potent of the oestrogen chemicals and may be released into waste water.

Raw materials containing APEO can be replaced with APEO-free raw materials based on three groups of surfactants: alkylsulphates, alkylethersulphates and alcoholethoxylates. These three groups of surfactants are readily degradable under both oxygen rich and oxygen poor conditions and the surfactants are toxic or very toxic to aquatic organisms.

Alkyl sulphates and alkylethersulphates are not regarded as bioaccumulative although alcoholethoxylates (long chained with few ethoxylate units) are potentially bioaccumable. Although the substitute surfactants are toxic or very toxic to aquatic organisms, there is an environmental gain to be made by substitution since they break down rapidly. Moreover, substituting APEO enables the degradation product nonylphenol to be avoided. Nonylphenol can cause endocrine disruption.

R5 Free formaldehyde

This requirement is new and again is a requirement that is now common and replaces earlier individual requirements applicable to free formaldehyde.

Explanation of R5

It is still necessary to have a separate requirement for formaldehyde since the substance will not be captured in the classification requirement K3. Many responses from the consultation have shown that the requirement for free formaldehyde content of chemical products should be reformulated. The purpose of the requirement has been to restrict the content of formaldehyde in the product in order to limit the emissions of formaldehyde. If the requirement applies to a finished mix of (two-component) adhesive and hardener (immediately after mixing) the requirement will be more precise and the total formaldehyde emission will be reduced. In addition, new and better technology, that has been introduced during the consultation, will not be limited. The consultation has also documented that this requirement also ensures minimal formaldehyde emissions

by mixing the adhesive with new methods. For example it is shown that the emission of formaldehyde emission of the finished product can be <10 ppm (measured by EN 717-1). Adhesive manufacturers and other manufacturers of chemical products shall document the requirement in the form of a declaration. Nordic Ecolabelling does not want to demand a specific test for this requirement because it would be too extensive and a too great financial burden to document for each chemical product. Nordic Ecolabelling may ask for a test should there be any doubt about the declaration. The background for the requirement is given below. Adhesives and formaldehyde are also described in the rationale for K3 and K13.

Physically drying (dispersion- and contact-glues): In dispersion-, acrylic- or PVAc glues (Polyvinylacrylat) the polymer is dispersed in water, and in contact glue, the polymer is dissolved in organic solvents.

Chemical hardening (PUR glue, epoxy glue): Chemical hardening occurs when the adhesive is exposed to moisture (such as one-component polyurethane glue) or through a reaction when the polymer and hardener are mixed (for example epoxy glue). Hardening may also occur by the reactants being heated (for example phenolformaldehyd-glue).

Physically drying (hot melt glue): Hot-melt glue is applied while hot (150-250 ° C), when the binding agent is liquid, and hardening takes place when the binding agent is cooled down again.

Formaldehyde occurs in water based products but without particular technical significance. It occurs as an undesirable residue from the polymerization of the binding agent based on polyvinyl acetate (PVAc) and can not be completely avoided.

The majority of the formaldehyde present in adhesives occurs as free formaldehyde. However, formaldehyde can also originate from the components in the adhesive (such as preservatives). Through correspondance with the industry we have learned that glue polymeres usually have a formaldehyde content of about 1000-2000 ppm.

Adhesives/glues emit formaldehyde during both the polymerization and the hardening phase. Free formaldehyde reacts by application of glue with wood or other components through Cannizzaro reaction ²².

Once the glue has finally hardened /dried, formaldehyde can split of through degradation processes. We have learned that only glue with very low formaldehyde content can achieve <10 ppm formaldehyde in the unhardened product. IKEA uses the limit value <10 ppm formaldehyde in unhardened adhesives when they wish to specify a formaldehyde-free adhesive. However, adhesives cannot in principle not achieve a threshold of <10 ppm formaldehyde in the wet adhesive.

In the criteria it is possible to check and make requirements for the amount of free formaldehyde in the glue, in the mixture or the dried glue, but not have requirements for what actually occurs when the adhesive is applied to a surface. This is primarily because

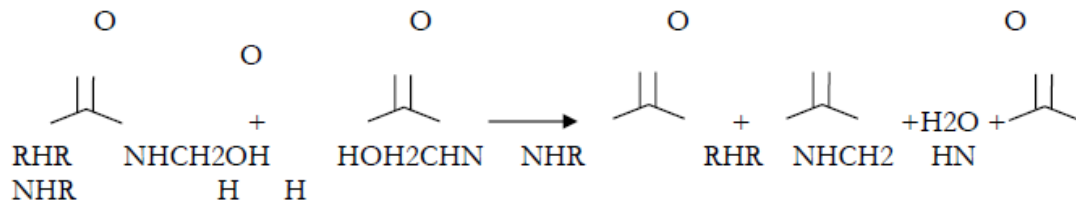
²² A special condition is the crossed Cannizzaro reaction. This variation is more common these days because the original Cannizzaro reaction yields a mixture of alcohol and carboxylic acid. For example any aldehyde with no alpha hydrogens can be reduced when in the presence of formaldehyde. Formaldehyde is oxidized to formic acid and the corresponding alcohol is obtained in a high yield although the atom economy is still low. http://en.wikipedia.org/wiki/Cannizzaro_reaction

neither the adhesive manufacturer or Nordic Ecolabelling has the opportunity to control the choice of timber / other material that the adhesive is applied to.

A measurement must be made to determine the amount of free formaldehyde. In principle there are three different methods used for analysis of free formaldehyde:

- 1) Free formaldehyde in the glue (titration)
- 2) Release of formaldehyde from the adhesive (closed chamber)
- 3) Release of formaldehyde from the glued surface (closed chamber, extraction or others)

Formaldehyde is split off when the molecules react and the adhesive dries/hardens, according to the following process:



Formaldehyde is classified as follows:

Conc ³ 25%: T; R23/24/25-34-40-43

5% ≤ Conc <25%: Xn; R20/21/22-36/37/38-40-43

1% ≤ Conc <5%: Xn; R40-43

0.2% ≤ Conc <1%: Xi; R43

Water-based adhesives consist of between 80 and 100% of polymer / binding agent. According to information from a large Danish adhesives manufacturer, the best polymer suppliers can at best achieve concentrations down to 200 ppm formaldehyde in newly produced polymer (building glue). But the content is normally considerably higher.

R6 Nano particles

Explanation of R6.

Nano technology, which also includes nano particles, is used to a greater or lesser degree within the building and interior decoration industry. What causes greatest concern is the use of nano particles that may be released and thereby have an effect on health and the environment. Nano particles may for example penetrate healthy cells enabling them to harm the cell or its DNA in the nucleus of the cell.

Within the EU the “European Union Scientific Committee on Emerging and Newly Identified Health Risks (EU SCENIHR)” released a report in 2005^{xxxvi}, which concludes that current methods for risk assessment need modification and that the existing toxicological and ecotoxicological methods will not necessarily be sufficient to assess questions that arise in connection with nano particles. The Committee is also of the view that in order to assess the exposure it will be necessary to know the number of nano particles and their surface as well as traditional information on quantity and concentration. The Committee maintains that existing equipment for routine measurement is inadequate and that existing methods for assessing exposure may not be suitable for assessing what will occur with the nano particles. Nano particles are used in a number of consumer products at present. As the situation now stands, there are either dissolved in fluids (suntan lotions), moulded in a polymer (car tyres), or deposited on a surface (inside refrigerators) in such a way that they will not immediately occur in the environments as free particles.

Nevertheless, use and wear may result in contact between these particles and organisms and the environment. In the building industry, nano technology is used primarily in applications that offer increased dirt and water repellent properties. For example, a wide range of paint products are available on the market according to the website The Project on Emerging Nanotechnologies^{xxxvii}. In Norway, paint manufacturer Jotun is in the process of commercialising a new house paint based on surface-treated nano particles with a core of silicon oxide^{xxxviii}. The use of nano particles allows the quantity of solvents to be reduced and enables the paint to dry more quickly while at the same time making it durable and harder than normal paint. It is not thought that rubbing down painted surface will release nano particles because they are bound in a polymer matrix.

Nano materials and nano technology have already been introduced in a range of areas in which Nordic Ecolabelling has criteria. Public authorities, environmental organisations and others are concerned about the lack of knowledge about the harmful effects on health and the environment. At the same time, nano technology could play a part in solving a number of environmental problems that we face today, such as in the use of cleaning technology and renewable energy.

Nordic Ecolabelling focuses on both traditional and new nano particles and imposes no requirements that would otherwise limit the use of nano technology in the form of materials with nano structures. Only in a few criteria are restrictions imposed on the active addition of nano particles based on the precautionary principle. Examples include the criteria for chemical building products (glue, filler, outdoor paint etc.).

Wood, willow and bamboo (R7 - R9)

The requirements in Chapter 2.2 of the criteria apply to products made of wood, willow and bamboo. Other equivalent raw materials may be included upon application to Nordic Ecolabelling. Furniture parts of recycled wood are exempt from the requirements R7 to R9 in this section.

For solid wood, veneer, willow and bamboo applicant may choose either to comply with document requirements R7 and R9 or select the revised requirements for wood raw materials (both A and B) in form 10. It is not possible to mix requirements R7 and R9 with the revised requirements A and B in form 10.

Requirements R8 Biocides are applicable regardless of the requirements (R7 and R9 or form 10) selected.

R7 Origin and traceability

Consultative proposal:

R7 Origin and traceability

This requirement concerns all product parts containing wood, willow, bamboo or fibre products thereof.

The licence holder must have written procedures covering sustainable wood and fibre raw material supplies and a documented system for tracing the origin of fibre raw materials. Wood and fibre raw materials must not originate in:

- *Protected areas or areas treated by means of an official procedure with a view to achieving protected status.*
- *Areas in which rights of title or of use are unresolved.*

- *Unlawfully harvested wood and fibre raw materials.*
- *Old virgin forest and forest with high protective value.*
- *Genetically modified trees and plants.*

- ☒ *Name (in latin and in a Nordic language), quantity and geographical origin (country/ state and region/ province/ municipality) of the wood and fibre raw materials used. Form 3 may be used. Nordic Ecolabelling may request further documentation in the event of uncertainty about the origin of the raw material. In the event of non-compliance with this requirement Nordic Ecolabelling may revoke the licence.*
- ☒ *A written procedure describing how the requirement is met. The procedures must include an updated list of all suppliers of wood and fibre raw materials used in the product. Form 3 may be used.*

The form of the requirement has been changed slightly with the addition of the last documentation requirement and the inclusion of bamboo and willow.

Explanation of the change to R7:

The manufacturer must maintain control over wood that has not been certified by ensuring that raw materials have been lawfully harvested and do not originate in forest environments with a high need of protection for biological and/or social reasons. This requirement is intended to make manufacturers more aware of the raw materials they use in their various products. In the event of suspicion that wood deriving from such areas has been used, Nordic Ecolabelling may require documentation to be submitted. In the worst cases the licence may be withdrawn.

The requirement has now been amended, as a result of which we now require wood producers to document how they ensure that the wrong type of wood is not used and to show which types of wood are used and their geographical origin. This increase in the stringency of the requirement will make it easier to verify compliance with the requirement. If a product originates in a forestry operation that has been certified in accordance with an approved forestry standard and has previously been documented, this requirement need not be documented again.

There is an increased focus on lawful felling. According to a report produced by the WWF on illegal timber used on the European market, an average of 40% of wood-based products imported from South-East Asia (including China) probably derives from unlawful felling. The EU has initiated an action plan to counter unlawful felling known as the FLEGT action plan (Forest Law Enforcement, Governance and Trade)^{xxxix}. A licensing system will be developed by means of bilateral agreements with the largest timber exporting countries. A number of countries in Europe have also adopted the EU's green purchasing policy for timber, including Belgium, Denmark, France, Germany and the UK.

Demand for bamboo products has increased significantly and Nordic Ecolabelling therefore wishes to ensure that raw materials do not derive from areas where biodiversity or social conservation values are under threat. Bamboo is a type of grass and is the fastest growing plant on earth. It can be harvested after approximately 7 years without the plant dying. It is often claimed that bamboo is harder than hardwood and is therefore suitable for use in floors, chopsticks, salad bowls etc. Over 1200 bamboo species grow in Asia, Central America and South America and some species grow in parts of Africa and Australia. The areas of use of these species vary. Bamboo also represents an important food for pandas making up 99% of its diet. Only one variety is used for flooring (Moso/Phyllostachys pubescens), and the panda will not eat this variety. Bamboo grows

wild "weeds" and does not normally require fertiliser or spraying. Bamboo is also used to prevent soil erosion in exposed areas. When bamboo is felled, new shoots grow on the remaining stump. This makes it difficult to remove bamboo after it has established itself. Bamboo is often cultivated by peasant farmers, but because of the increased pressure on bamboo there is a danger that the felling of forests and the use of insecticides and fertilisers will result in the destruction of well-functioning eco systems. According to INBAR (International Network for Bamboo and Rattan) bamboo is viewed as a natural resource and is harvested from unregulated natural forests in South-West China. In many places however the practice followed during harvesting is such that it may harm habitats that are dependent upon bamboo (such as the red panda and the giant panda) and also destroy the eco system in general.^{xl}. Bamboo is also cultivated in plantations of various types.

For example, Nordic Ecolabelling regards FSC or PEFC "controlled wood" certification and Chain of Custody (CoC) certification as examples of systems that support the traceability of fibre raw materials.

R8 Biocides

This requirement has not been changed relative to previous versions.

R9 Wood from certified forestry operations

The consultative proposal:

R9 Wood from certified forestry

This requirement applies to solid wood, laminated wood and plywood. Willow and bamboo are not included.

70 weight % of all purchased pine, spruce, birch and tropical timber must derive from certified forestry operations.

50 weight % of other types of wood must derive from certified forestry operations.

The requirement may be documented as purchased wood on an annual basis for the various types of wood used. Certification must be performed by a third party on the basis of a current forestry standard that fulfils the requirements applicable to standards and certification systems contained in Form 3.



Proportion (%) of certified wood used in the applicant's Nordic Swan Ecolabelled production on an annual basis.

Description of the system used to secure the traceability of the wood.

Copy of a certificate signed and authorized by a certification body.

Nordic Ecolabelling may request additional information in order to assess whether the requirements applicable to standards, certification systems and certified proportion have been met. For example a copy of the approval report issued by the certification body, a copy of the forestry standard including the name, address and telephone number of the organization that drafted the standard as well as references to persons representing parties and interest groupings invited to participate in the development of the forestry standard.

The background to R9

Forestry impacts on the environment. To reduce this environmental impact, the requirement is imposed that products base-don raw materials from round timber must contain at least 70% wood (pine wood, spruce, birch and tropical wood) and 50% (other types of wood) certified in accordance with a standard for sustainable forestry. Of the types of wood found in the Nordic countries, forests of softwood such as pine and spruce have a high proportion of certification while smaller quantities of hardwood derive from certified forestry operations. Availability of wood from certified forests varies in the Nordic countries, the availability of certified wood is expected to increase in the coming years and Nordic Ecolabelling is in a position to help to increase the proportion of certified wood products used in the wood and furniture industry. Nordic

Ecolabelling approves forestry standards (e.g. national and regional forestry standards) that fulfil the requirements in Form 3 of the Criteria document, i.e. all forestry standards are not automatically approved. Nordic Ecolabelling has not generally approved all forestry standards in the PEFC or FSC schemes, but the individual or national standards have been assessed individually by Nordic Ecolabelling. The forestry group assesses only forestry standards that are important in order for products to be Nordic Swan Ecolabelled.

According to figures produced by the UN^{xi} for 2007-2008, 8.3% of the world's forests have been certified. This represents 320 million hectares. Between 2007 and 2008 the growth in certified forestry areas totalled 8.8%. This figure includes the US standard SFI and the Canadian standard CSA, which were adopted by PEFC in 2005, but not e.g. the Malaysian standard (MTCC) which is currently being considered by the PEFC. Table 1 shows figures from FSC and PEFC from September 2008.

Table 1. Certified forests in September 2008 by continent. The figures are taken from the websites of FSC and PEFC (www.fsc.org and www.pefc.org)

	Million hectares FSC	Million hectares PEFC
EUROPE	48.1	54.7
N.-AMERICA	35.6	145.5
ASIA-OCEANIA	3.7	7.9
LATIN-AMERICA	11.6	7.9
AFRICA	3.5	0.0
Total	102.5	216.0

Moreover, according to the UN Market Report, Western Europe has certified more than 50% of its total forest areas, North America more than a third, whereas Africa and Asia have achieved only 0.1%. In tropical areas, 40% of the certified forestry areas are based on certification schemes that have not been verified by third parties.

Explanation for the amendment to R9

The requirement in the current criteria document is that 70% certified wood must be used, although scope for exemption exists if it is not possible to acquire certified wood. From a perspective of the processing of applications, exemptions have mainly been granted in the case of hardwoods since this requirement has been difficult to fulfil. This exemption option has now been removed and the requirement has been differentiated in relation to the availability of wood from certified forestry operations depending on the types of wood used. The consultative proposal is for a requirement with 70% wood from certified forestry operation for pinewood, spruce, birch and tropical timber respectively, and 50% for other types of wood. In practice, a 50% requirement will nevertheless represent an increase in stringency since previously a large number of exemptions have been granted with respect to this requirement.

In the Nordic countries (and the rest of Europe) the availability of softwood from certified forestry is generally high, whereas the availability of hardwood is significantly lower. In the case of tropical wood, the availability is less than for softwood whereas Nordic Ecolabelling's assessment has been that the requirement that a high proportion of tropical wood be certified was necessary in order to ensure the credibility of the Nordic Swan Ecolabel.

When Nordic Ecolabelling initially imposed requirements as to wood from sustainable forestry operations, the focus was on traditional forestry in Europe and tropical areas. Today, a number of forestry products originate from plantation operations. The environmental impact of plantation cultivation of forest varies considerably. By definition, this method of cultivation is a monoculture and has a negative effect on biodiversity. Similarly, there are issues relating to the conversion of land areas (virgin forest and untouched areas) to plantation use, as well as problems relating to the displacement of local populations. The FSC has developed requirements applicable to plantation forestry in their criteria for sustainable forestry. However, these requirements fail to address a number of problems caused by plantation cultivation. For this reason the FSC is at present working on a revision of the standard for plantation farming. This standard is expected to be ready in 2009.

