



# Revision of EU GPP Criteria for Furniture

## Technical report supporting: EU GPP criteria draft 2.0

Prepared by

Shane Donatello  
Hans Moons  
Oliver Wolf  
Carme Hidalgo  
Natalia Fuentes

30<sup>th</sup> April 2014



## Contents

List of Tables.....	4
1. EU GPP REVISION PROCESS FOR FURNITURE.....	5
2. EXECUTIVE SUMMARY OF BACKGROUND REPORT.....	7
2.1. LEGAL ASPECTS AND STANDARDS RELEVANT TO FURNITURE.....	7
2.2. MARKET ANALYSIS.....	7
2.3. LIFE CYCLE ASSESSMENT OF FURNITURE.....	8
2.4. MAIN MATERIALS IN FURNITURE.....	9
2.4.1. Wood and wood-based materials.....	9
2.4.2. Metals.....	10
2.4.3. Plastics.....	11
2.4.4. Upholstery.....	12
2.5. HAZARDOUS SUBSTANCES IN FURNITURE MATERIALS.....	13
2.6. UPTAKE OF FURNITURE GPP IN THE EU.....	13
2.7. CONSUMER INTERESTS FOR FURNITURE.....	14
3. GUIDANCE FOR THE PROCUREMENT PROCESS.....	16
3.1. TYPES OF CRITERIA IN GPP.....	16
3.1.1. Selection criteria.....	16
3.1.2. Technical Specifications.....	17
3.1.3. Award criteria.....	17
3.2. GREEN PUBLIC PROCUREMENT IN THE EU.....	17
4. PROPOSED EU GPP CRITERIA AND RATIONALE.....	20
4.1. MINIMUM TECHNICAL SPECIFICATIONS.....	20
4.1.1. CRITERION 1 – LEGAL ORIGIN AND TRACEABILITY OF WOOD AND WOOD-BASED MATERIALS.....	20
4.1.2. CRITERION 2 – SUSTAINABLE WOOD.....	20
4.1.3. CRITERION 3 – FORMALDEHYDE EMISSIONS FROM WOOD-BASED PANELS.....	21

4.1.4	CRITERION 4 – PLASTIC PARTS .....	22
4.1.5	CRITERION 5 – METAL PARTS .....	23
4.1.6	CRITERION 6 – SURFACE COATING OF WOOD, PLASTIC AND/OR METAL PARTS ....	23
4.1.7	CRITERION 7 - ADHESIVES AND GLUES.....	24
4.1.8	CRITERION 8 - PACKAGING MATERIALS .....	25
4.1.9	CRITERION 9 – DURABILITY, FITNESS FOR USE, REPARABILITY AND ERGONOMICS	25
4.2	AWARD CRITERIA .....	27
4.2.1.	CRITERION 1 – SUSTAINABLE WOOD .....	27
4.2.2	CRITERION 2 - RECYCLED CONTENT OF PLASTICS .....	27
4.2.3	CRITERION 3 - PADDING MATERIALS .....	28
4.2.4	CRITERION 4 – TEXTILE COVERING FABRICS.....	28
5	COST CONSIDERATIONS .....	30
	Appendix I: ISO 14021 definition of recycled material .....	33
	Appendix II: Furniture standards listed in CEN Committee (CEN/TC 207).....	34
	A.1.1. Upholstered furniture .....	34
	A.1.2. Office furniture .....	34
	A.1.3. Hardware for furniture .....	34
	A.1.4. Outdoor furniture .....	34
	A.1.5. Seating furniture .....	35
	A.1.6. Tables .....	35
	A.1.7. Kitchen furniture.....	35
	A.1.8. Beds.....	35
	A.1.9. Storage Furniture .....	35
	A.1.10. Glass in furniture.....	36
	A.1.11. Surface resistance and characteristics.....	36
	A.1.12. Other types of furniture.....	36
	Appendix III: criteria and verification for latex foams.....	37

Appendix IV: Criteria and verification for PU foams .....	40
---	----

## **List of Tables**

Table 1. Limits for extractable substances in furniture textile fabrics.....	28
Table 2. Carcinogenic aromatic amine dyes to be tested for by EN 14362-1 and -3.....	29
Table 3. Considerations regarding the cost and environmental benefits of certain proposed GPP criteria .....	30
Table 4. Restricted substance criteria for latex foams.....	37
Table 5. List of VOC emission limits for latex foams. ....	38
Table 6. List of restricted substances in PU foam in Ecolabel furniture. ....	40
Table 7. Limits for VOC emissions from PU foam samples .....	42

## **List of Figures**

Figure 1. EU Ecolabel and GPP criteria development processes.....	5
Figure 2. Supply of solid timber in the EU-25 (imports and production). ....	9
Figure 3. Fraction of furniture public procurement contracts including GPP core criteria. ....	14
Figure 4. Furniture characteristics that consumers are willing to pay an extra 10% for. ....	14

# 1. EU GPP REVISION PROCESS FOR FURNITURE

The EU GPP criteria for the product group “furniture” are under revision. The revision process is being carried out in parallel with revision of EU Ecolabel criteria for the same product group (see Figure 1).

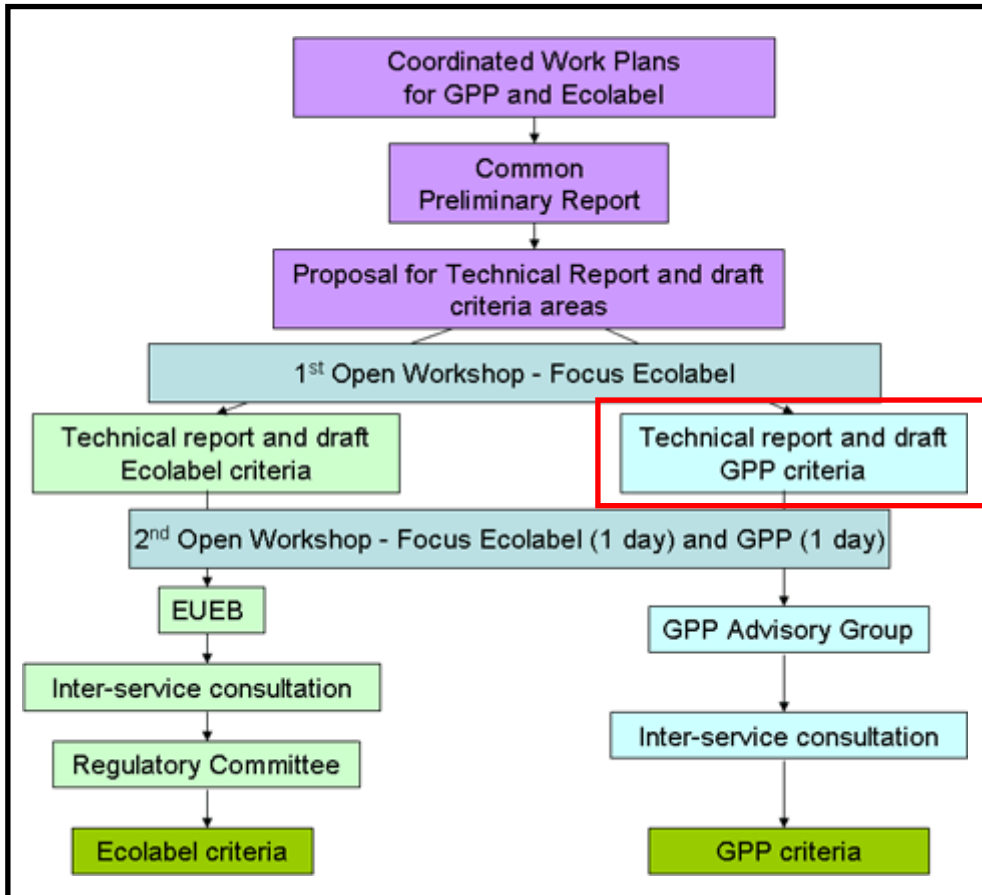


Figure 1. EU Ecolabel and GPP criteria development processes<sup>1</sup>.

The process involves the writing and publication of a common preliminary/background report that describes developments in the furniture industry regarding market data, legislation, the life-cycle impacts of furniture products, best available technologies and any new toxicity data regarding hazardous substances used in furniture manufacture. Previously, Ecolabel criteria was restricted to wooden furniture ( $\geq 90\%$  by weight wood/wood-based material) while GPP criteria applied to a much broader range of furniture products. It is currently proposed to expand the EU Ecolabel criteria to cover the same range of furniture product types as GPP criteria.