Requirement R9 concerning wood from certified forestry operations does not distinguish between whether the wood derives from traditional forestry or from plantation forestry, only whether the wood comes from an area in which Nordic Swan Ecolabelling has approved the forestry standard used. On the other hand, the requirement does distinguish between wood materials made of different types of wood, primarily based on the availability of wood from certified forestry, as described above.

There is no requirement that a specific portion of bamboo or willow must be certified in accordance with a forestry standard or organic cultivation. At present, little bamboo from certified areas is available and this is the first time that bamboo has been included in the criteria. Requirement R7 will ensure that bamboo will originate from sustainable cultivation/forestry.

New forms have been proposed (Forms 3a-3c).

Panels made of wood, willow and bamboo (R10 - R15)

General comments

The requirements in Chapter 2.3 of the Criteria document apply to wood-based panels such as chipboard, fibreboard (including MDF and HDF panels), OBS (Oriented Strand Board), veneer boards (plywood and parallel-laminated veneer) and solid wood panels (corresponding to non-load bearing laminate panels or hobby panels). The requirements also encompass corresponding products made of willow and bamboo. Other equivalent raw materials may be included subject to an application to Nordic Swan Ecolabelling. The requirement applies to panels present in the product in quantities in excess of 5 w/w %.

For panels of solid wood, veneer, bamboo or wood fiber, the applicant may choose either to comply with and document requirements R11 and R14, or select the revised requirements for wood raw materials (both A and B) in form 11. It is not possible to mix requirements R11 and R14 with the revised requirements A and B of form 11.

R10 states that in the case of Nordic Swan Ecolabelled building panels no further documentation is required. Their compliance with the criteria for building panels will already have been documented. Requirement R12 is new and replaces what was formerly R8-R10 which have now been removed. The formaldehyde requirement R13 (formerly R6) has been amended.

The background to the requirement is that formaldehyde is harmful to health and that in the production and use of the products can cause health problems.

What we know about the risk to health and the environment of formaldehyde

Formaldehyde is a colourless gas with a characteristic sharp and penetrating odour. The substance is readily soluble in water, alcohols and ethers. Formaldehyde is highly reactive, flammable and forms explosive mixtures with atmospheric air. For this reason, formaldehyde is generally sold as an aqueous solution (formalin) with a formaldehyde content of approximately 35-50%.

If inhaled, formaldehyde gas may cause painful irritation of the mucous membranes of the nose and throat and the eyes after exposure for a couple of hours of concentrations of less than 0.2 ppm, although there are considerable variations in sensitivity. Particularly sensitive persons, such as children, may feel irritation in the mucous membranes and eyes as a result of exposure to concentrations as low as 0.06 mg/m³. It has been shown that children exposed to formaldehyde irritation may suffer a reduction in their resistance to respiratory infections. Some 1% of the population is over-sensitive to formaldehyde and in working environment contexts, many cases of asthmatic reactions to formaldehyde have been registered. Formaldehyde has shown a broad spectrum of mutagenic effects in many types of test systems in the form of binding to the genome.

Experiments with rats have shown that formaldehyde is a carcinogen, which is what formaldehyde is now classified as (and is not simply suspected of being).

The requirements on formaldehyde emissions imposed by other authorities and organisations:

In 1983 the Danish Ministry of the Environment introduced rules on the formaldehyde contents of chipboard, plywood panels and other wood based panels containing formaldehyde-emitting glue, the highest permitted level being 0.15 mg formaldehyde/m³ room air (0.12 ppm) in testing in a climate chamber. Alternatively, businesses may document that the content of free formaldehyde does not exceed 25 ml per 100 gram solid substance. This statute remains in force and there has been no change in the level of the requirements in the 25 years that have passed since its enactment.

The WHO recommendation on the maximum emission of formaldehyde is 0.12 mg/m³ (0.1 ppm), which is close to the level provided for in the Danish legislation. At present the labelling scheme for the emission of formaldehyde from panel products is an “E”. The level of the requirement in the Nordic Ecolabelling criteria for furniture was in the previous version E1, which is 0.1 ppm, i.e. equivalent to the WHO recommendation, and corresponds to the level in the legislation in most European states. According to a datasheet from 1997 issued by the National Safety Council in the United States, the background level of formaldehyde is less than 0.02 ppm for both outdoor and indoor air.^{lvi}. Different types of wood also emit formaldehyde and according to APA, oak may emit 0.09 ppm.^{lvii}.

Nordic Ecolabelling’s previous requirement was 0.02 mg/m³ lower than the requirement imposed by the authorities in Denmark and 0.01 mg/m³ higher than the WHO recommendation. However, there may be some variations because of the reference to the standard and the moisture of the wood at the time of measurement, which may involve some small changes in the result. E1 is the present requirement in furniture and fitments Version 3.4 (Nordic Swan Ecolabel).

Japan has a labelling system for emissions with three levels, where the following requirements apply to formaldehyde emissions: Formaldehyde = 1.5 ml/l, equivalent to 6.5 mg formaldehyde per 100 gram of panel. This is reasonably close to E1. In addition, there is formaldehyde = 0.5 mg/l, corresponding to 2.5 – 3 mg formaldehyde per 100 gram panel. This also fits with the general understanding of what E0 represents in terms of level. Formaldehyde = 0.3 mg/l, corresponding to 1.5-2 mg formaldehyde per 100 gram panel. This reflects the general understanding of what E super zero constitutes in terms of level.

The Flower ecolabel criteria for wood-based furniture impose the following requirement as to formaldehyde emissions: 50% E1. The same applies to mattresses in the Flower requirements.

The development of wood panels with lower formaldehyde emissions

During the development of criteria for a wood-based furniture by the Flower scheme, it emerged that German producers of wood-based furniture are capable of producing panels that emit formaldehyde in concentrations equivalent to 50% of E1.

Several glues are used in the production of wood-based panels:

1. *Urea-formaldehyde*, which according to APA – The Engineered Wood Association, is used for interior chipboard panels that are not required to be resistant to higher levels of moisture. Probably the most widely used today exists in two types: Urea-formaldehyde (UF) and Melamine urea formaldehyde glue (MUF). UF-glue is not as efficient in binding the formaldehyde in the panel as other glues and is accordingly not able to meet the emission requirements that exist today. MUF binds formaldehyde to the panels more efficiently, resulting in lower levels of formaldehyde emission. The environmental impact of Urea is negligible as regards urea bound in a building panel.
2. *Isocyanate based glue*: Isocyanates are substances that are very harmful to health and it creates very poor working conditions in the production of the panels. Accordingly, this glue is not widely used. It does exist, however, and could represent a means of reproducing formaldehyde emissions. See also the comments on isocyanate in the explanation of R3.
3. *Phenol formaldehyde glue*. Can be used for wood-based panels that must be suitable for use in damp conditions. More costly. Using phenol as an additive in glue ensures that the formaldehyde is bound in the panel in a different chemical form. According to APA, all recent data on measurements of formaldehyde emissions from panels bound with phenol formaldehyde glue corresponds to the outdoor background concentration. They refer to tests on formaldehyde emissions from chipboard of max. 0.2 mg/m³. Phenol is known to be harmful to health and is on the list of undesired substances. However, phenol is bound in the chipboard and reacts chemically with formaldehyde (which must also be described as an undesirable substance), and as a result the environmental and health-related problems related with phenol and formaldehyde are significantly reduced in the finished panel.

R14 Panels of solid wood, laminated wood or veneer

Consultative proposal: Referece to R9.

This requirement refers to R9 which contains the requirement that the wood must contain a certain proportion from documented certified forestry operations. For an explanation, see R9.

R15 Energy consumption and origin of raw materials in wood-based panels

Requirement R15 has been amended in relation to earlier energy requirements (R11). The requirement is now somewhat more extensive, at the same time as which is has been increased in its stringency. The requirement is also described in detail in order to simplify the necessary calculation. Moreover, the requirement contains an example of a calculation to avoid any misunderstanding. The requirement is now wholly analogous to the proposal in the Consultative Proposal for Criteria for Building Panels, although sound absorbing panels are not included in the furniture document since they are not of relevance here.

The requirement consists of two parts: One part requires energy consumption (both electricity and fuel consumption) to be less than or equal to stated threshold values. The second part contains a formula in which a specific points score must be achieved. The formula encompasses environmental parameters which are divided by a factor for each parameter and added together to reach a score. In order to meet the requirement, the score for the panel must as a minimum equal a specified threshold value. An example of the calculation can be found in Appendix 4a.

Consultative proposal:

R15 Energy consumption and raw material origins of wood-based panels (including products based on bamboo and willow)

The energy consumed in the production of the wood-based panel must be less than or equal to the requirement specified in the table for electricity and fuel consumption.

Table 3. Environmental parameters and energy calculation requirements

Environmental parameter	Requirement
A = Wood raw material from certified sustainable forestry (%)	-
B = Proportion of recycled raw material (%)	-
C = Proportion of renewable fuel (%)	-
D = Electricity consumption (kWh/m ²)	Max 1 kWh/kg
E = Fuel consumption (kWh/m ²)	Max 3.4 kWh/kg

The total score P calculated using the environmental parameters in Table 3 must be calculated using the formulae below. To meet the requirement the points score:

P must be at least 9.5 in the case of chipboard

P must be at least 8.0 in the case of other wood-based panels

$$P = \frac{A}{25} + \frac{B}{25} + \frac{C}{25} + \left(4 - \frac{D}{0,25}\right) + \left(4 - \frac{E}{0,85}\right)$$

Origin of raw materials

In the case of fibre from timber, the part of wood raw material from certified sustainable forestry must be calculated as an annual average. Secondary products such as woodchips and sawdust from other production are counted as recycled wood raw materials.

Energy consumption (electricity and fuel)

Renewable fuels are defined as non-fossil fuels (peat is defined as fossil fuel)

Energy consumption is calculated as the annual average.

Energy consumption calculated as kWh/ kg panel must include the primary panel production and production of the actual applicable ingoing primary raw materials. Primary raw materials are raw materials present in quantities in excess of 5 weight % of the finished panel (for example wood-fibre and glue). Energy consumed in extracting the raw material must not be included.

In the case of panel production energy calculations must be based on data from and including raw material processing (ingoing conveyor belt on the production line) up to and including the finished product before surface treatment, if applicable. Energy consumed during surface treatment shall not be included.

In the case of production of chemical products, for example glue, the energy calculation must be based on data from production. The energy content of the raw material shall not be included. In exceptional cases a standard value of 15 MJ/ kg (solution in use) may be used in the case of adhesives, broken down as 12 MJ/ kg for fuel and 3 MJ/ kg for purchased electricity (4:1).

The energy content of various fuels can be found in Form 4 in Appendix 2.

If the manufacturer has a surplus of energy and sells this off in the form of electricity, steam or heat, the quantity sold must be deducted from the fuel consumption figure. The calculation must include only fuel that is in fact used in panel production.

Electricity consumption is electricity purchased from an external supplier.



Submit the calculation of P in accordance with the above requirements.

Wood raw material must be documented as in R11.



Specify the types of fuels used in the production of the panel during the course of last year and which of these fuels are renewable. Specify the quantity of electricity used and the quantity of panel (kg or m³) produced during the last year.

Explanation of R15

The requirement rewards low energy consumption and the use of renewable fuels. Low energy consumption is important in light of the climate challenges facing the world. There is a close relationship between energy consumption and man-made climate change because a very high proportion of the world's energy consumption is currently met by fossil sources of energy such as oil, gas and coal. A reduction in energy consumption is accordingly an important objective for Nordic Ecolabelling.

Differentiation will facilitate the ecolabelling of those building panels within the various types of panels that are best in environmental terms: chipboard, wood fibre/veneer/laminated panels as well as sound-absorbing panels. In addition to the previous environmental parameters consumption of electricity and fuel, the use of renewable fuels, wood raw materials from certified sustainable forestry and the use of recycled raw materials is also rewarded.

The explanation of this change is given to some extent in the evaluation and discussed in extensive detail in the Background Document for Panel Materials (see separate document). The calculation example is given in Form 4 of the Appendix.

The surface treatment of wood, bamboo and willow (R16 - R19)

The requirements in Chapter 2.4 of the Criteria document concern the surface treatment of wood, bamboo and willow and materials based on these raw materials. The requirements apply only if the materials to which the surface treatment is applied are present in more than 5 weight % in the finished furniture. Laminate is viewed as surface treatment for the purpose of these requirements.

Consultative proposal:

R16 Chemical products and additives

Chemical products and additives used in surface treatment in the production of wood and wood-based materials must satisfy the requirements specified in R3, R4 and R5 in Chapter 2.1.



Declaration given by the manufacturer in accordance with Form 2a in Appendix 2.



Product safety sheet/product sheets in accordance with the applicable legislation in the country of application, for example Appendix II to REACH (Directive 1907/2006/EC) for each product.

R17 Quantity applied and method of application

The number of coats, quantity applied (g/m²) and the method(s) of application must be documented. An exemption from this requirement will be granted if the total quantity of VOC in the applied products is <5 weight %.

The following degrees of effectiveness²³ are used for the purpose of calculation:

Spraying device without recycling, 50%

Spraying device with recycling, 70%

Electrostatic spraying 65%

Spraying, bell/disk, 80%

Roller varnishing 95%

Blanket varnishing 95%

Vacuum varnishing 95%

Dipping 95%

Rinsing 95%



Number of coats and quantity applied per coat per m² of surface area.

R18 Quantity of organic solvents applied

The quantity applied will be shown in the calculations in R17 and the quantity of organic solvent is calculated using Form 2a or an equivalent (e.g. weight % of organic solvent). The quantity applied must not exceed the thresholds specified in the table below. An exemption from this requirement will be granted if the total quantity of VOC in the applied products is <5 weight %.

Table 4. Requirements applicable to the quantity of organic solvents used in various product groups.

Product group	Quantity organic solvent¹ (g/m²)
<i>Bedroom furniture, reception room furniture, doors, MDF panels and contoured surfaces²</i>	<i>< 10</i>
<i>Tables, chairs and other product groups</i>	<i>< 30</i>
<i>Contract furniture and furniture of high quality³</i>	<i>< 60</i>

¹ Organic solvents are defined as solvents with a boiling point <250 °C at 0.013 kPa.

²³ The degrees of effectiveness are standard values. Other degrees of effectiveness may be used if they can be documented.

² Contoured surfaces are paper, sheets, thin sheets of wood (0.5 – 2 mm) and laminates applied to wood as a surface.

³ This product group refers to the surface treatment of furniture intended for purposes that can be documented to have a special need for enhanced wear properties and a long lifetime. The requirements as to strength, safety and stability must be of the highest level relative to the standards specified in the table in Appendix 1, Section 6.1. Durability must follow the standards specified in the table in Appendix 1, Section 6.2 and must be at level 5 or higher. Examples of furniture categories with these properties include furniture for use in hospitals, kindergartens, schools, teaching, offices or furniture for other long-term public/private activities. Nordic Ecolabelling reserves the right in the individual case to determine whether a licence application will be included by this product group.



A separate calculation showing the values in g/m² within the applicable product groups. The basis for calculation is provided in requirement R18 and Form 2a.

The quantity of organic solvents is calculated on the basis of the information contained in Form 2a. The quantity may also be calculated as the total of the organic solvents (upper percentage specification) given in the datasheet for the product. If applicable, information from a chemical manufacturer in the form of a recipe may be submitted directly to Nordic Ecolabelling.

Calculation example for R18 shown at the end of Appendix 2a.

Example:

The producer has stated a consumption of coating of 120 g/m² and using a spraying device with recycling as application method. From Form 2a it is stated that the content of organic solvents is 6 %.

Calculation: $(120/0,7) \times 0,06 = 10,3 \text{ g/m}^2$ organic solvents.

The product fulfills the criteria for this product group.

R19 Quantity of environmentally harmful products applied

One of the following two options must be fulfilled:

- 1) Chemical products must not be classified according to table 5
or
- 2) the total quantity of products applied as surface treatment classified as environmentally harmful in table 5 must be less than 10 g/m² surface. In cases where UV-varnishes are used the total quantity must be less than 14 g/m² surface.

In the calculation of the applied amount the degrees of effectiveness listed in R17 must be used.

All environmentally harmful substances which are included in the unhardened chemical product shall be included in the calculation.

Table 5 – Classification of environmental harmfulness

Classification	Hazard symbol and risk phrase	CLP regulation 1272/2008*
Environmentally harmful	N R50	Very toxic to aquatic life. Category Acute 1 with H400,
	N R50/53	Very toxic to aquatic life. Category Chronic 1 with H410.
	N R51/53	Very toxic to aquatic life. Category Chronic 2 with H411
	R52/53	Very toxic to aquatic life. Category Chronic 3 with H412.
	N R59	Ozone with EUH059

** Classification in accordance with the EU Dangerous Substances Directive 67/548/EEC with subsequent amendments and adjustments and/or CLP regulation 1272/2008 with subsequent amendments and adjustments. In the transition period until the 1st of February 2015, the classification can be according to EU Substance Directive or according to CLP. After the transition period, only classification according to CLP is valid. A list of R-phrases and wording is listed in appendix 2 form 2b.*

- ☒ 1) Product safety sheet/product sheet in accordance with the applicable legislation in the country of application, for example Appendix II to REACH (Directive 1907/2006/EC) for each product.
- ☒ 2) Declaration from the producer of the surface treatment products regarding content of environmentally harmful substances and a calculation showing the total quantity of environmentally harmful substances as g/m². A similar calculation example for VOC is shown in Form 2a.

The total quantity of environmentally harmful substances can be calculated based on the information in Form 2a. The quantity may also be calculated as the total of the environmentally harmful substances (upper percentage specification) given in the datasheet for the product. If applicable, information from a chemical manufacturer in the form of a recipe may be submitted directly to Nordic Ecolabelling.

Explanation of and background to R16-R19.

The aim has been to simplify the earlier requirements, since these were complicated and provided for a number of different means of documenting the requirements. The previous chemical requirements R13, R14, R15 and R17 have been removed and have been replaced by the new chemical requirement R16 which refers to the general chemical requirements in Chapter 2.1. Requirement R18 is identical to parts of the previous requirement R18 and has been separated out as an independent requirement.

Products containing less than 5% VOC are exempted from requirements R17 and R18. The reason is that products with such a small proportion of VOC will fulfil the requirements imposed so that an exemption will not reduce the environmental protection. It will simply represent an easing of the burden of both the applicant and Nordic Ecolabelling in the processing of the application.

Previously, it was possible to document the requirement applicable to environmentally harmful substances in surface treatment products in two ways, either using environmental classification and content of organic solvents in the products or by calculating emissions of organic solvents and the applied quantity per m² of surface (application method). A review of the European Union's BAT Report (Best Available Technology)^{lviii} for surface treatments with organic solvents and contact with the industry appear to

indicate that the preferred method of documenting environmental impact is the application method (g/m^2). This method involves calculating the quantity applied in g/m^2 and then determining the content of organic solvents and environmentally harmful substances based on the application method and the content of (e.g. %) organic solvents and environmentally harmful substances. This applies to requirements R17-R20. R19 (quantity of organic solvents applied) aims at a differentiation of requirement levels within product groups of furniture. An attempt has been made to retain the most central and relevant requirements in Version 3.4. Increases in the levels in requirement R19 have been documented which seem relevant both based on the review of BAT and the review of existing licences. In addition, a new classification in product groups has been introduced. A new product group is contract furniture and furniture of high quality in respect of which the requirement is eased. An easing of this nature for this type of furniture can be justified on the grounds that they are subject to the highest requirements as to strength, safety and stability with reference to separate standards in Section 6.1 of Appendix 1 and to a minimum level of 5 for durability in Section 6.2 of the requirement (R60) concerning properties in use. In any event, Nordic Ecolabelling reserves the right to decide in the individual case whether a furniture product is encompassed by this product group. In the past it has been difficult for customers to choose method and understand what exactly is required in the requirements. Against this background the requirements have been made clearer, at the same time as which the documentation requirement provides for multiple alternatives making it simpler to fulfil the requirement. Moreover, in order to avoid misunderstandings about how the calculations are performed, an example of a calculation is included in an appendix to the criteria document.

A review of the BAT document "Surface treatment using organic solvents (2007)" leads to the conclusion that this document will constitute an important reference in assessing various requirements relating to the surface treatment of wood. The document describes technical aspects of production in considerable detail and contains clear definitions and proposals for VOC levels for various types of furniture. It also describes in detail what the average values for various types of surface treatment are, and the content of water and solvents for various categories. Reference is made in particular to Chapter 17 and, in part, Chapter 18 of the document (pages 395-428). Other relevant reference: Chapter 21.17-21.18 (pages 636-638) and Chapter 22.16 (pages 646-648).

There is a trend in the direction of a greater use of water-based varnishes and at the same time these varnishes are approaching acid-cured varnishes in terms of quality and durability. UV-cured varnishes (water-based) are increasing in scope, and there is also a trend in the direction of chemicals that are more friendly towards health and the environment. UV-hardened varnishes are best in terms of quality and durability^{58,59}. Acid-hardened varnishes are still widely used and have a market share of 30-40%^{lix}. See Table 17.2 of the BAT report for the main properties and content of solvents in the most commonly used paints and additives in furniture and wood materials. There is also a clear perception that g/m^2 is a very relevant and precise specification of the amount of paint/varnish used and how much VOC the surface treatment involves⁵⁸. It is also contended that this is a type of requirement that is easy to document/calculate. Table 17.5 of the BAT report shows that there are grounds for increasing the stringency of the requirements in R19. There are also grounds for clarification in relation to the type of furniture product (multiple categories).

It is also possible to achieve significant reductions in VOC (up to 70%) by using solvent-based systems with what is termed "waste gas treatment". With this technique emissions

of solvents during the curing time are reduced. See BAT⁵⁸ for details. This is first and foremost possible in large production plants and is not used in small and medium sized companies. This technology is generally introduced where emissions of VOC exceed 15 tons per year and is regulated in a separate VOC directive. See the BAT report for details.

Surface treatment of furniture of high quality (e.g. contract use)

This type of surface treatment is more extensive and normally includes the following steps: 1. Sanding and removal of dust, 2. Staining, 3. Sanding and removal of dust, 4. Primer, 5. Sanding and removal of dust, 6. Top coat.

Stage 2 normally involves manual spraying and stages 4 and 6 spraying. UV-cured paint is rarely used since paints of this type are not suitable for use on 3-dimensional surfaces that have been pre-assembled. However, if part of the furniture has still not been assembled, then it is entirely possible to use a UV-based surface treatment with application by rolling rather than spraying.

According to the BAT report, a German company (Rippert GmbH) and a Finnish company (Tikkurila Coatings Oy) (probably others as well) have, independently of each other, developed a UV-curing method involving the use of UV-curing in an inert atmosphere. This method allows UV varnishes and UV paints to be hardened on 3D components and on assembled chairs. The equipment and surface treatment are claimed to be commercially available.

Acid-hardened varnish and chemical requirements:

The National Institute of Technology in Norway has drafted a report^{lx} which inter alia considers the surface treatment of wood. An overview has been drafted of the content and classification of various acid-hardening varnishes. The main ingredients in the varnishes are n-Butylacetate, xylene, urea polymer with formaldehyde. These are two-component varnishes where the hardener contains p-toluensulphonic acid and one or more alcohols. The formaldehyde content is in the region of 0.1-1%. A lower limit applies to formaldehyde in order for a product containing formaldehyde to be classified as allergenic (R43) of 0.2%. Most varnishes for which HSE product datasheets have been received are not classified as allergenic, only one is. The table below shows typical examples of constituent substances and classifications of acid- hardening varnishes.

Table 2 Typical examples of ingredients in acid-hardening varnishes, component 1

Product type	Ingredients	Quantity of ingredients (%)	Classification of ingredients	Classification of product
Acid-hardening varnish, Part 1	n-Butyl acetate	10-25	R10-66-67	Xn, R-10-20/21-36/38
	Xylene	10-25	Xn, R10-20/21-38	
	Urea, polymer with formaldehyde, isobutylene	10-25	R53	
	2-methylpropane-1-ol	2.5-10	Xi, R10-37/38-41-67	
	Methylbenzene	2.5-10	Xn, F, R11-20	
	Butane-1-	2.5-10	Xn, R10-22-37/38-41-67	

	Melamine, polymer with formaldehyde, butylate	2.5-10	R53	
	Formaldehyde	0.1-1	T, R23/24/25-34-40-43	

Table 2: Typical examples of ingredients in acid-hardening varnish, component 2 - hardener

Product type	Ingredients	Quantity of ingredients (%)	Classification of ingredients	Classification of products
Acid-hardening varnish part 2 hardener	Butane-1-ol	50-75	Xn, R10-22-37/38-41-67	Xn, R10-22-37/38-41-67
	p-toluene sulphonic acid with max. 5% H ₂ SO ₄	10-25	Xi, R36/37/38	
	n-butyl acetate	2.5-10	R10-66-67	

The tables indicate that the acid-hardening varnishes will largely meet the classification requirement in R3 and the requirement concerning additives to chemical products, R4. On the other hand, acid-hardening varnishes will have difficulty in satisfying the requirements concerning the quantity of VOC applied (R19), with the possible exception of the highest class for durable contract furniture. Nordic Ecolabelling wishes to contribute a reduction in the use of acid-hardening varnishes without excluding them entirely. This means that in the case of acid-hardening varnishes the quantity applied must be small or they must be used in furniture that is subject to specific requirements as regards properties in use (see criteria and Appendix 1 Section 6.1 and 6.2).

Quantity of environmentally harmful products applied (R19)

The requirement has been retained, but clarification has been inserted that it concerns all environmentally harmful products labelled with or without N. This clarification was important since previously the requirement was unclear. On October 3, 2018, the classification H413 (R53 without N) is removed from the requirement. Bringing the H413 into the calculation was a sharpening of the requirement from the last generation of the criteria that was done without sufficient documentation, and it was not the intention of the revision that this requirement should be tightened in such a way. The classification now permitted is the least problematic environmental hazard classification and will be in line with similar requirements in other Nordic Ecolabelling criteria. An increase in stringency has been proposed, but also in easing of the quantity applied of environmentally harmful substances in R19 in that there is now only one value to observe, rather than two as previously. Unfortunately, data does not exist to permit more differentiated requirements to be imposed. Thus this represents a simplification of the requirement.

Highpressure laminate (HPL) panels (R20 – R25)

The following requirements include HPL panels when the high-pressure laminate material represents more than 10% by weight of the finished ecolabeled product. The requirements include only the high-pressure laminate. Any wood-based panel is covered by the requirements of section 2.2.

R20 Ecolabelled product

If the product is Ecolabelled, all requirements in section 2.5 (R20, R21, R22, R23 and R24) are automatically fulfilled.



If the product is Ecolabelled, the product type and manufacturer and licence number must be specified.

R21 Wood fibre and waste wood in paper, cardboard and pulp

The requirement includes raw materials purchased as wood fibers in paper, cardboard and pulp, that individually represents more than 10 percent by weight of the finished panel. The requirement does not apply paper labels attached to the product. One of the three following requirements opportunities have to be met.

Nordic Swan Ecolabelled paper products as well as pulp and paper controlled under the existing Nordic Swan Ecolabel basic module for paper, is automatically approved in this requirement.

Annually, at least:

1. 30% of the fibre raw material in paper, cardboard or pulp must come from forest areas in which operation has been certified under the forestry standard and certification system stated in Appendix 3c or which is certified as organically cultivated or where cultivation is in the process of being converted to organic production,

or

2. 70% of the fibre raw material in paper, cardboard or pulp must be recycled fibre or bi-products such as shavings or sawdust,

or

3. a combination of 1 and 2. If the fibre raw material in paper, cardboard or pulp consists of less than 70% recycled fibre, the proportion of fibre raw material from certified areas must be calculated according to the following formula:

Requirement for proportion of fibre raw material from certified areas in paper, cardboard or pulp (Y):

$$Y (\%) \geq 30 - 0.4x$$

where x = proportion of recycled fibre or bi-products such as shavings and sawdust.

- ☒ The declaration and any calculations from the supplier of the paper, cardboard or pulp that the requirement has been satisfied. The declaration must contain the name of the paper, cardboard or pulp.
- ☒ Where points 1 or 3 apply, the paper, cardboard or pulp manufacturer must send a copy of the relevant forestry certificate which complies with the guidelines for forest certification and organic cultivation, as described in Appendix 3c.
- ☒ By using the Nordic Swan Ecolabelled paper, cardboard or pulp submit trade name and license number of the product. When using products controlled by the existing Nordic Swan Ecolabel paper basic module the producer, production plant, name of mass or paper quality and grammage shall be described.

Background for requirement

The requirement is new, compared to the previous version. In the previous version, there was no requirement for either certified sustainability or recycled fibres or bi-products such as shavings and sawdust.

Paper, cardboard and pulp are constituents of several of the panel types in this product group. It is therefore judged that paper, cardboard and pulp have high environmental relevance for this product group. The environmental relevance relates to ensuring sustainable cultivation of wood raw materials and to permitting the use of recycled fibre in paper, cardboard and pulp and thus reducing the use of new wood fibre. Even though wood fibres are a renewable raw material, it is important to ensure that virgin wood raw materials are from sustainable forests in order to protect forest resources, biological diversity and socio-economic functions, etc.

In the case of recycled fibre and bi-products, which do not come directly from saw works, traceability back to the forest is not always available and thus there is reduced opportunity for documentation certified wood. The environmental benefit from using recycled fibre and waste wood lies mainly in avoided use of virgin wood raw material. By using recycled fibre for paper, further resources are saved, as it is more demanding to produce paper from new fibres than from recycled fibre²⁴.

In the consultation, comments were received about if "Controlled Wood" could be used as documentation of the requirement. The answer to this is: "Controlled Wood" cannot be used to document the requirement. The purpose of "Controlled Wood" is to ensure that the non-certified wood in the product, do not come from controversial sources. "Controlled Wood" do not ensure, that wood or wood fibres is either recycled (post-consumer) or certified sustainable, like it says in this requirement. However, this requirement could be documented with a FSC Mix or PEFC Mix certificate, as this ensures 70% wood or fibre from sustainable forests or 70% waste wood or recycled wood fibres. Nordic Ecolabelling has after the consultation chosen to adjust the percentage of recycled fibres from 75% to 70%. Then the level fits with FSC Mix and PEFC Mix.

R22 Emissions of COD from paper and cardboard production

The total emissions of acid-consuming organic material (COD - chemical oxygen demand) to water must be less than the specified COD value in Table 6 for the paper or cardboard used (for unfiltered sample). Each type of pulp has its own level in the requirement. The COD emission from pulp production must be included in the total COD calculation for the paper or cardboard used.

COD emissions are thus calculated by adding the emissions COD mass kg/ADT (weighted mean of incoming pulps) + COD emission paper machine kg/t.

Nordic Swan Ecolabelled paper products as well as pulp and paper controlled under the existing Nordic Swan Ecolabel basic module for paper, is automatically approved in this requirement.

Tabell 6 COD requirement levels for different pulp and paper types

Pulp type	Total COD level kg/ADt for pulp and paper
Bleached chemical pulp (sulphate and other chemical pulps except sulphite pulp)	22.0
Bleached chemical pulp (sulphite pulp)	29.0
Unbleached chemical pulp	14.0
CTMP pulp	19.0
TMP/Groundwood pulp	7.0
Recycled fibre pulp	4.0

- ☒ Submit a description of the sampling programme, including measurement methods, measurement results from previous 12 months and measurement frequency, see also Section 1 of Appendix 1.
- ☒ By using the Nordic Swan Ecolabelled paper, cardboard or pulp submit trade name and license number of the product. When using products controlled by the existing Nordic Swan Ecolabel paper basic module the producer, production plant, name of mass or paper quality and grammage shall be described.

²⁴ Background for ecolabelling of paper products, Nordic Ecolabelling 2011.

Background for the requirement

The requirement has been updated with differentiated requirement levels according to the type of pulp or paper used. The criteria now include several different panel types in which paper or cardboard may be used. Hence, greater controllability in the requirement is achieved by having requirement levels suitable for the specific paper and pulp types.

All pulp processes and paper production emit COD (chemical oxygen demand), P (phosphorus) and N (nitrogen). Contaminants in emissions to water consist of dissolved organic material from wood and bark, fibres and residues of boiling, bleaching and paper-making chemicals, indicated as the content of oxygen-consuming substances, COD, together with the fertiliser components phosphorus, P, and nitrogen, N. The organic matter is broken by micro-organisms with the use of oxygen. This can lead to depleted oxygen levels - and in some cases, completely oxygen-free conditions - in the aquatic environment. This can have a negative effect on fish and benthic animals.

The requirement level is based on the latest BAT for both the pulp and the paper production values from the BREF document of 2014.

Table 1 BAT for both the pulp and the paper production

Pulp and paper types	BAT REF 2014 kg/ADt (for paper the unit is kg/ton)
Bleached chemical pulp (sulphate and other chemical pulps except sulphite pulp)	7-20 kg/ADt
Bleached chemical pulp (sulphit pulp)	3-10 kg/ADt
Unbleached chemical pulp	5-8 kg/ADt
CTMP-pulp	12-20 kg/ADt
TMP/Ground wood	0.9-4.5 kg/ADt
Recycled fibre pulp	0.4-1.4 kg/ADt (deinked 0.9-3) kg/ADt
Paper machine (not special paper)	0.15-1.5 kg/ton

Previously there were requirements for bleaching of paper and for surfactants for decolourising recycled fibres. These two requirements have now been omitted, as it is deemed more relevant to set an energy requirement for paper production. The criteria have therefore been expanded with an energy requirement for paper and pulp production.

R23 Energy requirements for paper and pulp production

The requirement covers paper and pulp which individually are present at more than 30% by weight in the finished panel.

Nordic Swan Ecolabelled paper products as well as pulp and paper controlled under the existing Nordic Swan Ecolabel basic module for paper, is automatically approved in this requirement.

The following requirements must be satisfied for paper or pulp:

$$P_{\text{electricity(total)}} < 1.25$$

$$P_{\text{fuel(total)}} < 1.25$$

P stands for energy point for paper/pulp production. In $P_{\text{electricity(total)}}$ and $P_{\text{fuel(total)}}$, energy points are included from both paper production and the pulps used in the paper. See further explanation in Appendix 4B.

- ☒ The pulp and paper manufacturer must submit a calculation according to Appendix 2e which shows that the point limits are being satisfied. The calculation sheet developed by Nordic Ecolabelling must be used for the calculation.
- ☒ By using the Nordic Swan Ecolabelled paper, cardboard or pulp submit trade name and license number of the product. When using products controlled by the existing Nordic Swan Ecolabel paper basic module the producer, production plant, name of mass or paper quality and grammage shall be described.

Background for the requirement

In panels where the paper fraction forms a high proportion of the material composition, the paper makes a significant contribution to the panel's total energy impact. Relevance has therefore been identified for an energy requirement for both pulp and paper production for paper types present in the panel by more than 30% by weight. The energy requirement for paper has been taken from the Nordic Ecolabelling basic module for paper and requires specific data and calculations from the paper manufacturer.

Due to the high level of documentation, it has therefore been assessed that the requirement should only come into force for paper proportions above 30% by weight. This has been supplemented with a reference value for production of kraft paper in order to adapt the requirement to this product group. Appendix 6 gives a detailed description of the energy calculation.

Depending on the type of panel, the paper may occur in different weight percentages. In plasterboards, the paper proportion is often around 5% by weight, but may be higher. For HPL panels, around 50-60% craft paper and 2-15% decor paper is often used. In addition, paper may occur in both cement-based panels and mineral wool panels.

The principle behind the energy requirement in the Basic Module for paper is that manufacturers of different pulp and paper types calculate specific values for both the electricity consumption and the fuel used in their production. This is done by totalling the energy consumption for the different part-processes. In order to calculate energy points for heat consumption and electricity consumption, the actual specific electricity consumption or fuel consumption is divided by the relevant reference values in Appendix 6.

The requirement has been developed for the Nordic Ecolabelling basic module for paper, and the associated reference values are based on BAT values from the so-called BREF document, drawn up in accordance with the EU IPPC Directive, published in 2000. The reference values were formulated in 1999.

Points limit for energy

Along with comparison with the reference value, energy use is controlled by a points limit.