Following publication of the background report, a technical report was published in which possible new criteria areas for furniture were proposed and a 1<sup>st</sup> Open workshop / Ad-Hoc working group meeting took place in Sevilla on 7 October 2013 to discuss the proposals. Feedback from stakeholders representing manufacturers, intermediaries, consumer organizations, NGOs and Member States was gathered prior to the meeting via questionnaires, during the meeting via

<sup>1</sup> source: [http://ec.europa.eu/environment/gpp/gpp\\_criteria\\_procedure.htm](http://ec.europa.eu/environment/gpp/gpp_criteria_procedure.htm)

verbal dialogue and after the meeting via ongoing exchange of phone calls, emails and uploading of information onto the Batis webpage<sup>2</sup>, to which all registered stakeholders have access. All published information is also available online at the EC Joint Research Centre (JRC) website<sup>3</sup>.

Specifically for the purposes of engaging more with procurement experts, a group was created in February 2014 on the European procurement forum website<sup>4</sup>.

After gathering all the stakeholder feedback, new sets of criteria have been proposed for EU Ecolabel and EU GPP furniture. This 2<sup>nd</sup> technical report specifically focuses on the public procurement processes for furniture and relevant environmental criteria that are recommended for use as green public procurement criteria in calls to tender. A separate technical report has been produced that specifically focuses on criteria for EU Ecolabel products. Both reports will be made available for consultation on the Batis system and the JRC website.

As a general rule of thumb, the Ecolabel criteria should aim to apply to the top 10-20% of furniture products available on the market in terms of environmental performance or sustainability. On the other hand, GPP criteria for furniture should be less stringent and be able to be met by a larger range of furniture products on the market.

---

<sup>2</sup> <http://eippcb.jrc.ec.europa.eu/batis/> - forum: furniture

<sup>3</sup> <http://susproc.jrc.ec.europa.eu/furniture/stakeholders.html>

<sup>4</sup> [www.procurement-forum.eu](http://www.procurement-forum.eu) – group name “EU GPP criteria revision for furniture”

## **2. EXECUTIVE SUMMARY OF BACKGROUND REPORT**

A brief summary of the main sections of the draft background report for furniture published in September 2013 is included here.

### **2.1. LEGAL ASPECTS AND STANDARDS RELEVANT TO FURNITURE**

Numerous pieces of legislation are relevant to one degree or another for specific furniture products.

Regarding the definition and use of hazardous substances, the importance of the REACH Regulation (1907/2006) and the CLP Regulation (1272/2008) must be highlighted. Other more specific legal instruments include the VOC Directive (1999/13/EC) for installations where significant quantities of VOC containing compounds (e.g. formaldehyde resins for wood-based panels or surface coating chemicals for furniture) are handled and the Biocides Regulation (528/2012) which lists authorised active ingredients in biocidal products as a function of the group application (two group applications apply directly to wooden materials).

For wood and wood based materials, Regulation 995/2010 (the EU Timber Regulation) outlines the requirements for any timber to be legally sold on the EU market and links with existing processes for FLEGT licenses and CITES permits. Going beyond legal requirements, the most relevant programmes for demonstrating that wood and wood based materials are sustainably sourced are the FSC and PEFC certification schemes. Across the EU, wooden particleboards, fibreboards and panels, are classified as E1 (0.1ppm) or E2 (0.1-0.3ppm) based on their release rates of formaldehyde as assessed by relevant EN standards such as EN 622 and EN 717.

A large number of EN standards exist that are specifically designed for individual product types such as EN 527 for work tables and desks in offices, EN 581 for outdoor tables and sets, EN 747 for bunk beds and EN 1335 for office chairs. These standards are important from an environmental point of view when they refer to durability or performance-based aspects of the furniture. Another important standard is EN 1021 for fire resistance of upholstered furniture, which can effectively require that flame retardants be used with certain materials.

To add to an already complex situation, some Member States choose to apply more stringent standards than those required by EN specifications, for example the UK Fire Regulations.

### **2.2 MARKET ANALYSIS**

According to the World Furniture Outlook by CSIL<sup>5</sup>, the global furniture market is worth around **US\$420 billion** per year. The global market is dominated by China (37%) but the 3<sup>rd</sup> and 4<sup>th</sup> main producers were Germany and Italy (each with a 6% market share). In total, EU-27 countries account for around 20% of global furniture production.

---

<sup>5</sup> CSIL Furniture Outlook. Global trends and forecasts for the furniture sector. CSIL Alessandra Tracogna. Feb. 2012. (available online at: <http://www.slideshare.net/ClarionGermany/03-csil-alessandratracogna>)

The EU furniture industry faces strong competition from cheaper overseas competitors, in particular China. In response, they are developing more innovative and sophisticated furniture products and giving increased attention to the environmental impact of their products.

It is difficult to quantify any direct environmental impact of assumed scenarios of the uptake of the GPP criteria listed here because most market data is expressed in number of units of furniture or production value whereas environmental impacts related to materials are directly expressed as unit mass or volume of that material.

Nonetheless, some of the more likely impacts of the application of GPP criteria in furniture procurement activities would be as follows:

- Increase in demand for wood from sustainably managed sources.
- Incentivise the use of recycled wood fibres by considering them as sustainable wood.
- Sending a market signal to producers to increase the use of recycled plastic.
- Improving the product information made available to consumers.
- Encouraging innovation in furniture companies in terms of design for disassembly, and partial replacement of components.
- Fostering skills development in furniture repair, renovation and responsible End-of-Life (EoL) disposal (either of the original manufacturer or 3<sup>rd</sup> parties).
- Reduction of the quantities of furniture waste sent to landfill as products become easier to separate and users would be informed of the optimum disposal route for each component (e.g. recycling, downcycling or energy recovery).

### ***2.3 LIFE CYCLE ASSESSMENT OF FURNITURE***

The life cycle of furniture products has been considered in the following phases; Materials, Manufacturing, Packaging, Distribution, Use and End of Life (EoL). An original total of 109 reports related to the LCA of furniture were assessed. After analysis of 13 screened Life Cycle Assessment (LCA) studies and 35 verified Environmental Product Declarations (EPD's) the following conclusions were drawn:

- The dominant fraction (80-90%) of environmental impacts is linked to furniture **materials/ components**. While embodied energy in metals and plastics are higher than wood, durability and recyclability are also important considerations. Specifying recycled materials can help reduce material impact.
- **Manufacturing**, the assembly and/or treatment of components, is the next most significant source of environmental impacts due to the use of chemicals in surface coatings and elevated temperature curing processes.
- Impacts due to **packaging** were not dominant but not negligible either and some room for improvement exists in this area.



- **Distribution** was difficult to investigate since this can vary widely due to the global nature of the furniture market. In most LCA studies, average transportation scenarios were used, which masks the varying importance of this part of the furniture life cycle.
- The **use** phase was not important in terms of environmental impact. However, durability and reparability of products are important considerations to extend the use phase.
- The **End of Life (EoL)** impacts vary considerably depending on what materials are used in the furniture. Recycling of furniture components or recovering energy from furniture waste is often complicated due to difficulties in separating components.

## 2.4 MAIN MATERIALS IN FURNITURE

Data from the PRODCOM database on Eurostat showed that the main materials used in individual pieces of furniture were: wood (56 %), metal (12 %) plastics (6 %) and other/unspecified (26 %).

### 2.4.1 Wood and wood-based materials

Solid wood is typically split into softwood, temperate hardwood and tropical hardwood. Very little hardwood is harvested in the EU. However, technical innovations such as heat treatment and staining and finishing techniques are extending the range of applications of European softwood into those traditionally reserved for hardwood. Softwood accounts for over 70 % of the total solid wood market in the EU and the majority is produced in the EU, as can be seen in Figure 2.



Figure 2. Supply of solid timber in the EU-25 (imports and production)<sup>6</sup>.

In 2011, the EU market demand for solid wood was 230 million m<sup>3</sup>, of which 53 million m<sup>3</sup> was imported. The total demand for wood-based panels in the EU is difficult to estimate but can be considered to be at least 55 million m<sup>3</sup> in 2003. Wood-based panels include sub-categories of

<sup>6</sup> Source: 2011 Statistics EU Totals Timber trade monitoring in support of effective, efficient and equitable operation of the EU Timber Regulation (EUTR)

material such as plywood, particleboard, fibreboard and veneer sheets. These figures do not distinguish the final use type and so only fractions of these totals (230 and 55 million m<sup>3</sup>) end up being used in furniture.

Initiatives for ensuring the supply of solid wood from sustainably managed forests are dominated by the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification schemes (PEFC). Globally, around 182 million ha (44% of which is located in the EU) of forests are FSC certified for sustainable management. With PEFC certified forests, the land area is 258 million ha (33% of which is located in the EU). However, the availability of certified hardwood is much lower than that of certified softwood. Thus it is likely that any solid wood in GPP furniture will tend towards being softwood.