This limit defines by how much the paper's total energy consumption may exceed the optimum figure. A point limit of 1.25 indicates that the average total energy consumption of the paper may be no more than 25% higher than when the energy use is at the level of the reference value. The point model allows higher energy consumption in order to provide flexibility for the paper manufacturer.

See a further explanation of this requirement in the Nordic Ecolabelling basic module version 2, which can be requested from Nordic Ecolabelling.

R24 Energy requirements for HPL panel production

The requirement covers the applied energy for production of the panel and may be documented either for the ecolabelled panel production or for the company's total annual production of HPL panels.

HPL panels $\leq$ 2 mm thin:

No more than 18 MJ/kg panel may be used for producing the panel.

HPL panels $>$ 2 mm thick:

No more than 14 MJ/kg panel may be used for producing the panel.

The requirement does not include extraction of resources or production of incoming raw materials. Paper has its own energy requirements in R15. Self-produced energy and resold surplus energy should be stated, but will not count as applied energy in the calculation.

- ☒ A calculation should be submitted documenting compliance with the requirement. The calculation must contain information about: quantity of produced panels, sub-divided into thick and thin, applied electricity and fuel, and which fuel sources are being used.

Background for the requirement

There is RPS for energy requirements in the actual HPL panel production. A wide variation in energy consumption has been detected in panel production. From the sector EPD of 2010 from ICDLI – International Committee of the Decorative Laminates Industry – an average variation of 50% among the 10 production systems covered by the EPD can be identified. This variation is mainly due to the materials efficiency and energy efficiency of the HPL production system, and to different energy sources.

At the same time, HPL production is a very homogeneous production type in terms of materials composition.

The sector EPD describes the following materials composition: decor paper 2-12%, craft paper 55-62%, melamine resin 2-12% and phenolic resin 20-32%²⁵. In addition, various additives are used to a minor extent, e.g. aluminium hydroxide or aluminium oxide, which are used as the top coating above the decor paper, and any UV protection for HPL panels for external use.

The limited materials variation stated in the sector EPD means, that the variation in energy consumption in production is mainly due to energy efficiency in the actual panel production. The potential for energy improvements in panel production lies in reducing heat consumption by reusing process heat. Electricity and heat energy are correlated in HPL production, as, for example, a heat pump may use electricity but is capable of reducing heat consumption. A requirement has therefore been set for the total energy consumption, in order to permit flexible interaction between electricity and fuel consumption.

The actual resin fraction also contributes to the panel's energy impact. Here, energy consumption stems especially from the production of the constituent raw materials in the adhesive, and should therefore be capable of documentation by data several links behind in the product chain. Even so, the potential for energy reduction is unclear. Together

²⁵ EPD for Decorative High-Pressure Laminates, International Committee of the Decorative Laminates Industry (ICDLI), 2012

with the low controllability, it is therefore judged that no energy requirement for the resin should be set at the present time.

Table 2 Energy data for HPL panels

HPL – mm thickness	Energy for materials, total primary energy requirement, cradle to gate [MJ/kg]	Energy for production, total primary energy requirement [MJ/kg]	Applied energy in panel production MJ/kg (not primary energy)
Max Compact & Max Exterior panels 8mm*	67	4.5	3
Max Thin panel 1 mm*	66	13.7	8.9
Egger EPD		18 to 33	Unknown
HPL Sector EPD** - 8mm	76	30.8	19.2
HPL Sector EPD** -0.8 mm	76	116.6	64.6

**These values are in principle specific to the EPD, but have been calculated by subtracting the generic material energy and calculating back to the applied energy from the primary energy.*

***The values have been taken from the ICDLI sector EPD, which states the average for 10 different European HPL manufacturers.*

It is possible to make use of self-produced energy in HPL production. For example, by collection of VOC emissions and later recovering the energy by combustion. Self-produced energy does not count in the requirement, but must be indicated when documenting the requirement. The same applies to surplus energy from production, which is sold to another user.

During the revision of the criteria, Nordic Ecolabelling has collected various energy data for HPL panel production. These include commissioned a report with energy mapping of different types of panel productions.

The collected energy data for HPL panels shows that there are large variations in energy consumption expressed in MJ/kg produced HPL panel. For example, energy data from HPL manufacturers from the International Committee of the Decorative Laminates Industry (ICDLI) shows great variation (table 4).

The found energy data also shows that there is a big difference in energy consumption between thin and thick HPL panels, when the unit is MJ/kg. Here, the thin panels have higher energy consumption per kg panel, than the thick. This can be explained by the smaller units in an identical manufacturing process. This gives a lower energy efficiency when comparing with larger units (thicker panels) per kg. Because of that a differentiated requirement level is set for thin HPL panels (< 2 mm) and thick (> = 2 mm) compact laminate panels. The ICDLI EPD also sub-divides HPL panels according to thickness in the same way.

In the consultation draft very ambitious requirement levels was proposed. The comments in the consultation pointed out, that these values were too harsh and the requirement of energy for the production of HPL panels is therefore adjusted after the consultation. The requirement level in the consultation proposal was < 10 MJ/kg for panels < 2 mm in thickness and is subsequently adjusted to < 18 MJ/kg. The requirement of < 6 MJ/kg

for panels > 2 mm in thickness in the consultation proposal is now adjusted to < 14 MJ/kg.

Data from the HPL Industry EPD from the International Committee of the Decorative Laminates Industry (ICDLI) indicates an average value of 19 MJ/kg for thick panels and 64 MJ/kg for thin panels for the production. Then the final requirement levels of a maximum of 14 MJ/kg and 18 MJ/kg are ambitious requirements.

R25 Emissions from HPL production

In the case of production in countries where the mandatory national requirements are less stringent than the emission levels in this requirement, it must be documented that the following emissions levels have not been exceeded.

The requirement relates to panels in which the content of HPL (High Pressure Laminate) accounts for more than 10% by weight of the panel.

The following limit values for emissions to air at the workplace may not be exceeded during production of HPL (High Pressure Laminate):

The limit value is expressed in relation to a reference period of 8 hours' time-weighted average (TWA):

Limit value for formaldehyde cas. no. 50-00-0: 0.5 ppm or 0.6 mg/m³

Limit value for phenol cas. no. 108-95-2: 2 ppm or 8 mg/m³

The limit value is expressed in relation to a short-term value of max. 15 min.:

Limit value for formaldehyde cas. no. 50-00-0: 1.0 ppm or 1.2 mg/m³

Limit value for phenol cas. no. 108-95-2: 4 ppm or 16 mg/m³

☒ Air measurements for phenol and formaldehyde for the past 12 months, containing a description of the sampling programme, including measurement methods and measurement frequency. For analysis methods, see Appendix 1.

Or

☒ Description of mandatory national regulatory requirements, showing that the requirement automatically is followed.

Background for the requirement

The requirement is new and included in connection with the extension of the criteria to HPL panels. HPL panels consist of kraft paper and decor paper impregnated with phenolic and melamine resin. During the hardening, drying and pressing process, the methanol, formaldehyde and phenol evaporate from the laminate. These substances are harmful to the environment and to health, but can be cleaned from the exhaust air with a special incineration technique. It is therefore important to ensure that the emissions level at the workplace is low and complies with the recommended limit values described by the Nordic authorities.

Resins used for impregnation in the HPL and laminate production have generally high formaldehyde content, normally about 1% by weight of free formaldehyde. At the same time the resin may include formaldehyde oligomer (synthetic polymer) with a weight percent greater than 50.

The limit value is the average concentration in the air which can be inhaled at the workplace during an eight-hour working day, but also includes short-term values and possible ceiling values. Short-term value means that even if the time-weighted average concentration does not exceed the limit value, the concentration in a time period of

maximum 15 minutes must never exceed the limit value by a factor of 2. In Denmark, the limit value for formaldehyde is also a ceiling value and must therefore never be exceeded at any time.

In the Nordic Region, there are national emission values for both phenol and formaldehyde. These are either mandatory or, in some countries, advisory, but they may be made mandatory by official order. A limit value for phenol has also been defined in Commission Directive 2009/161/EU. However, this is not necessarily mandatory in all EU countries, and the requirement has therefore been laid down for all manufacture outside the Nordic Region to ensure that the level in the EU Directives is satisfied as a minimum for phenol and that the least stringent level from the Nordic authorities is complied with.

Phenol has an EU limit value of 2 ppm and 8 mg/m³ laid down in Commission Directive 2009/161/EU. However, the EU Directive does not have direct legal application in the individual countries. Formaldehyde does not yet have an EU limit value. Table 27 below shows both EU and Nordic national limit values.

Table 3 Limit values for formaldehyde and phenol emissions in relation to the working environment

	Formaldehyde limit value		Phenol limit value	
	Working day (8 hours' exposure)	Short-term value	Working day (8 hours' exposure)	Short-term value
EU*	None	None	2 ppm or 8 mg/m ³	None
Denmark**	0.3 ppm or 0.4 mg/m ³	0.6 ppm or 0.8 mg/m ³	1 ppm or 4 mg/m ³	2 ppm or 8 mg/m ³
Sweden***	0.3 ppm or 0.37 mg/m ³	0.6 ppm or 0.74 mg/m ³	1 ppm or 4 mg/m ³	2 ppm or 8 mg/m ³
Norway****	0.5 ppm or 0.6 mg/m ³	1 ppm or 1.2 mg/m ³	1 ppm or 4 mg/m ³	3 ppm or 12 mg/m ³
Finland*****	0.3 ppm or 0.37 mg/m ³	1 ppm or 1.2 mg/m ³	2 ppm or 8 mg/m ³	4 ppm or 16 mg/m ³

* Commission Directive 2009/161/EU, ** Danish Working Environment Authority, *** Swedish Work Environment Authority, **** Norwegian Labour Inspection Authority: Regulations, Order no. 704, *****Finnish Occupational Safety and Health Administration.

Metals, separability and recycling (R26 - R30)

In Chapter 2.5 of the criteria document, requirements R19 (now R 26) (separability from other furniture parts), R20 (now R27) (the use of recycled aluminium) and R21 (now R28) (the use of recycled materials for other metals) will be retained, following a review of the industry. Requirements R27 and R28 apply if the furniture consists of more than 50 weight percent metal in total. Note that a triviality threshold of 50 g applies. The background to and an explanation of this is provided below. No change in the requirements is proposed in this revision.

Note that exceptions are made for the requirements of K27 to K30 for metal parts weighing less than 50 grams. The exemption does not apply to coating with cadmium which is also prohibited by the Nordic governments. The reason for this exception is that it is difficult and very labor intensive for furniture manufacturers to track information about metal production of small metal parts where they do not have direct contact with the metal producers. This is often the case with small parts such as screws.

The exception is also related to requirements R1 Material composition where small parts may be exempted for weighing.

R26 Recycling of materials

The metal in the product must be separable from other materials (does not include surface treatment) without the use of specialist tools.



Description of how the metals can be separated from other materials, Form 5.

Requirements where the product contains more than 50 weight % metal

An exemption applies in the case of requirements R22 and R23 to metal parts weighing less than 50 grams.

R27 Aluminium

At least 50 weight % of the metal in the product must be recycled metal. Alternatively, the smelting plant that supplies the metal must on an annual basis use at least 50% recycled metal in its production.



Declaration from the furniture manufacturer or declaration from the smelting plant, Form 5.

R28 Other metals

At least 20 weight % of the metal in the product must be recycled metal. Alternatively, the smelting plant that supplies the metal must on an annual basis use at least 20% recycled metal in its production.



Declaration from the furniture manufacturer or declaration from the smelting plant, Form 5.

Background to and explanation of R26, R27 and R28:

Metals in furniture

The recycling requirements for aluminum and other metals (R27 and R28) enter into force if the metal is present in the product at more than 50% by weight. The requirement covers all metal types even if a single type of metal is present in a small proportion. The requirement is therefore adjusted from version 4.6 to version 4.7, so there is an option to combine the proportion of the different metals and calculate an overall recirculation percentage.

Additionally, the definition of recycled metal is extended to include both pre-consumer and post-consumer as defined by the ISO 14021, as this previously unclear in the requirement text.

Metals are used in ordinary furniture in structural elements and in small exposed parts. Furniture may also be designed as metal furniture (e.g. tables, chairs) or metal fitments. Metals used in furniture and fitments may include:

- Steel, e.g. pipes, sections
- Aluminium, e.g. sections
- Stainless steel, e.g. sections, pipes, coatings
- Other metals (including copper, brass)
- Screws and small parts made of chromium, zinc, nickel etc.

Steel and aluminium are the most widely used, but stainless steel is also used to some extent. Other metals are used to a limited extent in certain parts of furniture and fitments.

Steel products are often provided with surface treatment in the form of coatings of chromium, nickel or zinc or through wet or powder varnishing.

The production of metals

The production of metals involves emissions and the use of large quantities of energy see Appendix 1 for a more detailed description.

Much of the discussion about the requirements applicable to metals has focused on whether it is possible to trace where the material originated.

Operators involved in metal production etc.

- Producers of raw materials, input materials
- Suppliers: Raw materials, incl. input materials
- Metal works (including surface treatment, where applicable), if applicable also individual metal companies for rod, pipe products, e.g. pipe manufacturers
- Surface treatment plants
- Metal wholesalers
- Component manufacturers (component suppliers), if applicable, surface treatment
- Furniture producers

Description of a product chain

The metal works purchases raw materials (iron ore, scrap, bauxite, other raw materials and chemicals) from raw material producer/supplier in the home country or from outside the country, often from suppliers operating from abroad. The metal works supplies metal products to surface treater, which performs metal coating or chemical surface treatment (e.g. varnishing). Some metal works perform their own surface treatment, e.g. varnishing. Metal works may produce rods and pipe products and in addition individual metal companies produce premanufactured products (e.g. pipe makers). Surface treatment plants perform coatings such as chrome plating, nickel plating, zinc plating and surface treatment with e.g. varnish. Metal wholesalers frequently sell semimanufactured metals, e.g. plate and rod products without final surface treatment. The component manufacturers are often located outside the metal works in the home country or nowadays more frequently abroad. The component manufacturer acquires metals from the metal producer/company or from metal wholesalers. The component manufacturer may also surface treat the metal components.

Furniture producers purchase pre-produced metal parts from component manufacturers or from the metal works, depending on the type of metal part. Some parts, e.g. pipe parts and design details can be acquired directly from the metal works and then be varnished by the furniture producer or alternatively ready made parts may be acquired from a component producer. For example, in the case of office chairs, ready made components are often acquired from suppliers outside the country. Furniture producers acquire metal coating such as chrome plating from surface treatment specialists. In some cases furniture producers may purchase preproduced metal parts from surface treatment specialists or less frequently metal parts without surface treatment from metal wholesalers.

Traceability for furniture producers

The information on traceability provided here comes from information from furniture producers in Finland, Norway and Sweden. In this description of traceability new information has been acquired from a couple of large Finnish furniture producers. In addition, information on traceability has been provided by Norwegian and Swedish furniture producers during the course of the reporting on metals and the processing of

licence applications. The most recent information from Denmark on traceability has also been incorporated. Furniture producers purchased metal parts from component producers (suppliers) or a metal works. If the furniture producer purchases pre-made components, information to this effect is normally not provided by the metal works. If the component manufacturer operates from outside the country, it will be more difficult to acquire information on metal production from the metal works. If the furniture producer purchases his metals directly from the metal works, information on metal production will be more readily available. Generally the furniture manufacturers state that it is difficult to acquire information (documentation) on metal production (if the furniture producer is not in direct contact with the metal producer).

Metals in office furniture

Metals are used in ordinary office furniture. The proportion of metal in home furniture/fitments varies widely depending on the design. The proportion of metal in office tables with wooden tops and metal legs will typically be approximately 30-40%. By contrast the metal in an ordinary office chair with metal legs makes up over 60% of the weight of the product (based on information from producers of office furniture).

The significance of the metal requirements for furniture

The present triviality threshold of 50% allows an ordinary office table to fulfil the metal requirement without documenting the use of recycled metals. This means that only the surface treatment requirement will apply to metals in office tables. Ordinary office chairs (used with office tables) cannot fulfil the present triviality limit without documentation on the recycling of metal.

If a triviality threshold of 30% is imposed, metal recycling must also be documented in the case of office tables with metal legs. If it is considered important that recycled metal be used in Nordic Swan Ecolabelled office tables, then the triviality threshold must be set at 30%.

It is difficult for furniture manufacturers to trace/track recycled metal parts on the market. The proportion of recycled metal in components such as table legs also depends on the production process. The availability on the market of special recycled metal has been reduced. To enable the Nordic Swan Ecolabel to be used on office furniture such as office tables it will be necessary to accept a triviality limit of 50%. The limit of 50% means that it is already more difficult for office chairs with metal leg constructions to fulfil the metal requirement.

It is reasonable to impose a requirement as to recycled metal with a triviality limit (50%) so that recycled metal must be used in Nordic Swan Ecolabelled "metal furniture". It is important for Nordic Ecolabelling to secure traceability for the primary material in Nordic Swan Ecolabelled furniture that consists primarily of metal (or of wood).

As noted earlier, the production of metal parts leads to major environmental destruction as a consequence of mining operations and the extraction of metals from minerals. The use of recycled materials reduces these environmental consequences, in amongst other ways by reducing mining operations and reducing the energy consumption associated with production. For example, up to 95% of the energy used in the production of primary aluminium can be saved by utilising recycled aluminium. This according to the aluminium industry^{lxi}. Accordingly it is preferable for as much recycled metal as possible

to be used. Appendix 1 provides further information on the environmental consequences of metal production.

According to Wesnes and Christiansen, K^{xix}, demand for raw materials (in this case, metal) is so great that in practice most metal for recycling is collected. On the other hand, the requirement as to metal recycling will play a part in increasing the availability of recycled metal. Recycling is defined as post-consumer recovered metal and recovered metal from offcuts and scrap. See, inter alia, the description below.