Wood-based panels consist mainly of wood chips or fibres and a binder. Wood fibres can be sourced from logging co-products such as branches, off-cuts and sawdust. The most common binders are formaldehyde-based resins, for example melamine-formaldehyde, phenolic-formaldehyde or urea-formaldehyde. The main concern with formaldehyde-based resins is subsequent formaldehyde emissions from the panel since this chemical is officially classified as a suspect carcinogen. Alternatives to petroleum based wood adhesives are being researched although there are no such products widely available on the market as yet<sup>7</sup>. Non-formaldehyde based resins that are currently used are mainly cement, methylene bisphenyl isocyanate (MDI), polymer 4.4 diphenyl methane di-isocyanate (PMDI) or phenolic glue.

## **2.4.2. Metals**

The vast majority of metals used in furniture are steels, aluminium and iron. In general, the manufacture of metals requires thermal processing of large amounts of ore. These metals have different physical and technical properties that lend themselves well to particular requirements for different furniture components. For example iron is dense and often used in heavy outdoor furniture, stainless steel can be used in components that are at high risk of oxidation and can provide highly polished surfaces whereas aluminium is by far the lightest of these metals.

### **2.4.2.1 Aluminium**

In 2011, a total of 13.2 million tonnes of aluminium was supplied in Europe of which 35% was produced by primary EU smelters, 34% was recycled in EU refiners and remelters and 30% was net imported<sup>8</sup>. The production of primary aluminium has an extremely high environmental and economic cost. To produce 1t of primary Al requires: 5t of bauxite ore and 145-170 MJ/kg. Processing of the ore produces a problematic waste in red muds and red sands.

Aluminium can be repeatedly recycled without losing its desirable properties. There is already a large economic incentive for recycling because of massive energy savings in recycled compared to primary aluminium. The embodied energy of recycled or secondary aluminium is 8-16 MJ/kg, some 90-95% lower than the 145-170 MJ/kg required for primary aluminium.

---

<sup>7</sup> Gonzalez-Garcia et al., 2011. J. Clean. Prod., Vol. 19, p.445-53.

<sup>8</sup> The European Aluminum Association <http://www.alueurope.eu/aluminium-sector-in-europe-2010/>

### **2.4.2.2. Iron and steel**

These metals are described together since iron production is also the first stage in the manufacture of primary steel. Of all metal ores mined in the world, iron ore is by far the most dominant (around 90-95% of total ore mining quantity). In turn, the majority of global iron production (ca. 98%) is for use in the subsequent manufacture of steel.

The primary route for steel manufacture is as follows:

1. Iron (pig iron) is produced by melting a controlled mixture of iron ore, coke and limestone in a blast furnace at around 2000°C.
2. It is then combined with a certain fraction of recycled steel (ca. 10-30% and depending on availability) and melted in a Basic Oxygen Furnace (BOF).
3. Finishing of the product with alloying elements such as Ni and Cr or electroplating depending on the end application and grade of steel to be produced.

The embodied energy of 1t of steel by the BOF route above is around 28-31MJ/kg and requires around 1.5t iron ore, 0.75t coke and 0.23t limestone. The process produces around 300-400kg of slag waste per tonne of steel produced although this material has been shown to be of particular value as inert aggregates (air cooled slag) or in blended cements (when ground and rapidly quenched). In a similar manner to aluminium, but to a lesser degree, there are strong economic and environmental advantages in steel or iron recycling. Steel with a recycled content up to 100% can be produced from electric arc (EA) furnaces. On average, to produce 1t of recycled steel, the EA route requires around 0.88t recycled steel, 0.15t coal and 0.043t limestone.

### **2.4.3 Plastics**

Hard plastic components in furniture are generally made of polymers such as ABS (Acrylonitrile Butadiene Styrene), PP (PolyPropylene), PS (Polystyrene), PC (Polycarbonate), PE (Polyethylene) and PVC (PolyVinyl Chloride). These polymers are all examples of thermoplastics and thus can be recycled if separated appropriately.

Additives are used in plastics for various reasons such as colouring and UV resistance. It is impossible to control impurities from additives in recycled post-consumer plastics and there are possible risks of incompatibility between additives. Consequently, recycled plastic furniture tends to focus on furniture products at the lower end of the market and/or where the source of recycled plastic is relatively uniform and well defined. There are a number of examples of furniture products currently available on the market with defined recycled plastic contents, including some outdoor furniture products made of >90% recycled HDPE. The Nordic Swan ecolabel requires that any furniture consisting of >10% by weight plastic should use plastic with an average recycled content of 50%. There are approximately 280 licenses for Nordic ecolabel furniture in Sweden alone although it is uncertain how many of these products actually contain >10% by weight plastic.

Plastic recycling rates across the EU are generally low (around 10-30 % in individual Member States) and processes are complicated by the vast array of plastic types in waste streams and the

need to sort them from mixed waste sources. Recycling efforts are also hampered by the attractiveness of energy recovery from plastics, due to their high calorific values.

A sensitive issue is the use of PVC in green products. For example, the Nordic ecolabel expressly prohibits its use in furniture. Despite the fact that PVC can be recycled many times over like other thermoplastics, one of the main arguments against PVC is the potential to generate dioxins when this material is incinerated. Such a feature is unique to PVC due to its chloride content. The use of high quantities of plasticisers is also associated with PVC. In this respect, a distinction should be made between "hard" PVC components and "soft" PVC such as faux leather. In soft PVC, up to 80% of the mass of the material can be due to plasticisers and other additives and there exist concerns about the hazardous properties of a number of plasticisers in particular some that lie within the phthalate family of compounds.

A common concern for all plastics is that they are produced from finite fossil fuels (in particular crude oil). The use of renewable sources to produce bio-plastics is a recent development and production rates are estimated to be growing at a rate of 20% per year in the EU. To date the use of bio-plastics in furniture has not been widely adopted although this could be a potentially interesting factor to consider in future criteria revisions<sup>9</sup>.

#### **2.4.4 Upholstery**

Textiles, leather and padding materials are the main materials used in furniture upholstery.

Environmental impacts from textiles based on natural fibres will be related to the use of fertilisers and pesticides during plant/animal growth and wastewater production during processing. For both natural and synthetic textiles, the use of dyes and bleaching agents for aesthetic purposes and finishing agents is an important consideration. With synthetic fibres in particular, there is the potential to improve environmental performance by using recycled fibres although these materials are inherently more flammable and may require higher treatments with flame retardants. Other important criteria are linked to the environmental performance of the textile plant itself in terms of solid, gaseous and wastewater emissions.

Although leather is not a dominant material in furniture, it represented around 14% of the global market for leather in 2007 (some 3210 million sqft). Producers argue that animal hides are essentially a co-product of meat and that environmental impacts should focus on hide preservatives, the tanning process and dyes or flame retardants. Many hazardous substances are involved in the production of leather and their limitation, particularly of Cr(VI), is one of the main concerns. As with textiles, an important consideration is the performance of the tannery plant and its emissions.

Padding materials have been specifically addressed in separate EU Ecolabel criteria for the product group "Bed Mattresses". The main padding materials used in furniture are PolyUrethane (PU) foams and Latex foams. The main environmental impact of padding materials is linked to the use of hazardous chemicals in dyes, adhesives, catalysts, biocides, flame retardants and blowing

---

<sup>9</sup> L. Shen et al., 2009. Biofuels, Bioproducts and Biorefining, Vol. 4(1) p.25-40.

agents. Padding materials (as well as textiles and leather) may contribute significantly to VOC emissions from the final furniture product.

## **2.5 HAZARDOUS SUBSTANCES IN FURNITURE MATERIALS**

The process for deciding on the hazardous properties of any chemical substance or mixture is set out in the REACH Regulation (1907/2006) and the CLP Regulation (1272/2008). Substances of Very High Concern (SVHC) in the EU as defined under REACH Article 57(a-f)<sup>10</sup> are either placed on the candidate list awaiting assessment by the European Chemicals Agency (ECHA), included in the REACH Annex XVII list of restricted substances or included in the REACH Annex XIV list of authorised substances after assessment.

The main potential sources of hazardous substances in furniture will depend on what materials are used. Examples of chemicals containing SVHC or that are listed on Annex XVII include:

- Biocides used in the preservation of outdoor wood.
- Flame retardants (mainly limited to use with synthetic textiles and padding materials).
- Adhesives and resins used in wood-based panel manufacture and furniture assembly.
- Organic solvents and VOC emissions from paints and varnishes.
- Heavy metals used as pigments in paints or plastic additives, in metal coatings or electroplating operations and in leather tanning.
- Carcinogenic aromatic amine dyes that may be used in textiles and leather and Pentadecafluorooctanoic acid (PFOA) used in finishing treatments.
- Phthalates, vinyl chloride monomer and Bisphenol A used in plastic manufacture.

## **2.6 UPTAKE OF FURNITURE GPP IN THE EU**

In 2008, the European Commission set up a target that by 2010, 50% of all public tendering procedures should be compliant with core EU GPP criteria for 10 priority product groups, including furniture. According to a CEPS study<sup>11</sup> in 2011-12, involving a survey of 850 public authorities from 26 EU countries, information on 151 furniture contracts was obtained, predominantly (91%) regarding the purchase of indoor furniture. Around 50% of the contracts (41% monetary value) presented contained at least one core GPP criterion but only 14% (25% monetary value) complied with all core criteria. The performance of different countries (who each supplied at least 5 contract examples in the survey) is shown in Figure 3.

---

<sup>10</sup> a) carcinogenic, b) mutagenic, c) toxic for reproduction, d) persistent, bioaccumulative and toxic, e) very persistent and very bioaccumulative, f) other concerns over serious effects to human health or the environment \*as defined in Directive 67/548/EEC

<sup>11</sup> *The uptake of Green Public Procurement in the EU-27*. Centre for European Policy Studies in collaboration with College of Europe. February 2012. (available online at: <http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf>)

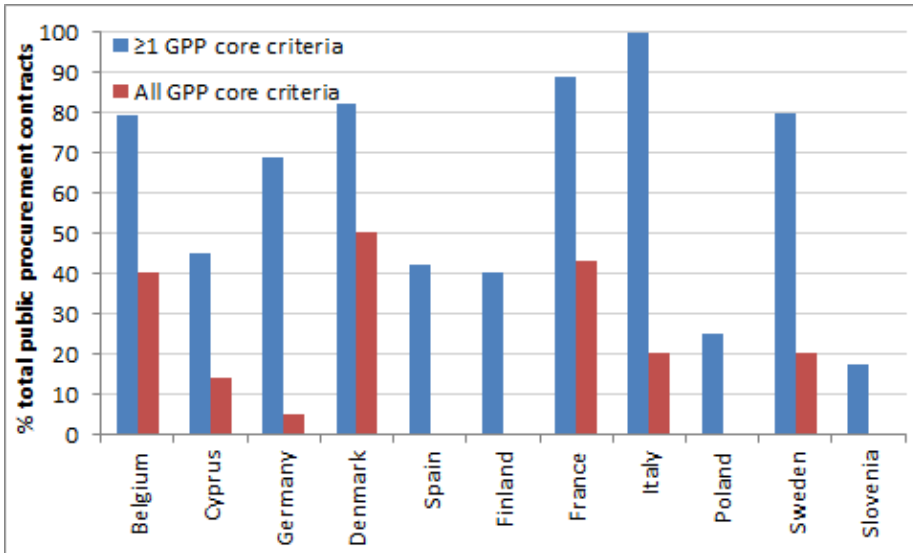


Figure 3. Fraction of furniture public procurement contracts including GPP core criteria.

From the contract details which were supplied, the uptake of core GPP criteria was less than hoped for but still encouraging. However, it should be noted that those authorities who were proactive enough to respond to the survey are also the same authorities more likely to incorporate GPP criteria into their procurement procedures.

## 2.7 CONSUMER INTERESTS FOR FURNITURE

Although not fundamentally essential, it is ideal if GPP criteria reflect issues that are valued by consumers. This will help ensure the uptake of such criteria by procurers in calls for tenders and send the signal to the market. Bearing this in mind, it is worth referring to the results of an Italian consumer survey conducted by FederlegnoArredo shown in Figure 4 below.

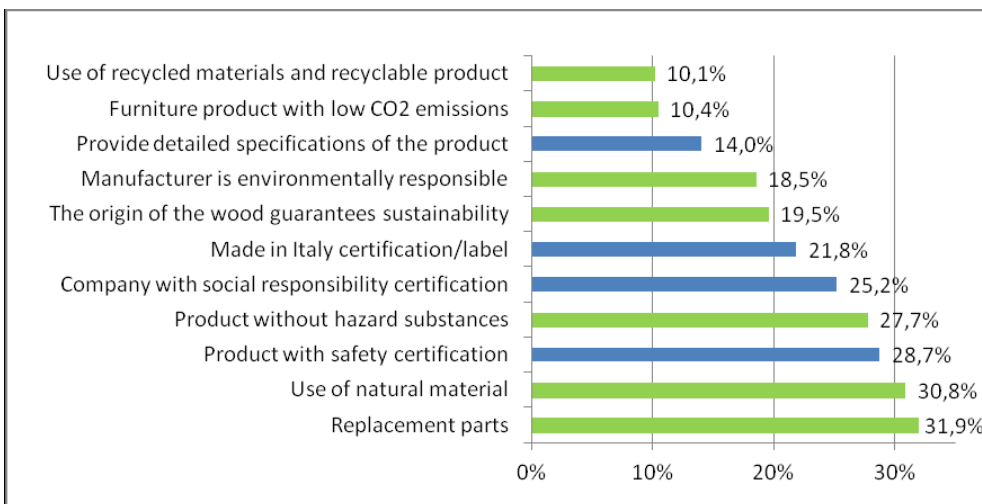


Figure 4. Furniture characteristics that consumers are willing to pay an extra 10% for<sup>12</sup>.

<sup>12</sup> Adapted from the report "Voglio di Piu. Ambiente, Tecnologia e Web 2.0".

The results clearly indicate the importance of spare part availability and by extension, the reparability of the product in order to extend its useful life. Regarding the use of natural materials, it was not clear whether this implies a preference for wood versus metals and plastics or for timber wood against resin bound fibreboard panels. Nonetheless, it is an important issue, as was the origin of the wood material. Concern was also shown about hazardous substances and this subject is covered in considerable degree by proposed Ecolabel criteria for furniture. It should also be introduced to some extent in GPP criteria.

### **3. GUIDANCE FOR THE PROCUREMENT PROCESS**

Two new Public Procurement Directives (2014/24/EC and 2014/25/EC) have been adopted very recently (March 2014), repealing Directives 2014/18/EC and 2014/17 respectively. Member States have two years to transpose the directives into national law. Although the Directive only applies to contracts that exceed a value of **EUR 134,000** for '*central government bodies*' or **EUR 207,000** for '*sub-central contracting authorities*', it contains a series of definitions and guidelines that are useful to promoting the principles of equal treatment, non-discrimination, mutual recognition, proportionality and transparency in the procurement process.

It is expected that most furniture contracts will be well below the lower EU threshold of EUR 137,000. In the majority of furniture contracts it is foreseen that open procurement processes should be used. Nonetheless, some furniture contracts may require higher degrees of interaction with suppliers in cases such as the leasing of furniture, custom-made furniture purchasing or office renovation works that include furnishings, and a restricted procurement process may be relevant.

#### **3.1. TYPES OF CRITERIA IN GPP**

A series of criteria are specified which procurers may use to better define the products they wish to purchase and be better informed about the environmental performance of the products and, in cases where selection criteria are used, about the company that. The aim of the Green Public Procurement (GPP) initiative is to provide procurers with a solid set of carefully considered environmental criteria that can be used as minimum technical specifications and/or as award criteria in calls for tender. The criteria should be set at such a level that strikes a balance between being strict enough to only allow the more environmentally friendly products/works/services to be considered but not so strict to the point at which competition is severely reduced and/or costs increase significantly. Introducing environmental criteria into calls for tenders sends a strong, but voluntary signal to the market to respond.

##### **3.1.1 Selection criteria**

Selection criteria can be used to exclude certain companies from partaking in the tendering process. The main example of this is the exclusion of companies that have been convicted of breaking the law although it must be emphasised that the principle of proportionality should be considered when deciding if a particular conviction is sufficiently grave to justify exclusion.

Selection criteria can also be used to ensure that only tenderers with a proven technical or professional capacity are permitted to enter into the procurement process. It is unlikely that such criteria would be applicable to furniture procurement contracts except perhaps when the furniture is provided as part of a contract that includes renovation works and possibly custom-made furniture. Such criteria may require potential bidders to demonstrate waste-management systems and quality control procedures used in the furniture production process.



### **3.1.2 Technical Specifications**

Any furniture product offered in bids must meet the minimum technical specifications set by the procurer. The specifications must be clear, easy to understand and most importantly, easy to verify.

With regards to GPP criteria, a given minimum technical specification can be split into two levels: core and comprehensive. The core criteria are less environmentally ambitious but should not entail any significant cost increase in the product and require minimum additional effort to verify whereas comprehensive criteria are more ambitious and could potentially result in a price increase of the final product and may require extra efforts to verify.

With furniture, GPP criteria should focus on the materials used in furniture, certain hazardous substances, the durability of the final product and ease of repair/refurbishment since these are the most important aspects from a life cycle perspective.