However, notwithstanding the high level of recovery of metals, the use of primary aluminium is increasing, amongst other reasons because of new buildings and other new applications. The aluminium industry has published the following figures for 2007^{lxii}:

- Applied primary Al: 37.8 million tons
- Recovered Al (including offcuts and scrap from processing): 37.4 million tons
- "Post-consumer" Al that is recycled: 8.1 million tons
- Non-recycled Al: 4.1 million tons
- Al with uncertain fate: 3.5 million tons
- Annual increase Al to metal bank: 27.4 million tons
- Total quantity Al in metal bank: 611.4 million tons

Although the industry frequently argues that it is economically beneficial to recycle metals and that most is in fact recycled, the figures show that the quantity of Al that is not recycled or that has an unknown fate is almost as large as the quantity of post-consumer Al that is recycled. It is therefore important to continue to maintain a focus on the origin of the metals which are used.

Recycled materials can be used for casting aluminium, whereas primary aluminium is mainly used for extruding Al sections. The use of extruded aluminium sections is increasing, particularly within the building industry and the automotive industry. This results in a steady increase in demand for primary aluminium.

A different approach for ecolabelling would have been to impose requirements on mining operations and the production of metals or require the use of metals to be minimised. Work is ongoing on certification systems for raw materials for the metal industry and in Australia the WWF was involved in the development of a certification programme for the mining industry. The valuation report was created in 2006^{lxiii}, but the process seems largely to have stopped up and there seems to be a long way to go before the penetration achieved by certificates for the traceability of wood products is reached.

The surface treatment of metals (R29 and R30)

Chapter 2.5 also contains requirements applicable to the surface treatment of metals. The previous chemical requirements applicable to surface treatment, R23, R24 and R25 have been removed since these issues are now covered by the new requirement, R29.

R29 Chemical products and additives

Chemical products and additives used in the pre-treatment and surface treatment of metals must fulfil requirements R3 and R6 in Chapter 2.1. Exceptions are given for R3, R4, R5 and R6 in the metal production and the coating of the metal (metallisation). Documentation is specified in Chapter 2.1 and Form 2a.



Declaration in accordance with Form 2a in Appendix 2 from the manufacturer.

- ☒ *Product safety datasheet/product sheet in accordance with the applicable legislation in the country of application, for example Appendix II of REACH (Directive 907/2006/EC) for each product.*

R30 Coating

Metals must not be coated with cadmium, chromium, nickel, zinc and their compounds.

In exceptional cases the surface treatment of metal surfaces with chromium, nickel or zinc may be permitted in the case of small parts (for example screws, bolts, mechanisms where this is necessary because of heavy physical wear. In exceptional cases the surface treatment of metal surfaces with chromium, nickel or zinc may be permitted on chair legs and fold up tables if this furniture fulfils the standards for use in public environments (see the table in section 6.1 appendix 1). See R61 for a closer description. The exception will not include parts that are designed to come into frequent contact with skin (applies for nickel), and moreover parts treated in this way must be recyclable.

The chrome plating process must be based on 3-valent chromium and 6-valent chromium must not be used.

The chrome plating, nickel plating and zinc plating processes must use techniques for cleaning, ion exchange and membrane techniques or equivalent techniques in order to recycle the chemical products as extensively as possible.

The emissions from the surface treatment process must be recycled or destroyed. The system must be closed and have no waste outlet system with the exception of zinc where emissions must not exceed:

Zinc: 0.5 mg/l

If zinc is emitted test method EN ISO 11885 has to be used.

Emissions to water are calculated as a yearly middle value and based on minimum one representative daily sample per week.

Samples of process water shall be taken after external treatment, and analyses shall be carried out on unfiltered sample.

Sampling frequency set by the authorities, can be approved.

- ☒ *Declaration from the furniture manufacturer or supplier of surface treated metals, Form 5.*

In the case of surface treatment with chrome, nickel or zinc:

- ☒ *The need for this type of surface treatment must be documented using tests or a report documenting that the metal surface is exposed to heavy physical wear.*

Standards for public environment (specified in Section 6.1 in Appendix 1) can be used.

Background to and explanation of the changes to R29 and R30:

The triviality threshold of more than 5 weight % in the requirement on surface treatment has been removed.

The previous requirement “Halogenated organic compounds must not be used in the degreasing and surface treatment of metals” has been removed since this area is now covered by the new R29 requirement. R29 refers to the general chemical requirements R3 and R4, see the chapter in which these requirements are discussed. Halogenated organic compounds are very harmful to health and contribute to emissions of VOC. They must therefore not be used in the surface treatment of metals.

The current criteria impose requirements on coatings used on metals, the aim of which is to exclude substances used in surface treatment that are the most harmful to health and the environment (e.g. heavy metals and other hazardous substances).

Metals must not be coated with cadmium, chromium, nickel and zinc. Cadmium is a heavy metal that is very harmful to the environment and its use in ecolabelled products cannot be accepted. In exceptional cases plating with chromium, nickel and zinc may be accepted on exposed and small parts (screws, bolts, mechanisms etc.) where this is necessary on the grounds of heavy physical wear or parts that need to close tightly. N-Cr plating could be permitted on the grounds that it is important to the performance of the furniture that critical part should be as durable as possible. Nevertheless, Ni-Cr plating

must be performed in such a way that it fulfils the specified criteria values which are stricter than the values provided for in the Oskar requirement (Parcom recommendation 92/4.

In the latest revision Nordic Ecolabelling increased the stringency of the requirement applicable to the plating of metals significantly. This increase in stringency is based on the report entitled "The Nordic Ecolabelling of surface treatments of furniture, Askengren & Co, March 2006^{liv}". Emission levels for nickel and chromium have been increased to the new values that are stricter than guidelines such as BREF, OSPAR 92/4.

The plating process must be based on three-valent chromium and no six-valent chromium must occur in any pre- or post-processing operations. Chrome-plating and nickel-plating processes must utilise purification techniques, ion exchange techniques, membrane techniques or equivalent techniques to recover chemical products insofar as this is possible. In addition, emissions from the surface treatment processes must be recycled and destroyed. The system must be closed and release no emissions. An exception applies in the case of zinc.

It is proposed that the additional requirement should be imposed on zinc in the case of galvanisation. Emissions from surface treatment with zinc must not exceed: 0.5 mg/l (in accordance with Oskar. The official requirement as regards zinc emissions is less stringent in municipalities in Finland.

Chemical requirements applicable to the chrome plating process

The main chemicals used in three-valent chromium plating include chromium sulphate (R50, chromium chloride (R22, R50 and ammonium chloride (R22, R36. These will pass the chemical requirements as they stand today since at present the requirement is R50 with N. Under the layer of chrome plating is a coating of nickel. Nickel sulphate is used in preparing nickel baths and is classified as R50 (cancer 3 category and may conflict with the chemical requirements. An exemption applies to nickel sulphate for the following reasons: Nickel sulphate is handled only in the first stage of preparation of a nickel bath in closed containers received directly from the supplier. A nickel bath can last for several decades and nickel sulphate need not be handled during the life of the bath. One technical benefit of three-valent chromium is that generally speaking it has a better ability to coat the underlying nickel and accordingly reduce the risk of contact allergies in the event of skin contact⁶⁴.

Chemical requirements applicable to other types of surface treatment⁶⁰:

As regards the surface treatment of metal parts on indoor furniture, the finding is that most furniture producers do not perform this job themselves. It is performed by subcontractors.

Before the metal parts (steel can be treated, they must be pre-treated/degreased in order to secure maximum adhesion. Some operators use water-based degreasing (surfactants in water, whereas others use zinc phosphate. Iron phosphate can be used for indoor furniture, but since the subcontractor also surface-treats outdoor furniture, zinc phosphate is used for all furniture parts. Powder varnish is then used for surface-coating the parts.

Water-based degreasing products can be classified as corrosive or irritant. Classification is based on the use in the various products of the ingredients sodium hydroxide,

phosphoric acid, alcohol ethoxylates and dinatrium metasilicate. Environmentally harmful ingredients are also used in some of the products, but in quantities that are so small that the products are not classified as environmentally harmful.

Zinc phosphate products are classified as environmentally harmful, whereas iron phosphate products are not subject to classification.

Two different types of powder varnish are used. The most common is epoxy powder. Epoxy powder is classified as Xi, N, R36/38-43-51-53. This means that they pass the requirements in R3.

Other types of powder varnish used for these purposes are classified as follows:

1. R52/53. Polyester based with environmentally harmful and allergenic ingredients (harmful ingredients: Terephthalic acid-diglycidyl ester, classified as Xi,N,R36/38-R43-R51/53 and trimellitic acid-triglycidyl ester, classified as Xi,N,R36/38-R43-R51/53). The producer has tested the product and found that it is not allergenic.
2. Xi, R43 (harmful ingredients: 1-o-Tolylbiguanide, classified as Xi, R36-43) Not subject to classification (contains harmful ingredients in small quantities: 1,2,2,6,6-pentamethylpiperidine derivative, classified as Xn, N, R22-52/53).

Plastic and rubber (R31 – R35)

Polymer materials used as padding materials and fabrics (Chapters 2.8 and 2.10) must not be calculated into the weight/% limit for plastic materials and are not encompassed by the plastics requirements. Polyurethane (PUR foam) shall meet the requirements of padding materials of Chapter 2.8 and K33 in this chapter. Small plastic parts (eg. screws, staples and fasteners) are not included in the weight fraction and are not subject to the requirements of Chapter 2.7. Similarly, wires with weight ratio up to 5 weight % of the product are not covered by the requirements in Chapter 2.7.

Consultative proposal

R31 Description of material and labelling of plastic

Details must be provided of the types of plastic, fillers and reinforcements used in plastic parts. Parts made of plastic and weighing more than 50 g must be visibly labelled in accordance with ISO 11469. Parts made of PVC shall not be used.

☒ Report on plastic parts in accordance with Form 6 of Appendix 2.

R32 Additives

Additives in plastic and rubber must satisfy the requirement R4 in Chapter 2.1. The requirement applies to additives actively added to the polymer raw material in the master batch or compound in production of plastic or rubber. Documentation is provided in Chapter 2.1 and Form 2b.

☒ Declaration in accordance with Form 2b in Appendix 2 from the manufacturer.

R33 Nitrosamines in rubber

The content of nitrosamines or nitrosamines soluble substances must not exceed 0.01 mg/kg and 0.1 mg/kg rubber, respectively.

☒ Declaration from the furniture manufacturer or supplier of plastic/plastic parts in accordance with Form 6 in Appendix 2.

R34 Surface treatment

The surface treatment of plastic materials may be permitted if documentation can be submitted showing that this does not impact on the possibility for recycling and that the surface treatment fulfils the requirement in R32.



Declaration from the furniture manufacturer and documentation showing that the surface treatment does not impact on the possibility for recycling according to Form 6. The surface treatment must fulfil the requirements in R4 according to Form 2b

Requirements where the product contains more than 10 % plastic by weight

The requirement includes products consisting of more than 10% by weight of plastic in the furniture. Small plastic parts (<50 g per component), such as fittings and assembly details, which together do not exceed 5% by weight of the plastic in the furniture are not included in the requirement and should not be included in the weight of the plastic⁹ of the product.

R35 Recycled/recovered materials

Plastic of polypropylene (PP), polyethylene (PE) and polyethylene terephthalate (PET) shall consist of at least 50% by weight of pre- or post consumer materials.

For other types of plastic, at least 30% by weight of the plastic must consist of recycled pre- or post-consumer material.

Recycled plastic must not contain halogenated flame retardants. Nevertheless, impurities are permitted in quantities of up to 100 ppm. See Appendix 2b.

Recycled plastic is defined in the requirement according to ISO 14021 in the following two categories:

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

Nordic Ecolabelling defines rework, regrind or scrap, that cannot be recycled directly in the same process, but requires a reprocessing (eg sorting, reclamation and granulation) before it can be recycled, to be pre-consumer/ commercial material. This is whether it is produced in-house or externally.

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



Declaration from the plastic supplier that the raw material is recycled and the proportion of recycled plastic material, Form 6.



The manufacturer of production of off-cuts must document that the off-cut/waste is used for recycling and is not incinerated.

Explanation of the changes to requirements R31 – R36

The use of PVC is not allowed in Nordic Swan Ecolabelled furniture and furnishings.

The reason for this is as follows:

PVC

PVC is an abbreviation for polyvinyl chloride, and contains 57% chlorine. This means that PVC is not well suited for incineration, as chlorine can contribute to an increased dioxin formation in flue gas from waste incineration. Dioxins are one of the most acutely toxic substances that man has created, and are suspected to act as endocrine disruptors and carcinogens. PVC is therefore very often deposited, and as far as possible, parts of the hard PVC is recycled to produce new PVC. Consumers are to separate PVC waste from household waste in accordance with the rules applicable in the municipality. However, it is often a problem for the average consumer to distinguish between materials containing or not containing PVC. Therefore, a lot of PVC waste still ends up in municipal waste that is incinerated, although PVC is defined as non-combustible waste according to the decree on waste.

Plasticizers in PVC

Soft PVC products contain plasticizers or phthalates, which are added to make the material more flexible. The most commonly used plasticizers are the phthalates DEHP, DIDP and DINP. The use of DEHP is declining in Western Europe, while the use of DIDP and DINP in particular is increasing. According to the PVC industry itself DINP constitutes approx. 56% of phthalate consumption, while DEHP represents 24%²⁶. DEHP is now classified in the EU as detrimental to fertility and harmful to the fetus and can be found on the EU SVHC list along with other phthalates like BBP, DBP and DINP. It has been found that plasticizers in plastics are very volatile, and these plasticizers may therefore evaporate. These should therefore be avoided in rooms where people spend a lot of time, and cannot be used in Nordic Swan Ecolabelled products such as furniture, interior fitments and building panels.

DIDP and DINP are not officially classified in the EU system. However, a working group of the European Commission has found that both DIDP and DINP are endocrine disrupters in category II²⁷. The reason that this does not give an official classification under EU auspices is simply that there is no classification for endocrine disruption (not to be confused with damage to fertility, ie. reproductive harm. All phthalates used in large quantities in PVC is everywhere in our environment today, partly because these substances can easily be released from PVC products. In the environment, the phthalates DEHP, DINP and DIDP degrade slowly and they have a high bioaccumulation which is why "it cannot be excluded that they accumulate in the food chain."²⁸

Wires

From version 4.6 to version 4.7, an exemption is introduced in section 2.6 for wires that represent up to 5% by weight of the product. The exception is carried out based on the need for a de minimis limit, and that the background text is unclear as to which requirements in the criteria there are for wiring. The background document for furniture did not explain whether or not plastic wiring must meet the plastic requirements. One interpretation may be that it is forbidden to use PVC cables. This will be perceived as a sharpening of the requirements as there is not given any reasons for this in the background. The demand for PVC (especially in wires) will be addressed in a forthcoming criteria review, since there seem to be an increasing number of halogen-free cables on the market.

The new requirement (R27 concerning classification and additives) replaces the previous R28 and also covers requirements contained in its surface treatment section. Here as elsewhere the idea is that the general chemical requirements should capture problem substances. Here there has been an increase in stringency in that the new requirement is more extensive than previously and takes account of hazards to health and the environment in the production of furniture (ref. the criteria of Nordic Ecolabelling for toys). The required labelling of plastic parts weighing over 50 g is as previously and has been included as an aid to recycling.

Requirement R35: Nordic Ecolabelling wishes to impose the requirement that non-renewable materials must be recovered. If plastic makes up a large part of the furniture,

²⁶ PVC Informationsrådet i Danmark. www.pvc.dk. Hjemmesiden besøgt 22/3-05.

²⁷ Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption. European Commission DG ENV 2000.

²⁸ Status for phthalater, Miljøministeriet 2003.

the requirement is also imposed that the plastic must consist of some recovered/recycled plastic.

The requirement is adjusted from version 4.13 to 4.14. Now also pre-consumer recycled plastic is accepted for the plastic types PP, PE and PET. For other types of plastic, now at least 30% by weight (before at least 50% of the plastic must consist of recycled pre- or post-consumer material. It seems that several applicants deliberately avoid this requirement by only ecolabeling products from their product range, that do not contain larger plastic components. From dialogue with furniture manufacturers, it shows that the requirement for recycled plastic often is a barrier for ecolabelling in applications with larger plastic components. It is especially considered a problem for chairs. Furniture often have high quality requirement to plastic to ensure long lifetime of the furniture. Looking at the whole lifecycle for the furniture, long lifetime is an important environmental parameter.

The availability of recycled plastic is difficult to assess. During the course of this revision Nordic Ecolabelling conducted a study (in 2007 in collaboration with SP in Sweden. The aim was to determine whether material flows exist for the commonest thermoplastics that fulfil the quality requirements applicable to furniture. In the report SP concludes that the use of recycled plastic will take off and increase when the price of new plastic rises. According to the report, the furniture industry is favourably disposed towards using recycled plastic. Considerable quantities of packaging plastic are collected in the Nordic countries, primarily polyethylene (PE and polypropylene (PP. Most of the plastic that is collected goes to recycling outside Europe, although there are now a number of recycling operators in the Nordic countries and Europe. For example, one major Swedish plastic manufacturer supplies several different plastic qualities in the forms of granulates produced from recycled plastic. Most of this recycled plastic originates from waste/offcuts from industrial production. This producer also claims to offer competitive prices. The use of recycled plastic in furniture is at present limited. According to information supplied by a number of furniture manufacturers the quality demands made for plastic are so great that the use of recycled plastic is more or less precluded. However, quality is a broad term. In terms of durability there should be no problem in recycling plastics a number of times before what is termed down-cycling occurs, which reduces durability. However, recycled plastic does not offer the same finish as virgin plastic. Nevertheless it is possible to produce plastic using recycled plastic in the core with an outer coating of new plastic with a high finish.

SP concludes in the report that the use of recycled plastic will take off and increase when the price of new plastic rises.

Thus the requirement has been set in such a way that very little plastic furniture on the market will fulfil the requirement since the use of recycled plastic is limited. The examples that exist of use of recycled plastic in the furniture industry have shown that the plastic primarily originates in special waste flows (such as own packaging or collection of PET bottles, tops, used fishing nets etc. and not from general waste flows such as collected household waste. It is accordingly important that the furniture industry should continue to make an effort to increase demand for recycled plastic. Nordic Ecolabelling is of the view that alternative materials are available that are better from an environmental perspective so long as recycled plastic is not used.

The use of additives such as cadmium, lead and chromium has now largely been phased out. Nevertheless, electronic waste in particular may contain plastics containing halogenated flame retardants. The requirement has accordingly been imposed that the recycled plastic must not contain halogenated flame retardants, although pollutants of up to 100 ppm are permitted. So far no threshold limit has been imposed, which means that the detection limit in the method of analyses used will provide the limit for whether the recycled plastic contains flame retardants.

Padding materials

Some of the previous requirements such as R31, R32, R33, R35, R43 and R44 have been removed since they are captured by the new requirement: R37 Chemical products and additives in padding materials. Reference is made to Chapter 2.1 of the new criteria document. An exception is made in the case of use of isocyanates in the production of poly-urethane. The use of isocyanates must however be declared in accordance with Form 7. This too is new. A discussion is provided at the end of this chapter on the grounds for retaining the ban on the use of halogenated compounds, since objections to this requirement have inter alia been received from producers. The requirements in Chapter 2.8 cover padding materials that represent more than 1% by weight of the product.

~~R36 Ecolabelled padding materials (mattresses)~~

Consultative proposal

Is the padding materials Nordic Swan Ecolabelled or labelled with the EU Ecolabel? If yes, submit documentation and omit the rest of the requirements in Chapter 2.8.

- ☐ Name, manufacturer, production site and licence number/standard contract number for the textile.

R37 Chemical products and additives

Chemical products and additives used in the production of padding materials must fulfil requirements R3 and R4 in Chapter 2.1. Documentation is provided in Chapter 2.1 and Form 2a.

Isocyanate compounds are exempted from this requirement since they constitute a significant component in the production of polyurethane.

- ☐ Declaration in accordance with Form 2a and Form 7a in Appendix 2 from the manufacturer.
- ☐ Product safety datasheet/product sheet in accordance with current legislation in the country of application, e.g. Appendix II of REACH (Directive 1907/2006/ECF) for each product.

R38 Dyes

Dyes may be used only to distinguish between different qualities (e.g. hard and soft foam) within the same type of padding material. Metal complex dyes and dyes classified in accordance with Chapter 2.1 must not be used.

- ☐ Declaration in accordance with Form 2a and Form 7 in Appendix 2 from the manufacturer.

R39 Formaldehyde

Formaldehyde emissions must be less than 20 ppm in the case of padding materials. Alternatively, evaporation must not exceed 0.005 mg/m³ measured in climate chamber testing, Section 4 of Appendix 1.

- ☒ The manufacturer must either declare that no products containing formaldehyde have been used or include an analysis report showing the presence measured in accordance with Section 4 of Appendix 1.

R40 Recycling

A minimum of 90% of all production waste from the production of padding materials must be recycled.

- ☒ Description from the manufacturer of padding materials of how production waste is recycled.

Synthetic latex (SBR) and natural latex

R41 Butadiene content

The content of butadiene must be less than 1 mg/kg latex.

- ☒ The latex manufacturer must state the test results in accordance with the measurement method specified in Section 4 of Appendix 1.

R42 Nitrosamines

The concentration of N-nitrosamines must not exceed 0.0005mg/m³ measured using climate chamber testing.

- ☒ The latex manufacturer must state the test results in accordance with the test method specified in Section 4 of Appendix 1.

Polyurethane

R43 Blowing agents and isocyanate compounds

CFC, HCFC, HFC, methylene chloride and halogenated organic compounds must not be used as blowing agents. The use of isocyanate compounds must be declared in accordance with Form 7 in Appendix 2.

- ☒ Declaration in accordance with Form 7 in Appendix 2.

Changes to and explanation of R36 – R43

The requirements applicable to dyestuffs have been amended (from R34 to R33) and the section on azo dyestuffs has been removed. This is an EU requirement and even though padding materials are imported from outside the EU, no azo dyestuffs containing the arylamines in question have been observed in textile and mattress applications for the Nordic Swan Ecolabel or EU Ecolabel in the Nordic countries. The dyestuff requirements have been supplemented with a ban on metal complex dyes.

The requirement relating to the content of metals (R35) has been removed since all the dyes that we are aware of follow the guidelines on metals laid down by ETAD (The Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers).

The requirements applicable to formaldehyde have been tightened up (from R36 to R39). This is something that we have spent time on investigating in the Flower revision for mattresses and it should not be difficult for producers to comply with a threshold value of 20 ppm. Our experience of textile applications also confirms this.

The previous requirement concerning COD and surfactants (R38 in connection with the washing of natural fibre padding materials) has been removed. This requirement is seen to be less relevant than previously and less relevant relative to other environmental problems.

The COD requirement applicable to natural latex (R39) has been removed since this requirement is viewed as being too far down the supplier chain. The requirement is no longer especially relevant. Rubber latex is the sap from the *Hevea Brasiliensis* rubber tree. According to the encyclopaedia Store Norske Leksikon production of rubber has fallen steadily since 1989. Malaysia remains the world's third largest rubber producer after Indonesia and Thailand, and rubber is produced primarily by either local small-scale farmers or on federal plantations. 85% of the land area used for rubber production is located on the Malaysian peninsula. According to a WWF^{lxv} website, one of the main environmental concerns associated with rubber production is run-off from the first stages of the process, which in most cases is conducted near the plantations. The volume of this runoff water is 25 to 40 times greater than the volume of rubber produced. The discharges contain a high level of organic compounds and may also contain toxic resins from the tree.

The butadiene requirement has been changed (from R40 to R36) to apply to all butadiene.

The threshold value for nitrosamines has been changed (from R41 to R37, so that it now corresponds to the detection limit for the test method – corresponding to mattresses in the new draft Flower criteria).

Flame retardants

The requirement prohibiting halogenated flame retardants is in R4 to which requirement R37 refers. Halogenated flame retardants are a common designation for a larger group of organic substances. The substances have different structures, but all contain fluorine, chlorine or bromine. Under strong heat halogenated radicals are released which stop the chain reaction in the combustion process and thereby have a restrictive effect on the development of fire. In recent years attention has been focused on the brominated flame retardants in particular because they are not readily degradable in the environment. They may concentrate in the food chain and have shown to be present in living organisms and in mother's milk. Some of these substances have been shown to have harmful effects on health and the environment. The substances show little acute toxicity for humans, although certain halogenated flame retardants are acutely toxic for aquatic organisms. Long-term exposure has been shown to cause liver damage. It is suspected that certain brominated flame retardants may cause hormonal effects and may cause damage to the nerve system. For these reasons, amongst others, Nordic Ecolabelling has imposed a ban on the use of halogenated organic compounds^{lxvi lxvii lxviii lxix lxx lxxi}.

Contact with the Norwegian furniture industry indicates that it may be difficult to avoid the use of halogenated flame retardants when block foam is used. Flame retardants also play an important function in the production of the foam to prevent degradation of the material in the centre. A US study^{lxxii}, "*Furniture Flame Retardancy Partnership: Environmental Profiles of Chemical Flame-Retardant Alternatives for Low-Density Polyurethane Foam, United States Environmental Protection Agency, Volume 1, 2005*" showing alternative flame retardants and their environmental impacts was presented to parts of the industry. The idea was that the

individual alternatives should be assessed and that feedback should be given on why these products could not be used in the production of block foam. This may be of significance to some producers since it is possible that the existing ban in the current criteria on all halogenated flame retardants may make it difficult to Nordic Swan Ecolabel certain categories of furniture.

The US report presented 14 alternative flame retardants that might represent replacement products in the production process. According to the report the various alternatives to flame retardants have varying degrees of environmental and health effects, but fewer effects on the environment than various brominated flame retardants. Some of these alternatives conflict with the existing criteria since they are halogenated. Most non-halogenated compounds are phosphate-based and these generally have the lowest impact on health and the environment. In theory these might represent useful alternatives although the furniture industry argues that these substances may impose chemical/technical limitations in the production of PUR. Certain phosphate/nitrogen compounds in combination with titanium dioxide have also been mentioned.

The wish has been expressed in certain quarters of the furniture industry that specific exemptions should be granted for halogenated compounds, such as certain chlorine-based flame retardants. Part of the problem in allowing exemptions would be that choosing a limited number of alternatives is not viable since a wide variety of chemicals are used for a variety of production techniques within the industry. It might be detrimental/have a distortive effect on competition to pick out certain chemicals, since it is by no means obvious which these should be. Were this to be done, it might be useful to set up an inquiry amongst a wide number of producers and to evaluate the responses in arrears. Moreover, exemptions would involve considerable documentation by the producers in order to ensure as little negative environmental effect as possible. Furthermore developments are moving in the direction of a larger number of new potential alternatives with considerably fewer effects on the environment.

Requirement R40 says that at least 90% of padding materials must be recycled and has not been changed.

Mineral raw materials for soundproofing (R43)

R43 Mineral raw materials for sound insulation

*This requirement applies to the use of more than 5% by weight of mineral raw materials in the product
Mineral raw materials for sound insulation must be accepted as input material in a license to the Nordic Swan Ecolabel acoustic panel according to the criteria of Nordic Ecolabelling for building panels.*

Background to the requirement

There has been questions about Nordic Swan Ecolabelling of furniture with mineral raw materials for soundproofing. Mineral raw materials can be used in furniture and interior design as soundproofing in screens. This type of material was not included in the original version 4.0 of the criteria for furniture, but is included in the criteria of Nordic Ecolabelling for building panels. The criteria for furniture limits the requirements K1 use of materials in the appliance or device to max. 5% per material type and total max 10% by weight, of materials not covered by the requirements of the criteria.

There is therefore introduced a new requirement in the criteria for furniture and fitments; "K43 Mineral raw materials for sound insulation". The requirement states that mineral raw materials for sound insulation must be approved as incoming material in a license to the Nordic Swan Ecolabel building boards.

Requirements as regards textiles (R44 – R59)

Requirements in Chapter 2.10 of the criteria applies to textiles. Requirements for use properties are not changed since the last version and are therefore not included here.

Textiles encompass synthetic materials, natural fibres, hide and leather. For textiles that make up more than 1% by weight of the furniture, at least 80% by weight of the fibre material in the textiles must fulfil the requirements (this means that if a fibre mix comprises of 80% wool and 20% polyester, the wool fibres must fulfil the requirements below or 20% polyester and 60% wool must fulfil the requirements. The requirements apply both to the textiles used on sitting furniture (furniture textiles and other textiles used in the furniture. The textile requirements are generally exempted from the general chemical requirements (R3 – R5 in Chapter 2.1, but shall fulfill requirement R6 in Chapter 2.1.

R44 Ecolabelled textile

Is the textile Nordic Swan Ecolabelled or labelled with the EU Ecolabel? If yes, submit documentation of this and omit the remainder of the requirements in Chapter 2.8.



Name, manufacturer, production site and license number/ standard contract number of the textile.

R45 Hide and leather

Hide and leather that makes up more than 1 weight % of the furniture must be Nordic Swan Ecolabelled or fulfil the requirements applicable to the Nordic Ecolabelling of "Textiles, skins and leather", version 3.2.



Name, manufacturer and licence number of the hide or leather. If applicable, documentation in accordance with the criteria document "The Nordic Ecolabelling of textiles, skins and leather", version 3.2.

R46 Flame retardants and impregnation

The textile must not contain halogenated flame retardants or impregnations containing fluoride.



Declaration from the textile manufacturer in accordance with Form 8.

R47 Dyes, pigments and auxiliary chemicals

Dyes, pigments or auxiliary chemicals classified in accordance with Table 2 in R3 must not be used.



Declaration from textile manufacturer in accordance with Form 8.

Safety datasheet in accordance with current legislation in the country of application, for example Annex II of REACH (Regulation 1907/2006/EC) for each product.

R48 Chrome mordant dyeing

Chrome mordant dyeing is not permitted.



Declaration from the textile supplier in accordance with Form 8.

R49 Metal complex dyes based on copper, chromium or nickel

The use of metal complex dyes is not permitted.



Declaration from the textile supplier in accordance with Form 8.

R50 Auxiliary chemicals

Alkylphenol ethoxylates (APEO), linear alkylbenzene sulphonates (LAS), dimethylbis (hydrogenated tallow) ammoniumchloride (DHTDMAC), distearyl dimethylammoniumchloride (DSDMAC), ditallowalkyl

dimethylammoniumchloride (DTDMAC), ethylene diamine tetraacetate (EDTA) and diethylene triaminepentaacetic acid (DTPA) must not be used and must not make up part of any of the preparations used.

☒ *Declaration from the textile supplier in accordance with Form 8.*

R51 Formaldehyde

Emissions of formaldehyde must not exceed 20 ppm. Alternatively, evaporation must not exceed 0.005 mg/m³ measured in a climate chamber test, Section 4 of Appendix 1.

☒ *Analysis report showing occurrence measured in accordance with Section 4 of Appendix 1.*

R52 Wastewater discharges from wet processing

- A. *The chemical oxygen demand in the emission water discharged from wet processes (except greasy wool scouring sites and flax retting sites) shall when discharged after treatment (whether onsite or offsite) be less than 20 g COD/kg textile, expressed as an annual average. See the calculation example on page 2 of Appendix 8.*
- B. *If the effluent is treated onsite and released directly to nature, it must also have a pH value between 6 and 9 (unless the pH values in the recipients are higher or lower) and a temperature of less than 40°C (unless the temperature in the recipient environment is higher).*

☒ *Application including detailed documentation and analysis reports (ISO6060 or an equivalent must be used) showing that the products fulfil this criterion and a declaration of compliance.*

Changes to and explanation of R44 – R59

The former R45 and R46 have been combined in R44 (new). Irrespective of whether the textiles carry the Flower Label or the Nordic Swan Ecolabel, the outcome is the same: The textiles requirement has been fulfilled.

R47 is new: “Dyes, pigments and auxiliary chemicals”

This requirement uses R-phrases to exclude problematical substances. This means that we have definite requirements as to flame retardants and auxiliary chemicals and that we can remove the requirement applicable to dyes that are mutagenic and toxic to reproduction as this is now included in this R-phrase requirement.

The former R49 requirement concerning azo dyestuffs has been removed. This is an EU requirement and even though textiles are imported from outside the EU, Nordic Ecolabelling has never encountered azo dyestuffs with the aforementioned arylamines in Nordic applications for the Nordic Swan Ecolabel or EU Ecolabel.

The formaldehyde requirement, R51, has been made stricter. This is something that was investigated during the Flower scheme’s revision of the mattress criteria and it should not be difficult for producers to comply with a threshold value of 20 ppm. Experience of textile applications has also confirmed this.

Requirement R47 (formerly R55) has been amended. Requirement as to COD reduction for, inter alia, wool textiles has been removed. This is in part because this is a difficult requirement since wool contains a very COD-demanding substance (lanoline) needing a very effective treatment plant, which is not standard in all countries. Partly also because there is already a requirement that COD must be less than 20 g/kg textile, and it therefore seems unnecessary to also impose a requirement as to COD reduction in the treatment plant. Furthermore, we have received two responses from Norway and one from Sweden (see interview project) showing that this criterion is difficult because a number of large wool scarrers have been closed down (inter alia in Germany and New

Zealand. The COD requirement for wet processes is identical to the requirement in the Flower criteria (adopted March 2009 and for the Nordic Ecolabelling criteria amended in February 2009).

The requirement states that analysis method ISO 6060 or the equivalent must be used in the measurement of COD.

The properties of the textile for seating

R53 – R59. These requirements apply only to seating.

Glass/mirror glass and laminated glass (R60 – R62)

The requirements in Chapter 2.11 of the criteria documents apply to parts made of glass. A new requirement has been introduced for laminated glass.

Consultative proposal:

R60 Glass

Lead glazing, crystal glass and wire reinforced glass must not be used in the furniture.

Glass used in the furniture must be readily replaceable should it be damaged or smashed.

Declaration from the furniture manufacturer with the accompanying instructions for use containing guidance on how to replace damaged glass.

R61 Mirror glass

Mirror glass may be present as part of the furniture or fitment.

The metal coating used in mirror glass must not contain lead (Pb) and/or cobber (Cu) in excess of 0.2 weight %.

Mirror glass used in the furniture must be readily replaceable should it be damaged or smashed.



Test results and test method used by the mirror glass manufacturer or if applicable declaration that no lead or copper are used in the metal coating (Form 9). Accompanying instructions for use containing guidance on how to replace damaged mirror glass.

R62 Laminated glass

Laminated glass may be used in furniture if documentation can be submitted showing that laminated glass can be recycled.

Laminated glass used in the furniture must be readily replaceable should it be damaged or smashed.



Declaration from the furniture manufacturer with the accompanying instructions for use containing guidance on how to replace damaged glass.



Declaration from a recycling plant that laminated glass can be recycled and a description of how this is done.

Explanation of R60 – R62

The use of laminated glass is permitted provided that satisfactory documentation of recycling of the material can be furnished. Laminated glass consists of two plates of glass on each side of a polyvinyl butyral (PVB) film, which is produced under pressure and heat. No other chemical substances are used in laminated glass.

Following a thorough evaluation of the availability of recycling processing for mirror glass it has been concluded that this is possible.

Light sources in furniture and fitments (R63)

R 63 Lighting sources

Fittings must be equipped with light sources in energy class A or B. In the case of reflector lamps (directional lamps) LED or other effective reflector lamps must be used.

Energy classification in accordance with Commission Directive 98/11/EG for household lamps.

Effective reflector lamps means all reflector lamps that are better than normal halogen reflector lamps. For example, what is termed IRC or ES technology will be approved.



Description of the type of lamp and documentation of energy class.

Background to and explanation of R63

A mandatory requirement applies to light sources because the energy required for lighting can be considerable. In Norway, some 13% of energy consumption in housing goes to illumination [TEK 2007]. Incandescent lamps give off a great deal of heat, which on hot sunny summer days contributes to the creation of unnecessarily high indoor temperatures.

According to a recent EU directive, energy inefficient lamps are to be phased out. This process will start with a ban on sales of matte 100 watt incandescent bulbs in September 2009 and will be followed in September 2012 by a ban on the sale of clear 40 watt and clear 25 watt incandescent bulbs. The decisions in this directive will also apply to other inefficient lamps, and the directive will also apply to EEA states such as Norway.

The requirement refers to the energy labelling of lamps (Directive 98/11/EU), and imposes the requirement that fixed fittings must be fitted with lamps in energy class B or higher. Lamps labelled energy class A contain mercury, Hg, whereas as at April 2009 lamps in energy class B are available without mercury. This is the reason why class A lamps are not required.