### **3.1.3. Award criteria**

Any environmentally related award criteria for furniture, and how such criteria are scored, should be stated clearly at the beginning of the procurement process. These criteria represent a possibility for procurers to ask for suppliers to go beyond minimum specifications but without excluding any bidders from the process.

By limiting the points allocated for award criteria, the procurer can use these criteria as a way of discovering the market capability for meeting such ambitious criteria without the risk of having to pay unacceptably excessive costs.

It is recommended that environmental award criteria should account for at least 10-15% of the total points awarded to a product.

## **3.2. GREEN PUBLIC PROCUREMENT IN THE EU**

Green Public Procurement (GPP) is a voluntary policy instrument within the European Commission's Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan (2008)<sup>13</sup> and the Roadmap for a Resource- Efficient Europe (2011)<sup>14</sup> . It is defined as:

*'...a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured.'*

---

<sup>13</sup> Communication from the commission to the European Parliament, the council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan, 16th July 2008

<sup>14</sup> Communication from the commission to the European Parliament, the council, the European Economic and Social Committee and the Committee of the Regions on the Roadmap to a Resource Efficient Europe, 20th September 2011

Public procurement accounts for approximately 19.9% of the EU Gross Domestic Product (GDP)<sup>15</sup>, for that reason encouraging the use of “green” criteria in public procurement is a very important way to stimulate markets to produce and sell greener products. The aim of Green Public Procurement (GPP) is therefore to harness this considerable spending power in order to shape production and consumption trends and to enlarge markets for environmentally friendly products and services in support of the wider EU agenda of increased growth and competitiveness.

A document<sup>16</sup> regarding the state of affairs of National Action Plans for GPP implementation in most of the 28 EU Member States (last updated in December 2013) is available online.

Since GPP is (with some exceptions) a voluntary policy, Member States are free to adopt, adapt or ignore the criteria set out for the EU to suit their own needs. While EU GPP criteria can inspire national developments, it is a two-way relationship and tried and tested approaches from Member States with successful GPP criteria may in turn influence criteria at the EU level. Some examples of GPP criteria relative to furniture procurement in certain EU Member States is summarised here.

In Denmark<sup>17</sup>, core criteria exist for sustainable certified primary wood / recycled wood contents (70% for timber or 50% for wood based panels). Labelling of plastic parts >50 g is required to facilitate possible End-of-Life recycling and emphasis is placed on the durability and technical performance of the final product. With regards to chemicals, VOC limits of 5 % are set for surface coatings and 10 % for adhesives. Furthermore a host of hazardous substances are restricted from use in surface coatings. Basic requirements for packaging materials are also set. Award criteria are set for tenders that exceed the minimum sustainable wood requirements, for recycled content in any metals and plastics used and for compliance of any textiles or PU/latex foam used with the requirements of the EU Ecolabel criteria for these respective materials.

In Ireland<sup>18</sup>, GPP criteria have been used for furniture that include requiring that all wood be legally sourced and sustainable (FSC, PEFC, CSA, SFI<sup>19</sup> or equivalent) and require that any chipboard comply with E1 formaldehyde emission limits. Restrictions are placed on the use of certain lacquers and the VOC content of adhesives is limited to 10%. A surface finish quality requirement is also stated.

In Germany, GPP criteria are directly linked to existing criteria for Blue Angel products when such criteria exist. The most relevant Blue Angel schemes are:

- RAL UZ 12a (Low-emission and low-pollutant paints and varnishes). Restrictions are placed on hazardous substances, formaldehyde emission and VOC content of coating products (max. 10%). There are 58 licensed companies with 664 approved products.

---

<sup>15</sup> Data for 2009 reported in the EU Annual Growth Survey 2012, COM(2011) 815 final, Brussels, 23.11.2011.

<sup>16</sup> [http://ec.europa.eu/environment/gpp/pdf/national\\_gpp\\_strategies\\_en.pdf](http://ec.europa.eu/environment/gpp/pdf/national_gpp_strategies_en.pdf)

<sup>17</sup> <http://csr-indkob.dk/products/mobler/>

<sup>18</sup> [http://ec.europa.eu/environment/gpp/pdf/news\\_alert/Issue7\\_Example19\\_Ireland\\_Furniture.pdf](http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue7_Example19_Ireland_Furniture.pdf)

<sup>19</sup> CSA – Canadian Standards Association and SFI – Sustainable Forestry Initiative

- RAL UZ 38 (Low-emission furniture and slatted frames made of wood and wood-based materials). At least 50% of wood or 50% of primary raw materials in wood based panel manufacture must be from sustainably managed forests. Formaldehyde emissions from wood-based panels are also restricted to the E1 limits and limits are set for other VOC emissions from final coated products. Halogenated organic biocides or flame retardants are banned. There are 80 licensed companies and a total of 185 products available.
- RAL UZ 117 (Low-emission upholstered furniture) sets restrictions on the use of biocides and dyes/pigments in leather and textile fibres and on VOC emission requirements. There are 9 licensed companies with a total of 39 products available.
- RAL UZ 148 (Low emission upholstery leathers) goes into further detail about leather, setting some limits for performance of tannery wastewater treatment plants and the use of chemical preservatives during storage and transport of raw hides/ semi-finished leather products. There are 4 licensed companies with a total of 10 products available.

In the Basque region of Spain, basic level GPP criteria for office furniture require that products must have a minimum guarantee of 3 years, be reusable or recyclable and that plastic parts >50g be labelled for polymer type. Office chairs must meet ergonomic requirements and tables/desks have to meet relevant durability standards. For the Excellent level criteria, the minimum guarantee is extended to 5 years, wood in tables must contain at least 20% recycled or sustainably certified wood and minimum recycled contents of 20% are set for steel and aluminium. Restrictions are placed on surface coatings and hazardous substances/mixtures and any upholstery should comply with requirements for a recognised Eco-label scheme (such as Oeko-Tex 100, Nordic Swan, Blue Angel or EU Flower). Possible award criteria apply to products that exceed the minimum guarantee and minimum recycled contents or sustainable wood contents.

In the UK<sup>20</sup>, criteria are split into mandatory and best practice criteria. From April 2015, only sustainably produced or recycled timber will be permitted. Plastic furniture parts >50g must be marked to identify the polymer type and a series of restrictions are placed on hazardous substances in surface coating products. The VOC content of adhesives must not exceed 10% by weight and formaldehyde emissions from wood-based panels must comply with E1 emission limits. Furniture must meet any relevant UK technical and quality standards and be easy to repair and designed for disassembly, either for reuse or recycling. All packaging materials must be reusable or easily separated into recyclable fractions. Award criteria in the UK must account for at least 10-15% of the points awarded in a tender and include criteria for recycled, remanufactured or reused content for metal, plastic, wood-based or packaging materials, EU Ecolabel compliant padding materials and recycled or organic textile fibres.

A number of online resources, including a Commission GPP news alert, GPP examples and a helpdesk are available which can help procurers better understand how to approach GPP<sup>212223</sup>.

---

<sup>20</sup> <http://sd.defra.gov.uk/advice/public/buying/products/furniture/standards/>

<sup>21</sup> The "Buying green handbook" available at: [http://ec.europa.eu/environment/gpp/buying\\_handbook\\_en.htm](http://ec.europa.eu/environment/gpp/buying_handbook_en.htm)

<sup>22</sup> The European Commission's GPP website: [http://ec.europa.eu/environment/gpp/index\\_en.htm](http://ec.europa.eu/environment/gpp/index_en.htm)

<sup>23</sup> The Baltic GPP website: [www.balticgpp.eu](http://www.balticgpp.eu)

## 4. PROPOSED EU GPP CRITERIA AND RATIONALE

A number of environmentally related technical specifications and award criteria can be incorporated into the green public procurement process. Criteria have two levels, core and comprehensive and are listed in this section along with how they should be verified.

### 4.1 MINIMUM TECHNICAL SPECIFICATIONS

#### 4.1.1 CRITERION 1 – LEGAL ORIGIN AND TRACEABILITY OF WOOD AND WOOD-BASED MATERIALS

**Core criterion:** All wood and wood-based materials (excluding packaging and recycled wood) must be harvested in accordance with the applicable legislation in the country of harvest. “Applicable legislation” means the legislation in force in the country of harvest covering the following matters:

- rights to harvest timber within legally gazetted boundaries;
- payments for harvest rights and timber including duties related to timber harvesting;
- timber harvesting, including environmental and forest legislation including forest management and biodiversity conservation, where directly related to timber harvesting;
- third parties’ legal rights concerning use and tenure that are affected by timber harvesting; and
- trade and customs, in so far as the forest sector is concerned.

**Comprehensive criterion:** same

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EC ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof accepted are: a due diligence exercise, a valid FLEGT license or a CITES permit.