The energy labelling scheme for lamps does not encompass reflector bulbs and accordingly ordinary downlight halogen lamps are not included. Accordingly, in the case of reflector lamps (directional lamps) energy-efficient LED (Light Emitting Diode) or other efficient reflector sources must be used. The requirement means that downlights with ordinary halogen bulbs, for example, will be banned. Moreover, nor does the EU labelling requirement apply to light sources of less than 4 watt. In practice this will mean that much LED lighting will not qualify for energy-labelling even though it is low energy. Ecolabelling accepts LED, even though here too there may be environmental problems associated with some of the components.

The reason that the requirement is that the bulb itself should be energy-efficient, not simply that the fitting is capable of using energy-efficient light sources, is that people frequently replace existing bulbs with equivalent bulbs when they require changing. It is important to establish good habits from the outset when use of a new building commences.

As the situation stands today (2009) the kitchen manufacturing industry has largely used fitments with energy-intensive lamps. Nordic Ecolabelling's view is that the market is now mature for the use of more energy-efficient lighting to be required in this revision.

Linoleum (R64)

R64 Linoleum

This requirement applies to the use of more than 5% by weight of linoleum in the product.

Linoleum must be approved as incoming material in a license to Nordic Swan Ecolabelled floor under current criteria for ecolabelling of floors.

Background to the requirement

There has been questions about Nordic Ecolabelling of furniture with linoleum. Linoleum can be used as a table surface. This type of material was not included in the original version 4.0 of the criteria for furniture, but is included in the criteria of Nordic Ecolabelling for floors. The criteria for furniture limits the requirements K1 use of materials in the appliance or device to max. 5% per material type and total max 10% by weight, of materials not covered by the requirements of the criteria.

There is therefore introduced a new requirement in the criteria for furniture and fitments; "R60 Linoleum". The requirement requires that the linoleum must be approved as incoming material in a license to the Nordic Swan Ecolabelled floor.

Other requirements applicable to ecolabelled products

Packaging and recycling systems

The Nordic Criterion Group decided to remove the Return System Requirements R65 on October 9, 2017.

Properties in use

The requirements in Chapter 3.1 of the criteria document apply to the properties of furniture and fitments such as durability, strength, safety and stability.

Consultative proposal:

K61 Fitness for use

This requirement is a general requirement applicable to seating, tables, internal doors, kitchen cabinets and other cabinets.

The product for which an ecolabelling licence is sought must fulfil the requirements applicable to durability, strength, safety and stability provided for in the European standards relevant to the areas of use of the product. Other relevant standards may be accepted if the test institution can document that the chosen test provides roughly the same result. If no relevant European standard exists, then national or other international standards must be used. The test must be performed by an independent test institution.

The test stages in the relevant standard must be followed and selected in relation to the area of use for which the furniture is sold or marketed, assuming that the standard includes test stages.

Furniture must meet the following strength, safety and stability requirements (the requirement does not apply to doors for indoor use):

- *Min. level 3 for private use*
- *Min. level 4 for normal contract use*
- *Min. level 5 for tough contract use*

The requirements as to strength, safety and stability must primarily form the standards specified in the table in Appendix 1, Section 6.1. If the product fulfils the requirements of a standard other than EN or ISO, the test institution must provide an account of how the standard relates to the aforementioned requirements.

In the case of varnished, film and laminate-finished surfaces the surface must fulfil the following durability requirements. The requirements do not apply to untreated, soap, wax and oil-finished surfaces. Furthermore the requirement does not apply to doors for indoor use. The level of the requirements refers to the test methods specified in the table in Section 6.2 of Appendix 1.

Table 5. Requirements applicable to various furniture groups

Seating	Seat and arm rests	Requirement level 2
Storage units	External horizontal surfaces (up to 1.25 m), shelves and bases	Requirement level 3
Tables	Private use and normal contract use	Requirement level 4
	Tough contract use (restaurants/cafes)	Requirement level 5
Kitchens	Internal surfaces, including drawer bottoms, excluding shelves and bottoms	Requirement level 1
	External horizontal surfaces, shelves and bottoms	Requirement level 3
	Worktops	Requirement level 6

In the case of products for which no relevant standards exist, an independent relevant test institution may assess the safety, durability and function of the product on the basis of its design and materials used.

A general rule for selection of products for testing shall be based on the test standard. Save as otherwise described, tests shall be conducted within the product family to which the product belongs. The weakest and most critical elements in terms of stability must be selected for testing, e.g. the widest or the shortest possible distance between hedges, drawers with the largest dimensions and longest travel, tables with the longest free spans, etc.



Information on the function end user for which the product was tested and the standard used, the test institution and test report. If applicable, details of how national standards relate to the requirements of ISO or EN. Relevant standards are shown in the tables in Section 6.1 and 6.2 of Appendix 1.

Alternative (if no relevant standards exist):

Information on the test institution, test report and the assessment criteria.

The test institution must provide details of variations within the product group represented by the tested products and verify that the product is representative.

Changes to and explanation of R61

Generally speaking, the requirement is fairly similar, but the text has been clarified relative to the previous version, which was considered to be less than clear. In addition, Appendix 1, Section 6.1, now specifies which standardisations are to be used for various furniture categories. An example of a test result has now been included in connection with Appendix 1, Section 6.2.

5 Changes since the last version

A fairly large number of changes have been introduced in this revision, although many of these changes have involved concentrating earlier requirements together in a new chapter (2.1) on common chemical requirements. This has been the most fundamental and extensive change in the revision, and the aim has been to simplify the criteria considerably. A thorough discussion and explanation of this is provided earlier in the document. The tables below provide a full overview of all changes and comments to the changes.

Table number and text

Requirement in new criteria document	Requirement in old criteria document	Same	Change	Removed / moved	New	Comments
Material composition						
R1			x			Material composition. Previously no separate requirement number. Requirement is more specific and the requirements that can be documented on an annual basis by the factory/ production site has been opened and specified.
Requirements for chemical products						
R2					x	Ecolabelled chemical product
R3					x	Classification
R4					x	Content/additives
R5					x	Formaldehyde
R6					x	Nanoparticles
Requirements for wood, bamboo and willow						
R7	R1		x			Traceability and origin of wood, bamboo and willow
R8	R2	x				Biocides
R9	R3		x			Certified wood. Requirement is now differentiated. Exemption has been removed. Total of increase in stringency
Requirements for building panels						
R10	R4	x				Ecolabelled building panel
R11	R5	x				Traceability and origin of wood, bamboo and willow
R12					x	Chemical requirements. Refers to requirements R3, R4 and R5.
R13	R6		x			Formaldehyde with stringency increase
R14	R7		x			Certified wood in panel > 10 %. Same as R9.
R15	R11		x			Energy. Increase in stringency and a new calculation as well as raw materials requirement in accordance with R7 (new doc.)
R16	R12	x				Emissions to water
Requirements for surface treatment of wood and wood-based panels						
R17					x	Earlier requirements as to classification, content and additives now gathered in this requirement with reference to R3 and R4.
R18	R18		x			Quantity of surface coating applied
R19	R16, (R17 and R18)		x			Requirement now more differentiated with increases in stringency and only requirement as to application quantity can be documented in three different ways with calculation example.

Requirement in new criteria document	Requirement in old criteria document	Same	Change	Removed / moved	New	Comments
R20	R17 and R18		x			Requirement has been added and requirement now imposed as to quantity applied and classification. Possible stringency increase?
Requirements for metals (Introduced minimum limit of 50 g for requirements 22 to 25)						
R21	R19	x				Material separation.
R22	R20	x				Reuse of aluminium
R23	R21	x				Reuse of other metals
R24	R23, R24 and R25		x	x	x	Chemical products and additives. Previous requirements gathered in one new requirement. Possible stringency increase.
R25	R22		x			Coating. Requirement modified. Now also applies to zinc. Reduced stringency. Requirement more stringent since emissions no longer permitted.
Requirements for plastic and rubber						
R26	R26 and R27		x			Material description and labelling of plastic. The two previous requirements gathered in one new requirement.
R27	R28		x		x	Classification and additives. Requirements are now imposed as to classification at the same time as which there are several restrictions on additives. Increased stringency.
R28					x	Nitrosamines in rubber. New: Rubber permitted, but requirements imposed as to content. Reduced stringency.
R29	R29		x			Surface coating is now permitted, but this must not impact on recycling at the same time as which the general chemical requirements must be observed. Reduced stringency.
R30	R30	x				Recycled materials.
Requirements for padding materials (Introduced minimum limit of 1% by weight)						
R31					x	Ecolabelled padding materials
R32	R31,R32, R33,R35, R43,R44		x	x	x	Chemical products and additives. Requirement replaces a number of previous requirements with reference to general chemical requirements. Isocyanates are exempted. Slight stringency increase. Also requirements on very toxic and toxic substances (health). Slight stringency increase.
R33	R34		x			Dyestuffs. Little change in classification. Also requirements as to very toxic and toxic substances (health).
R34	R36		x			Formaldehyde. The requirement is now more stringent.
R35	R37	x				Recycling requirements
R36	R40	x	(x)			The requirement now applies to butadiene in general. Possible stringency increase.
R37	R41		x			Nitrosamines. Stringency increased.
R38	R42	x				Blowing agents.

The former requirements **R38** and **R39**, emissions to water, have been removed since they were not found to be relevant against the background of experience derived from application processing. Stringency reduction.

Requirement in new criteria document	Requirement in old criteria document	Same	Change	Removed /moved	New	Comments
Requirements for textiles, skin and leather						
R39	R45, R46	x			x	Ecolabelled textiles. Earlier requirements gathered in one new requirement.
R40	R47	x				Skin and leather
R41	R48	x				Flame retardants
R42	R49, R51		x			Dyes, pigments and auxiliary chemicals. Previous requirements gathered. Requirement represents possible stringency reduction and increase.
R43	R50	x				Chrome mordant dyeing
R44	R52		x			Metal complex dyes are now banned
R45	R53	x				Auxiliary chemicals
R46	R54		x			Formaldehyde. Requirement stringency increase
R47	R55		x	(x)		Waste water from wet processes changed from 25 to 20 g/kg. Earlier point (b) concerning COD in waste water from wool and linen removed. Stringency reduction.
R48	R56	x				Durability
R49	R57	x				Pilling
R50	R58	x				Dimensional change
R51	R59	x				Colour fastness
R52	R60	x				Wet rubbing
R53	R61	x				Dry rubbing
R54	R62	x				Colour fastness to light
Requirement for glass						
R55	R63		(x)			Glass. Slight nuance since laminated glass has been removed here since this is now permitted elsewhere.
R56	R64	x				Mirror glass
	R65 – R69			x		Glue. Note that the earlier requirements as to glue have been removed since these are now encompassed by the general chemical requirements in Chapter 2.1. Uncertain whether this is a reduction in stringency or not.
R57					x	Laminated glass
Other requirements						
	R70			x		Recycling. Requirements of the authorities in the Nordic countries handle this satisfactorily and the requirement no longer has the same validity.
R58					x	Lamps
R59		x				Recycling systems for products and packaging

R60	R72	x			Plastic materials with chlorine content
R61	R73		x		Properties in use. Requirement specified more precisely as is documentation requirement. Requirement must also be seen in the context of the requirement relating to the surface treatment of wood. Possible stringency increase.
R62	R74	x			Instructions for use
R63	R75	x			Requirements of authorities
R64	R76	x			Eco and quality assurance
R65	R77	x			Marketing

6 New criteria (updating)

The next revision of the criteria will consider the following areas:

- New requirements relating to reductions in climate and energy impact
- Emissions of VOC at factory level
- Transport requirements
- SVHC chemical requirements

7 References

- ⁱ Forest and Wood Products Research and Development Corporation. *Review of the Environmental Impact of Wood Compared with Alternative Products Used in the Production of Furniture*. Australian Government. Australia. 2003. [http://www.timber.org.au/resources/Review of the Environmental Impact of Wood Compared with Alternative Products Used in the Production of Furniture .pdf](http://www.timber.org.au/resources/Review%20of%20the%20Environmental%20Impact%20of%20Wood%20Compared%20with%20Alternative%20Products%20Used%20in%20the%20Production%20of%20Furniture.pdf)
- ⁱⁱ Wærp S, Flæte P O og Svanæs J. 2008. *MIKADO – Miljøegenskaper for tre- og trebaserte produkter over Livsløpet*. Et litteraturstudium. SINTEF Byggforsk. Norge. <http://www.sintef.no/Projectweb/MIKADO/>
- ⁱⁱⁱ Bill Lawson, “*Building materials energy and the environment. Towards ecologically sustainable development.*” The Royal Australian Institute of Architects, 1996.
- ^{iv} A. Jönsson, A. Tillman, T. Svensson, *Building and Environment*, 32(3), 245, 1997.
- ^v M. Mohammad, J. Welling, *Environmental and energy balances of wood products and substitutes.*, Food and Agriculture Organization of the United Nations (FAO), <http://www.fao.org/DOCREP/004/Y3609E/y3609e00.htm>
- ^{vi} T. Goverse, M. Hekkert, P. Groenewegen, E. Worrell, R. Smits, *Resources, Conservation and Recycling*, **34**, 53, 2001
- ^{vii} D. Harris, *Building and Environment*, **34**, 751, 1999
- ^{viii} R. Cole, P. Kernan, *Building and Environment*, **31**, 307, 1996
- ^{ix} T. Chen, J. Burnett, C. Chau, *Energy*, **26**, 323, 2001
- ^x McCoubrie, A. and Treloar, G. “*Life-Cycle Embodied Energy in Office Furniture*”, in “*Proceedings of “Embodied Energy - The Current State of Play”*”, pp. 113-118, Deakin University, Geelong, (1998)
- ^{xi} see <http://forestry.msu.edu/msaf/pdf/rawmaterialenergy.pdf>
- ^{xii} J. Glover, “*Which is better? Steel, concrete or wood. A comparison of assessments on three building materials in the housing sector.*”, Fourth Year thesis, Department of Chemical Engineering, University of Sydney, 2001
- ^{xiii} J. Glover, “*Which is better? Steel, concrete or wood. A comparison of assessments on three building materials in the housing sector.*”, Fourth Year thesis, Department of Chemical Engineering, University of Sydney, 2001
- ^{xiv} A. Buchanan, B. Honey, *Energy and Buildings*, **20**, 205, 1994.
- ^{xv} Canadian Wood Council Technical Bulletin No. 5 “*Life cycle analysis for residential buildings*”, 1994-2000, http://www.cwc.ca/publications/tech_bulletins/tech_bull_5/

-
- ^{xvi} Canadian Wood Council Technical Bulletin No. 2 "Environmental effects of building materials", 1994-2000, http://www.cwc.ca/publications/tech_bulletins/tech_bull_2/
- ^{xvii} Canadian Wood Council Technical Bulletin No. 4 "Comparing the environmental effects of building systems", 1994-2000, http://www.cwc.ca/publications/tech_bulletins/tech_bull_4/
- ^{xviii} Miljøstyrelsen i Danmark, 2001. <http://www.mst.dk/Udgivelser/Publikationer/2001/11/87-7944-909-3.htm>
- ^{xix} Wesnes M. Og Christiansen K. 2008. Notat om miljøforhold for møbler og bygningsplader. Miljømærkning Danmark, 2.-0 LCA consultants og Dansk Standard. Danmark.
- ^{xx} Erstad E. M.fl. 1997. Mot bærekraftig produksjon og produktutvikling i møbel- og trehandlende industri. Hovedrapport. Stiftelsen Østfoldforskning.
- ^{xxi} Antonsson m.fl. 1990. Soffan och miljön. En översiktlig studie av hur en soffa kan påverka miljön, från tillverkning av de olika materialen i den tills den blir avfall. IVL.
- ^{xxii} Kretsloppsdelegationen 1997. Producentansvar för möbler. 1997:15. Stockholm.
- ^{xxiii} Baadsgaard-Jensen 1993. Miljøforhold i møbelindustrien. Norsk Industrifond prosjekt "Træ og miljø". Arbeidsdokument. Træteknikk. DTI.
- ^{xxiv} Norsk møbelindustri, Braqnseinformasjon hentet fra nettsiden til Norsk Industri. Tilgjengelig fra: http://www.norskindustri.no/om_mobel/ (besøkt 3. august 2009)
- ^{xxv} <http://www.danishfurniture.dk>
- ^{xxvi} <http://www.lovdato.no/cgi-wift/ldles?doc=/sf/sf/sf-20020716-1139.html>
- ^{xxvii} Konsekvensutredninger av forslag til regulering av visse miljøgifter i forbrukerprodukter. Vedlegg 4. http://www.sft.no/artikkel_42872.aspx. Statens Forurensningstilsyn (SFT). Norge, 2008.
- ^{xxviii} Miljøvejledninger.dk - <http://www.miljoevjledninger.dk/index.aspx?articleid=+787+787>
- ^{xxix} Statens forurensningstilsyn, SFT, Norge 2008: "Konsekvensvurderinger av forslag til forbud mot miljøgifter i forbrukerprodukter". Tilgjengelig fra: http://www.sft.no/artikkel_42872.aspx (besøkt 5. august 2009)
- ^{xxx} Kallenborn, R., Berger, U., og Järnberg, U., 2004. Perfluorinated alkylated substances (PFAS) in the nordic environment.
- ^{xxxi} http://www.sft.no/nyheter/dokumenter/pfas_nmr2004.pdf /
- ^{xxxii} "Kartlegging av utvalgte nye organiske miljøgifter 2004. Bromerte flammehemmere, perfluoralkylstoffer, irgarol, diuron, BHT og dicofol" SFT: 927/2005. Tilgjengelig fra: http://www.sft.no/miljoreferanse_37630.aspx (besøkt 5. august 2009)
- ^{xxxiii} Substitution af alkylphenoethoxylater (APE) i maling, træbeskyttelse, lime og fugemasser, Arbejdsrapport fra Miljøstyrelsen Nr. 46, 2003
- ^{xxxiv} Nonylphenol og nonylphenoethoxylater i spildevand og slam, Miljøprojekt nr. 704, 2002
- ^{xxxv} Feminisation of fish, Environmental Project no. 729, Miljøstyrelsen, 2002
- ^{xxxvi} "Opinion on the appropriateness of existing methodologies to assess the potential risks associated with engineered and adventitious products of nanotechnologies", European Union Scientific Committee on Emerging and Newly Identified Health Risks (EU SCENIHR) Adopted by the SCENIHR during the 7th plenary meeting of 28-29 September 2005, <http://files.nanobio-raise.org/Downloads/scenihr.pdf>
- ^{xxxvii} The Project on Emerging Nanotechnologies, Consumer Products Inventory of Nanotechnology Products, Categories. Tilgjengelig fra: http://www.nanotechproject.org/inventories/consumer/browse/categories/home_garden/paint/ (Besøkt 5. august 2009)
- ^{xxxviii} Nytt fra NANOMAT, Nr. 4/2008, Forskningsrådet i Norge. Tilgjengelig fra: <http://www.forskningsradet.no/servlet/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition%3A&blobheadervalue1=+attachment%3B+filename%3DNanomat042008web.pdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1229378542509&ssbinary=true> (03.02.2009)
- ^{xxxix} European Union (EU) Action Plan for Forest Law Enforcement Governance and Trade (FLEGT) Tilgjengelig fra: <http://ec.europa.eu/environment/forests/flegt.htm> (besøkt 5. august 2009)
- ^{xl} Fra INBARs nettside om "Bamboo Forest Biodiversity Conservation project", <http://www.inbar.int/Board.asp?BoardID=280>
- ^{xli} UNECE/FAO Forest Products Annual Market Review, 2007-2008. Tilgjengelig fra: <http://timber.unece.org/index.php?id=2> (besøkt juni 2009)
- ^{xlii} Til fakta om sundheds om miljøskade for formaldehyd + lovgivning i DK i dag: Miljøstyrelsens faktaark om formaldehyd i Spånplader og lignende Miljøstyrelsens publikation fra 2006 om Samlet sundhedsmæssig vurdering af kemiske stoffer i indeklimaet fra udvalgte forbrugerprodukter (87-7052-207-3) Bekendtgørelse om begrænsning af formaldehyd i spånplader, rydsfinerplader og lignende plader, som anvendes i møbler, inventar og lignende.