**Rationale:** The EU Timber Regulation (No. 995/2010) obliges operators to comply but does not oblige final manufacturers to maintain chain of custody certificates. Thus it is possible that although the wood was legally harvested, the end furniture producer may not be aware of the origin of the wood. By obliging furniture manufacturers to ask operators to show their due diligence, this will hopefully encourage operators to redouble their efforts while also facilitating furniture companies, and thus consumers, a better understanding of where their timber comes from.

#### 4.1.2 CRITERION 2 – SUSTAINABLE WOOD

**Core criterion:** At least **50 %** of wood in the final furniture product (excluding packaging) shall be covered by valid sustainable forest management certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent. Recycled wood, following the definition of recycled material as given in ISO 14021 (see Appendix I), shall also be considered as sustainably

sourced materials. *(to be decided on how to define sustainability, possibly by mentioning the existing national schemes as examples)*

**Comprehensive criterion:** At least 70 % of wood in the final furniture product (excluding packaging) shall be covered by valid sustainable forest management certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent. Recycled wood, following the definition of recycled as given in ISO 14021 (see Appendix I), shall also be considered as sustainably sourced materials. *(to be decided on how to define sustainability, possibly by mentioning the existing national schemes as examples)*

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EC ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Wood bearing the EU Ecolabel or being certificates by FSC, PEFC are deemed to comply with this requirement. Equivalent means of proof must be accepted *(to be detailed further)*. With regards to recycled wood, the geographical origin and nature (pre- or post-consumer) shall be declared and a chain of custody certificate presented.

**Rationale:** Although 100 % certified sustainable wood is desirable, it could be difficult to maintain due to possible fluctuations in market demand, particularly for smaller companies that are accustomed to working with a limited number of suppliers. Instead, it is considered more appropriate to require a minimum of 50 or 70 % sustainable wood and use award criteria to reward furniture producers that can exceed these requirements. Although certified sustainable wood is widely available, extra effort from furniture manufacturers may be required to build relationships with alternative suppliers. Sustainable certified wood may carry a modest price premium due to both the added cost of wood producers needing to pay for independent audits and the general willingness for customers to pay a premium for final products made with certified sustainable wood. So far there is no clear tendency on whether or not certified sustainable wood is more expensive than non-certified wood. Sustainable certified forest acreages are increasing every year and the market is still coming to scale. To allow some flexibility to producers, certified sustainable forestry wood and recycled wood are grouped together under the term "sustainable wood" for the purposes of this criterion. Wood-based panels represent an obvious destination for recycled wood fibres with clear environmental benefits. One study calculated a potential reduction of 0.52 tonnes of CO<sub>2</sub> eq. per ton of panels produced with recycled fibres<sup>24</sup>.

#### **4.1.3 CRITERION 3 – FORMALDEHYDE EMISSIONS FROM WOOD-BASED PANELS**

**Core criterion:** Where wood-based panels that contain formaldehyde-based resins are used, formaldehyde emissions from panels prior to machining or coating shall be lower than the threshold value allowing them to be classified as E1 as per EN 13986 annex B or equivalent methods.

**Comprehensive criterion:** Same

---

<sup>24</sup> Mitchell, A., Stevens, G. Life Cycle Assessment of Closed Loop MDF Recycling: Microrelease Trial 2009

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Otherwise, the tenderer shall provide a third party certification from an accredited laboratory stating that the wood-based materials and production process is consistent with E1 requirements as defined in Annex B of EN 13986. Equivalent methods must show a proven correlation between the EN 717-1 chamber test.

**Rationale:** Formaldehyde is recognised by the World Health Organisation (WHO) as a suspect carcinogen but the use of formaldehyde-based resin formulations remains the most common method of producing wood-based panels. Emissions from unfaced panels and panels that have not yet been machined present risks to factory workers during assembly and to the environment at the end of the product life. A limit on formaldehyde emissions from unfinished panels encourages producers to only use the minimum amount of resin required to give the product the necessary technical properties and to favour optimally designed resin formulations that result in the lowest residual free-formaldehyde contents after curing.

The European industry (via the European Panel Federation-EPF) has developed the E1 standard. A framework for free-formaldehyde emission testing of wood-based panels is given in EN 13986 (Annex B). Each of these methods provides test results with different numerical values but which can be translated into the E1 standard value. Although the Nordic Ecolabel and French NF 217 standard criteria opt for limits based around 50 % of E1 values, the Blue Angel criteria in RAL UZ 38 simply require compliance with the E1 limit. Based on feedback received during the 1<sup>st</sup> AHWG meeting, it was decided to opt for the less stringent requirement of E1 and not to compromise quality and potential market availability of wood-based panels.

#### **4.1.4 CRITERION 4 – PLASTIC PARTS**

**Core criterion:** Plastic parts with a weight  $\geq 50$  g shall be visibly marked in accordance with the requirements of EN ISO 11469 so that materials can be identified to ensure they are able to be recycled, recovered or disposed of in the correct manner at end-of-life. If a component should be categorised under "other polymer type" designation, the applicant will provide data sheets from the supplier that state the nature of the polymer used in any individual plastic parts. Parts greater than 50g in weight that would be adversely affected by a marking, such as for consumer acceptance and aesthetic reasons, may place the necessary recycling information in the user manual or similar literature.

**Comprehensive criterion:** Same.

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EC ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply with the criteria. Alternatively for the core criterion, the bidder shall provide documented and photographic evidence demonstrating the markings on all plastic components  $\geq 50$  g in weight. If a component should be categorized under "other polymer type" designation, the applicant will provide data sheets from the supplier that state the nature of the polymer used in any individual plastic parts. The nature of the polymer can also be verified by testing samples directly from the final product if deemed necessary.

**Rationale:** The marking of plastic parts as per EN ISO 11469 is only a voluntary requirement but has been widely adopted in national level GPP criteria. The comprehensive level requirement matches the proposal in the EU Ecolabel criteria and basically requires furniture suppliers to only use plastic products that can feasibly be recycled and to explicitly inform the customer of how this can be achieved. Plastic recycling rates are low and generally limited to post-consumer bottles. One of the problems is the huge variety of potentially incompatible additives that can be used in different plastics, even if they are of the same polymer type.

#### **4.1.5 CRITERION 5 – METAL PARTS**

**Core criterion:** none.

**Comprehensive criterion:** The tenderer shall describe the type of metal used in any particular furniture component (i.e. Aluminium, Steel, Copper etc.). Where relevant, the grade of the alloy and the main metals (>3 % of total alloy weight) included in the alloy formulation shall be stated. Nickel plated stainless steel shall not be used in any furniture components that may come into direct skin contact with end users.

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply with core and comprehensive criteria. Otherwise, the tenderer shall describe the metals used in the furniture product, with declarations from downstream suppliers if necessary to clarify the grade of alloy used. In case of doubt, the final product can be tested to determine its elemental composition and thus metal/alloy grade by non-destructive analysis using a suitable handheld X-Ray Fluorescence instrument or by wet chemical methods of metal samples by dissolving the metal in acid and analyzing the solution for elemental composition by Inductively Coupled Plasma- or Atomic Absorption-Optical Emission Spectroscopy.

**Rationale:** Unlike plastics, the recycling rates for metals are very high. By informing the consumer of the metal types, they can be better informed of the potential value of the scrap metal components. The restriction of Nickel-plated stainless steel in metal components that can come into direct skin contact with end users is due to experimental data showing that the release rates of Nickel from this type of steel is sufficient to cause skin sensitization in patients with proven Nickel sensitivity.

#### **4.1.6 CRITERION 6 – SURFACE COATING OF WOOD, PLASTIC AND/OR METAL PARTS**

**Core criterion:** Products used for surface coating shall not contain any of the following hazardous substances according to Regulation No. 1272/2008 (H statements) or Directive 1999/45/EC (equivalent R phrases) in concentrations greater than 0.1%:

- Carcinogenic: H351(R40), H350(R45) or H350i(R49).
- Harmful to the reproductive system: H360F(R60), H360D(R61), H360FD(R60-61), H360Fd(R60-63), H360Df(R61-62), H361f(R62), H361d(R63) or H361fd(R62-63)
- Mutagenic: H340(R46) or, H341(R68)
- Toxic: H300(R28), H301(R25), H310(R27), H311(R24), H330(R23;R26) or H331(R23)

- Hazardous to the aquatic environment: H400(R50), H410(R50-53), H411(R51-53), H412(R52-53) or H413(R53).
- Cause heritable genetic damage: H340(R46).
- Causes damage to organs through prolonged or repeated exposure: H372 (R48/25; R48/24; R48/23).
- May cause damage to organs through prolonged or repeated exposure: H373 (R48/20; R48/21; R48/22).

**Comprehensive criterion**: same

**Verification**: Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Otherwise, the tenderer shall provide any relevant Safety Data Sheets (SDS) that state the hazard statements and/or risk phrases of all substances that impart hazardous properties to the coating compounds at concentrations greater than 0.1 % w/w.

**Rationale**: The limits for substances in part with the above listed H statements are set at 0.1% because this is the same limit above which chemical suppliers are obliged to declare the presence of any hazardous substances with the above listed H statements present in their product mixtures in accompanying SDS documentation as per Title IV and Annex II of REACH Regulation No. 1907/2006. The procurer simply has to compare the list of H-statements and concentrations of the SDS with those listed above. Compared to the previous GPP criteria for coating compounds, the equivalent new hazard statements that correspond to existing risk phrases have been added as per the changes introduced via Regulation No. 1272/2008. Although Volatile Organic Compounds (VOC's) in coatings are of concern, the limit of 5% VOC content on coating compounds has been removed since this is not explicitly banned in the proposed EU Ecolabel criteria and concerns were raised over furniture durability due to poor quality finishes with low VOC content coatings. Stakeholders should be further consulted to ensure that the above criteria also permit the use of certain UV curing lacquers since these treatments offer VOC free coatings on the final product.

#### **4.1.7 CRITERION 7 - ADHESIVES AND GLUES**

**Core criterion**: The VOC content of adhesives used in the assembly of furniture shall not exceed 10% of the total weight of the adhesive formulation.

**Comprehensive criterion**: The VOC content of adhesives used in the assembly of furniture shall not exceed 5% of the total weight of the adhesive formulation.

**Verification**: Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply with core and comprehensive criteria. Otherwise, the bidder must present a list with all adhesives used in the assembly of furniture and SDS where the VOC content is displayed demonstrating compliance with the above criteria.

**Rationale**: The VOC content of adhesives is a concern and a number of low VOC content (water-based) or VOC free (hot melt) adhesives are available on the market. According to a market study published by Grand View Research Inc., the market share of water-based (low to zero VOC



content) adhesives is already 46% on a volume basis and is expected to grow further at the expense of organic solvent based (high VOC content) adhesives, principally due to tighter environmental regulations in the EU and US<sup>25</sup>. The above criteria further encourage a shift toward low-zero VOC content adhesives.

#### **4.1.8 CRITERION 8 - PACKAGING MATERIALS**

**Core criterion:** Packaging must consist of readily recyclable material, and/or materials taken from renewable resources (renewable being defined as biomass-based materials or recycled materials), or be a multi-use system. All packaging materials shall be easily separable by hand into recyclable parts consisting of one material (e.g. cardboard, paper, plastic etc.). Plastic packaging shall be labelled in accordance with ISO 11469 except where it would be adversely affected by a marking, such as for consumer acceptance and aesthetic reasons. In such cases the necessary recycling information in the user manual or similar literature.

**Comprehensive criterion:** In addition to the core criterion, the overall average recycled content of the packaging material(s) on a weight basis must be at least 50%.

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply with core and comprehensive criteria. Otherwise, the tenderer shall describe the product packaging materials used and provide a declaration of compliance with the criteria according to EN 13429 for reusability or EN 13430 for recyclability.

For comprehensive criteria, the tenderer shall state the total weight of packaging materials used and the % recycled content of each of the different packaging materials shall be provided in declarations from the relevant packaging material suppliers. The overall recycled content of the packaging materials by weight shall be at least 50%.

**Rationale:** In some cases, especially with small furniture, the weight of the packaging can represent an important percentage of the total weight of the packed furniture (7-13 % on average according to some EPDs). Regarding materials, the main component of packaging is usually corrugated cardboard, but packaging can also contain plastic, paper, or metal pieces. The use of single-use packaging in the furniture industry is common practice. The main environmental problems related to packaging come from the consumption of raw materials and packaging waste, hence the benefit of using the recyclable, reusable and/or recycled materials.

#### **4.1.9 CRITERION 9 – DURABILITY, FITNESS FOR USE, REPARABILITY AND ERGONOMICS**

**Core criterion:**

a) Furniture must meet any relevant national or international quality standards or equivalent regarding serviceability (e.g. safety, abrasion resistance, tensile strength, light fastness, rub fastness, deformation by compression, ergonomics etc.).

---

<sup>25</sup> <http://www.prweb.com/releases/Adhesives-and-Sealants/Market/prweb11632453.htm>

b) Where the furniture consists of more than one component, it must be assembled in such a manner to facilitate manual disassembly into constituent components to allow either repair or replacement of damaged components or to facilitate recycling of components made of different materials.

c) The warranty of the furniture product shall cover a period of at least 3 years from the date of purchase.

d) The manufacturer shall guarantee the availability of spare components and parts for a period of at least 3 years from the date of purchase. If the spare parts are provided for free, this shall be expressly stated. Otherwise prices for the spare parts shall be clearly stated and shall be related to the value of the spare part in relation to the whole piece of furniture.

**Comprehensive criterion:** In addition to the core requirements, the furniture manufacturer shall offer a longer warranty period of at least 5 years from the date of purchase and guarantee the availability of spare parts for a longer period (at least 5 years) from the date of purchase.

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply with requirements a)-d). Otherwise, verification shall be as follows:

a) The tenderer must provide certification stating compliance with any technical standards relevant to the furniture product. As a guide, a list of technical standards considered by the CEN Technical Committee 207 (Furniture) can be consulted in Appendix II of the technical report that accompanies these criteria.

b) Disassembly instructions shall be provided that clearly demonstrate how the furniture can be manually dismantled, for the purposes of spare part replacement, repair or End-of-Life disposal.

c) A written guarantee clearly stating the warranty period of at least 3 years (5 years for comprehensive criterion) from the date of purchase shall be provided along with relevant contact details.

d) A list of spare parts, their prices and any relevant codes, that the customer can use to obtain any necessary spare parts during at least the next 3 years (5 years for comprehensive criterion). The spare part price, if any, shall be proportional to its specific contribution to the furniture product cost. If no email address or website with email contact function is included, the phone number shall be in the same country as where the product was placed on the market.

**Rationale:** In many cases it is necessary for furniture products to comply with certain standards to permit their sale in the EU. However, a number of other standards will directly influence the durability of the furniture product. Since most of the environmental impacts are associated with the materials used in manufacture, by doubling the lifetime of a furniture product, the effective environmental impact can be halved. This is why it is important that spare parts be made available to the consumer has the option to repair the furniture should any individual component break.

## **4.2 AWARD CRITERIA**

The procurer is recommended to award points not only to the lowest price but also to environmentally related award criteria that may improve the long term costs or environmental impacts from a life cycle perspective. At least 10-15 % of the points should be allocated to such award criteria. The award criteria may be simply extensions beyond core or comprehensive requirements or consist of separate criteria not covered by technical specifications.

### **4.2.1. CRITERION 1 – SUSTAINABLE WOOD**

**Core award criterion:** Points shall be awarded for products that exceed the minimum 50 % requirement for sustainable wood shall be covered by valid sustainable forest management certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent. Recycled wood, following the definition of recycled material as given in ISO 14021, shall also be considered as sustainably sourced materials.

**Comprehensive award criterion:** Points shall be awarded for products that exceed the minimum 70 % requirement for sustainable wood shall be covered by valid sustainable forest management certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent. Recycled wood, following the definition of recycled material as given in ISO 14021, shall also be considered as sustainably sourced materials.

**Verification:** The tenderer shall provide valid, independently certified chain of custody certificates and demonstrate that wood has been grown according to Sustainable Forestry Management principles. Certificates from FSC, PEFC or equivalent schemes shall be accepted as independent third party certification. With regards to recycled wood, the geographical origin and nature (pre- or post-consumer) shall be declared and a chain of custody certificate presented.

**Rationale:** This award criterion rewards those suppliers who take the extra effort to secure recycled wood or sustainable wood from 3<sup>rd</sup> party certified suppliers going beyond the minimum technical specifications.

### **4.2.2 CRITERION 2 - RECYCLED CONTENT OF PLASTICS**

**Core award criterion:** none.

**Comprehensive award criterion:** Points will be awarded where furniture products contain at least 10 % by weight of hard plastic components (excluding packaging).

**Verification:** The tenderer shall specify the overall plastic content (w/w) in the furniture product. For recycled plastic content, the tenderer shall provide a declaration from the manufacturer or plastic supplier stating the proportion of recycled content and providing 3<sup>rd</sup> party verified chain of custody certificates or supplier declarations that lead to the source of the recycled plastic and state that it meets the definition for recycled material stated in ISO 14021.