- ^{xliii} Slides fra oplæg i San Diego i 2005 af Manfred Dunkey fra Dynea.
- ^{xliv} Rapport fra Naturvårdsverket: i Sverige Formaldehyd - En kunnskapssammanställning och riskbedömning, Rapport 5399, september 2004, ISBN 91-620-5399-X.
- ^{xliv} Anbefalte faglige normer for inneklima, rapport fra Folkehelseinstituttet. Kap. 9 er om formaldehyd, <http://www.fhi.no/dav/249C03CEC6614E87862368DA175E7A31.pdf>
- ^{xlvi} Miljøstyrelsen, nettside om tekstiler, <http://www.mst.dk/Kemikalier/Fokus+paa+saerlige+produkter/Tekstiler/> (15. mars 2008)
- ^{xlvii} Kemikalieinspektionen om formaldehyd, http://www.kemi.se/templates/Page_4733.aspx
- ^{xlviii} Svenska regler för formaldehyd i träbaserade skivor (finns i 9 kapitlet, 20-27 §§, Kemikalieinspektionens föreskrifter (KIFS 1998:8) om kemiska produkter och biotekniska organismer.
- ^{xliv} Rådets direktiv 89/106/EEG om tillnärmning av medlemsstaternas lagar och andra författningar om byggprodukter
- ⁱ WHO: Air Quality Guidelines for Europe Second Edition, 2000, <http://www.euro.who.int/document/e71922.pdf>
- ^{li} Fra EPA: Consumer Product Safety Commission, An Update On Formaldehyde: 1997 Revision, CPSC Document #725, <http://www.cpsc.gov/cpscpub/pubs/725.htmlv>
- ^{lii} International Association for Research and Testing in the field of Textile Ecology (Öko-Tex), standard 100, <http://www.oeko-tex.com/en/main.html>
- ^{liii} Are Textile Formaldehyde Regulations Reasonable? Experiences from the Finnish Textile and Clothing Industries, Eero Priha, Tampere Regional Institute of Occupational Health, P.O. Box 486, FIN-33101, Tampere, Finland, Received 29 February 1995. Available online 2 May 2002.
- ^{liv} Hong Kong Standards and Testing Centre, http://www.stc-group.org/UserFiles/File/Newsletter/TMD/Formaldehyde_2004.pdf
- ^{lv} Formaldehyde requirements of wood-based materials and products, spec. no: IOS-MAT-003, IKEA, Sweden, 2008.
- ^{lvi} Formaldehyde Fact Sheet. The National Safety Council (NSC) Environmental Health Center Tilgjengelig fra: <http://www.cpsc.gov/cpscpub/pubs/725.pdf> (Besøkt 6. august 2009)
- ^{lvii} Wood Facts. Formaldehyde Emissions and Extentions, APA – The Engineered Wood Association Tilgjengelig fra: <http://www.apawood.org/pdfs/unmanaged/i330.pdf> (Besøkt 6. august 2009)
- ^{lviii} Surface Treatment using Organic Solvents, Integrated Pollution prevention and Control, Reference Document on Best Available Techniques. European Commission, Directorate-General, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 2007. Tilgjengelig fra: http://eippcb.jrc.es/reference/_download.cfm?twg=sts&file=sts_bref_0807.pdf
- ^{lix} Kjetil Veidel, 2008. Privat kommunikasjon med Kjetil Veidel fra Beckers Acroma.
- ^{lx} Underlag for revidering av kriteriene for miljømerking av møbler og innredninger, utemøbler og bygningsplater, Teknologisk Institutt, Norge, 2007.
- ^{lxi} The future builds on Aluminium. The International Aluminium Institute, 2009. Tilgjengelig fra: <http://greenbuilding.world-aluminium.org/page/EndOfLifeRecycling> (besøkt 9. august 2009)
- ^{lxii} Aluminium International Today, Nov/Dec 2008
- ^{lxiii} Mining Certification Evaluation Project. Tilgjengelig fra: http://www.minerals.csiro.au/sd/SD_MCEP.htm (besøkt 9. august 2009)
- ^{lxiv} Svanmärkning av ytbehandling av møbler, Rapport nr 1190-005-02. Askengren & Co, Sweden, 2006.
- ^{lxv} Environmental Impacts of Production: Pollution from Processing Rubber.WWF Tilgjengelig fra: http://www.panda.org/about_our_earth/agriculture_impacts/rubber/environmental_impacts/pollution/ (besøkt 11. august 2009)
- ^{lxvi} PUR-skum produkter i et livsløpsperspektiv – en vurdering av arbeidsmiljø og ytre miljø. ISBN nr: 82-7520-446-1. Stiftelsen Østfoldforskning, BA8 Rådgivende Ingeniører og Teknologisk Institutt. Norge, 2002.
- ^{lxvii} Bruken av bromerte flammehemmere i produkter: Materialstrømanalyse. Statens Forurensningstilsyn (SFT), TA-1947. Norge. 2003.
- ^{lxviii} Kartlegging av utvalgte nye organiske miljøgifter – bromerte flammehemmere, klorerte parafiner, bisfenol A og triclosan (TA-2006/2004). <http://www.sft.no/publikasjoner/overvaking/2096/ta2096.pdf>. ISBN 82-577-4488-3. Norsk Institutt for Vannforskning (NIVA). Norge, 2004.
- ^{lxix} Hvor brannsikre er stoppete møbler og madrasser? http://nbl.sintef.no/publication/lists/docs/NBL_A06103.pdf. NBL A06103. SINTEF. Norge, 2007.
- ^{lxx} Konsekvensutredninger av forslag til regulering av visse miljøgifter i forbrukerprodukter. Vedlegg 4. http://www.sft.no/artikkel_42872.aspx. Statens Forurensningstilsyn (SFT). Norge, 2008.
- ^{lxxi} Bromerte flammehemmere i avfallsstrømmen. TA-2380. <http://www.sft.no/publikasjoner/2380/ta2380.pdf>. Statens Forurensningstilsyn (SFT). Norge, 2008.

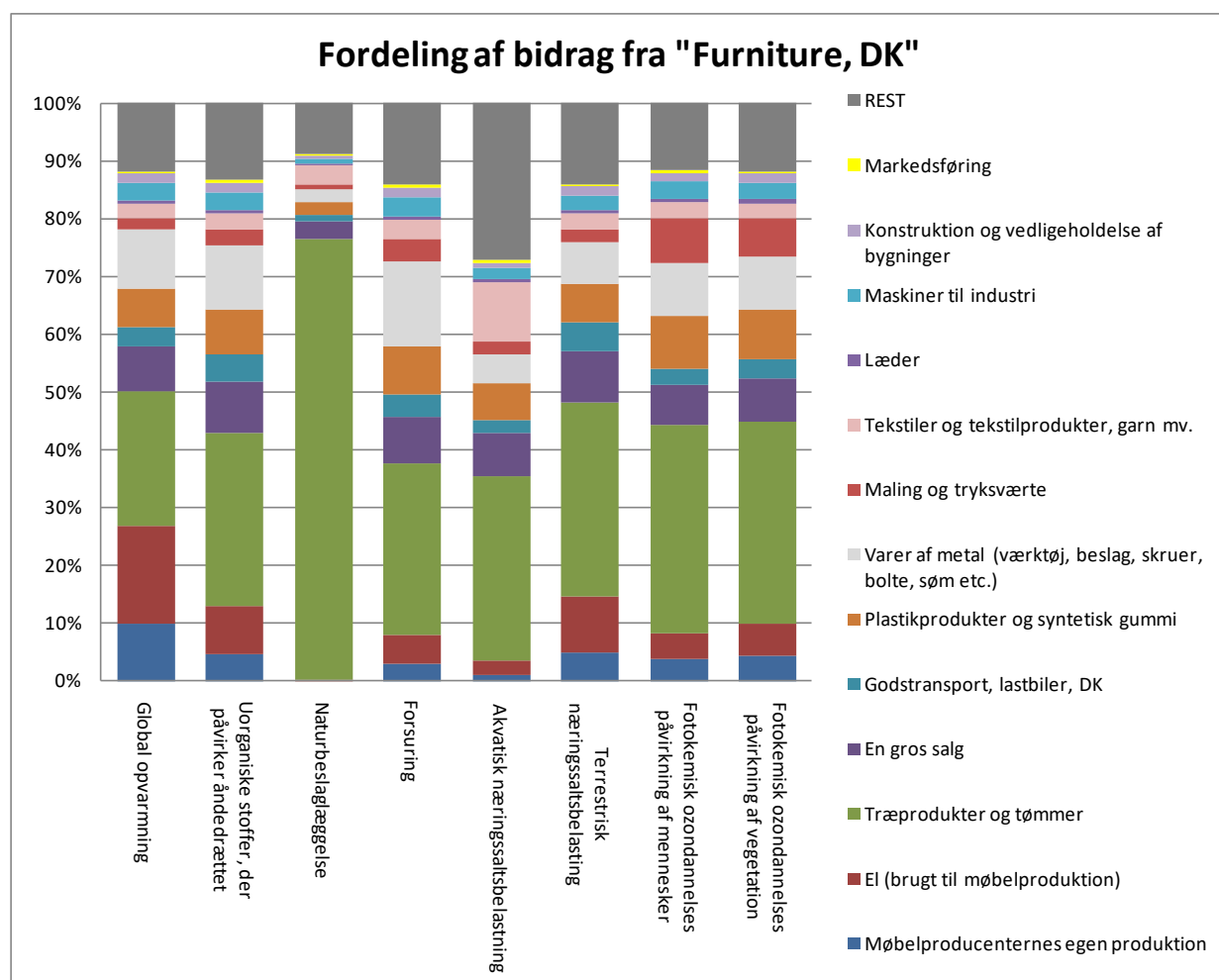
^{lxxii} Furniture Flame Retardancy Partnership: Environmental Profiles of Chemical Flame-Retardant Alternatives for Low-Density Polyurethane Foam. <http://www.epa.gov/dfe/pubs/flameret/ffr-alt.htm>. Environmental Protection Agency (EPA), USA, 2005.

Appendix 1.

Figure 1 shows the results of an input-output analysis and represents furniture produced in Denmark. The analysis was conducted by 2.-0 LCA Consultants and Danish Standards for Nordic Ecolabelling in 2008.

The conclusion will of course depend on the weighting applied in the study. It is important to note that Figure 1 shows contributions from various input factors in the furniture received from the furniture producer from subcontractors. Since no functional unit has been used to weight the various materials, this data cannot be used for the purpose of ranking environmental impact for the various materials used in the furniture in a life cycle perspective. Moreover, the data include production only, not use or disposal of furniture. Accordingly the whole life cycle of furniture has not been covered.

Figure 1. *Input-output screening of which suppliers to furniture producers have the greatest environmental effect on the production of furniture viewed in a life cycle perspective.*



Appendix 2. Production of metals

The production of metals involves emissions and the consumption of large quantities of energy.

Steel production

In ore-based steel production iron ore, coke and input goods are the raw materials. Pig iron and slag are created in the blast furnace. The raw iron is purged of sulphur and coal in the steel production process. Various alloying elements are subsequently added to give

the steel the right properties. The molten steel is then cast into steel ingots in the continuous casting process. The steel is processed further in order to produce the required end products.

In this steel production that takes place in the blast furnace energy is released and the process must accordingly be cooled by means of the addition of scrap. Scrap is added, but this is limited for physical reasons, normally to approximately 20% of the finished steel. Worldwide production of ore based crude steel totalled 662 million tons in 2004 (www.jernkontoret.se).

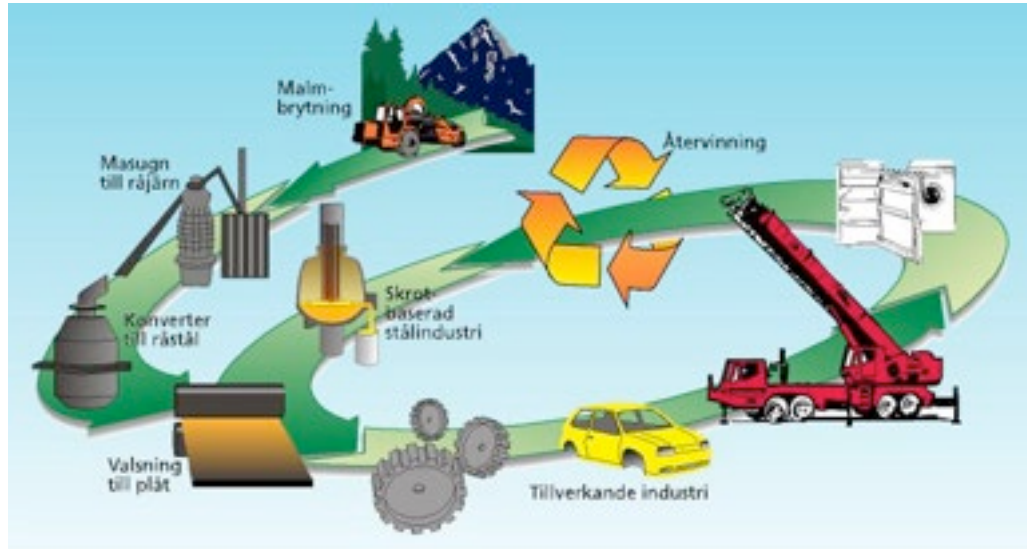
Stainless steel is produced by means of the addition of certain substances to make the steel "stainless", primarily (Cr) and molybdenum (Mo).

Scrap is the primary raw material in scrap-based production. This is supplemented with for example stainless steel as well as alloying materials insofar as these are not found in the scrap to a sufficient degree. In scrap-based steel production smelting is largely conducted in electrically powered arc furnaces. The scrap value of stainless steel is roughly speaking ten times higher than carbon steel. Worldwide in 2004 some 356 million tons of scrap-based steel was produced. Annual output of stainless steel is approximately 20 million tons (approximately 2% of total steel production).

The output of steel production based on scrap is not sufficient to meet demand. On average, scrap-based steel production meets 40-50% of demand. In order to avoid a shortfall in supply, production is supplemented by ore-based steel making. Different production processes are used for different steel products, generally based on the traditional production machinery. The production of hoop and plate steel is usually ore-based, while for example wire, rod and construction steel are usually produced on the base of scrap metal. Recycling has long been a matter of course and is widely used. All steel that is collected is recycled to produce new steel. Steel is often used in the production of products with a long useful life and worldwide demand for steel is increasing all the time.

Many mills use scrap in their production. In Europe, recycling levels have long been approximately 50% of the raw material in recycled steel and 25% approximately of the raw material used in recycled aluminium (International Council on Metals and Environment, ICME). IISI (2004) reported that on a worldwide basis in 2003, 33% of steel production was based on scrap and the corresponding figure for Europe was 40%. The proportion of scrap used in metal production varies from country to country depending on the availability of scrap on the market.

Aluminium products are processed through rolling, drawing, extrusion and casting. Recycled materials can be used in the casting of aluminium whereas in the case of extrusion of aluminium sections primary aluminium is required.



Aluminium production

The raw material bauxite is processed to produce a pure aluminium oxide (the Bayer process). Aluminium is produced on the basis of the aluminium oxide (Hall-Heroult-process) where the aluminium oxide is electrolytically reduced and dispersed with the aid of electricity. Where aluminium is produced on the basis of scrap, the scrap is melted in an electrically fired smelting furnace. The suspension content is regulated in the converter.

In Europe the content of recycled aluminium used in aluminium production has long been approximately 25% (International Council on Metals and Environment, ICME).

Processing of metal

Most of the output of steel mills consists of products that will undergo further processing. Processing normally takes the form of hot rolling, sometimes followed by cold rolling or forging, drawing, casting of finished details. In the processing steel is hot rolled into steel plate and hoop steel. Further processing takes the form of pickling (the steel is washed with hydrochloric acid to remove scale produced during hot rolling) and cold rolling. After cold rolling, in order to create a mouldable product, the plate must undergo heat treatment either by annealing or in a bell furnace. Some cold milled details are metal coated or varnished in order to produce a durable product.

Forging is often used to create large pieces as well as parts of irregular thickness and shape. Drawing is used to produce thin wire by cold drawing hot-rolled wire. Drawing is also used in rod and pipe production. Casting is used primarily in the production of large irregular shaped parts, such as engine blocks, but also to produce small parts.