**Rationale:** The requirement for recycled plastic content when plastics constitute more than 10 % of the product mass should help send a signal to the market for using recycled plastic in furniture. Recycled plastic has a substantially lower embodied energy than virgin plastic and offsets the

consumption of non-renewable crude oil. There are a number examples of products available on the market today with recycled plastic contents stated in environmental product declarations (EPDs). In particular with outdoor furniture, there are examples of plastic furniture (chairs, tables and benches) with almost a 100 % recycled plastic content.

### 4.2.3 CRITERION 3 - PADDING MATERIALS

**Core award criterion:** none.

**Comprehensive award criterion:** Any latex foam or polyurethane (PU) foam shall comply with the requirements specifically for PU foam or Latex foam as set out in the EU Ecolabel criteria (Decision xxx/xxx/EU for furniture).

**Verification:** Products holding the EU Ecolabel for furniture (Commission Decision /.../EU ) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to fully comply with the award criteria. Otherwise, certification of PU or Latex foam under equivalent industry standard schemes shall also be accepted. In other cases the tenderer shall provide all required test certificates and documentation in accordance with the criteria set out for latex foam or PU foam. For information, these specific criteria and verification methods are detailed in Decision xxx/xxx/EU. For information, these specific criteria and verification methods are detailed in Appendices III and IV.

**Rationale:** Latex and PU foams represent the dominant type of padding material used in furniture, accounting for approximately 80-90% of the market. The criteria are centred on restricted substance lists used in the industry and on VOC emissions from the foam material.

### 4.2.4 CRITERION 4 – TEXTILE COVERING FABRICS

**Core award criterion:** none.

**Comprehensive award criterion:** Points may be awarded for textiles that can be shown to be free of carcinogenic amine dye residues listed in Table 1 and comply with the limits for extractable formaldehyde and extractable heavy metals as listed in Table 2.

**Table 1. Limits for extractable substances in furniture textile fabrics**

Compound (limit)	
Formaldehyde (75 mg/kg)	Cobalt (1.0* or 4.0 mg/kg)
Antimony (30 mg/kg)	Copper (25* or 50 mg/kg)
Arsenic (0.2* or 1.0 mg/kg)	Lead (0.2* or 1.0 mg/kg)
Cadmium (0.1 mg/kg)	Nickel (1.0* or 4.0** mg/kg)
Chromium (1.0 or 2.0** mg/kg)	Mercury (0.02 mg/kg)

\* applies to textiles used in furniture designed for small children (<36 months of age)

\*\*the highest limit applies to normal textiles or cases where metal complex dyes have been used.

**Table 2. Carcinogenic aromatic amine dyes to be tested for by EN 14362-1 and -3.**

Aryl amine	CAS Number	Aryl amine	CAS Number
4-aminodiphenyl	92-67-1	4,4'-oxydianiline	101-80-4
Benzidine	92-87-5	4,4'-thiodianiline	139-65-1
4-chloro-o-toluidine	95-69-2	o-toluidine	95-53-4
2-naphtylamine	91-59-8	2,4-diaminotoluene	95-80-7
o-amino-azotoluene	97-56-3	2,4,5-trimethylaniline	137-17-7
2-amino-4-nitrotoluene	99-55-8	4-aminoazobenzene	60-09-3
4-chloroaniline	106-47-8	o-anisidine	90-04-0
2,4-diaminoanisol	615-05-4	2,4-Xylidine	95-68-1
4,4'-diaminodiphenylmethane	101-77-9	2,6-Xylidine	87-62-7
3,3'-dichlorobenzidine	91-94-1	p-cresidine	120-71-8
3,3'-dimethoxybenzidine	119-90-4	3,3'-dimethylbenzidine	119-93-7
3,3'-dimethyl-4,4'-diaminodiphenylmethane	838-88-0	4,4'-methylene-bis-(2-chloro-aniline)	101-14-4

**Verification:** The tenderer shall provide results from tests where 5 g of material is immersed in 100 g of an artificial sweat solution as defined in EN ISO 105-E04:2013 in a water bath at 40 °C for 1 hour. The solution is then filtered and analysed by ICP-OES or ICP-MS for the heavy metals listed in Table 1 below. In the case of formaldehyde, testing according to EN ISO 14184-1 shall only be required for textiles where an “easy care finish” has been applied. Otherwise the formaldehyde test is not required and shall be replaced by a declaration of non-use of such substances. Textiles that carry the EU Flower Ecolabel (Decision xxx/xxxx/EU) shall be deemed to be compliant with the final product criteria.

**Rationale:** The environmental impacts of cotton manufacture are strongly related to the use of pesticides during plant growth while the impacts of synthetic fibres are related to the energy footprint and associated crude oil consumption – hence the importance of recycled content for synthetic fibres. Comprehensive requirements for hazardous substances and metals in final textile products align with criteria other type I Ecolabels. The seemingly high permissible limit for carcinogenic aryl amines that should not be present at all is due to the fact that false positives (where other substances can wrongly be detected as the substance of interest) can be found during this test, generally up to levels of 20-30ppm.

## 5 COST CONSIDERATIONS

With furniture, the cost of a product over its lifetime (life-cycle cost) is dominated by the purchase price and the durability/reparability of the furniture, which will directly influence its useful lifetime. Ultimately the purchase cost of furniture, like many products, is highly subjective and will depend on factors such as brand names, discounts for bulk buying and with international suppliers, even exchange rates for different currencies. The EU study "Costs and Benefits of Green Public Procurement"<sup>26</sup> compared the cost of green certified mobile cabinets, storage units and office chairs in 4 different EU countries in 2007 and found that in 10 of the 12 cases, the green products commanded a market price of 13% or more compared to conventional alternatives. However, since 2007 a much wider range of green furniture products have entered the market and such a price disparity between green and conventional products may not be so large as competition amongst green products increases.

A comparison of the anticipated financial costs and environmental impacts of selected furniture GPP criteria is summarised below:

**Table 3. Considerations regarding the cost and environmental benefits of certain proposed GPP criteria**

Criterion	Influence on financial cost	Influence on environmental benefit
Sustainable wood	To produce certified sustainable wood involves extra costs to the wood producer from paying for auditors to visit the site and carry out an initial assessment and to make annual visits. These costs become less significant as the forest size for a particular licence becomes larger. In the US, anecdotal evidence from suppliers suggests that sustainable certified wood could fetch prices that are 5-20% higher than non-certified wood. However, these are only limited examples and as the quantity of FSC certified forest is continually increasing, the availability of sustainable certified wood does too and so there is competition between FSC wood suppliers that may be keeping any price premiums low. A clearer picture will emerge once the market comes to scale <sup>27</sup> . A report by CBI Ministry of Foreign Affairs stated that a general price premium of 10-30% existed for FSC-certified wood imported to the Netherlands <sup>28</sup> . The above factors reflect costs to the furniture manufacturer. How much the manufacturer will pass these costs on to the consumer is uncertain and will depend on their marketing strategy. Also the effect on price will be related to the overall contribution of wood raw	Sustainable forest management brings about a series of myriad environmental benefits including reduced adverse impact on ecosystems, reduced risk of soil erosion and reduced carbon emissions.

<sup>26</sup> Costs and Benefits of Green Public Procurement in Europe. Part 1: Comparison of the Life Cycle Costs of Green and Non-green products. Germany, 2007.

<sup>27</sup> FSC US Fact Sheet, accessed online at: <http://us.fsc.org/download.costs-and-benefits-of-forest-certification.198.htm>

<sup>28</sup> CBI report, accessed online at: [http://www.cbi.eu/system/files/marketintel/FSC-certified\\_tropical\\_timber\\_garden\\_furniture\\_in\\_The\\_Netherlands.pdf](http://www.cbi.eu/system/files/marketintel/FSC-certified_tropical_timber_garden_furniture_in_The_Netherlands.pdf)

	materials to the total furniture price, which may vary widely.	
Low VOC content adhesives	Low VOC content adhesives include "water-based" and "hot-melt" type formulations. Compared to organic solvent-based formulations, it has been stated that water-based adhesives are 15-20% cheaper to purchase <sup>29</sup> . However, where factory production times are important, it must be noted that water-based adhesives require 3 times more heat to dry fully and generally do not provide the same performance as organic solvent-based adhesives in terms of sheer or peel strength. The performance of hot melt adhesives is generally very high but requires specific techniques for their use.	There are obvious environmental and health benefits associated with lower VOC emissions both for workers and end users. However, if a low VOC content adhesive does not perform as well as an organic solvent-based adhesive and results in a reduction of product lifetime, then this would lead to a net negative environmental impact. The risk of such a scenario is minimised by requiring that furniture products meet any relevant technical standards and that the product should be easy to disassemble manually into component parts – which generally favours screws and fittings rather than adhesives.
Recycled Plastics	The most successfully recycled post-consumer plastics tend to be HDPE and PET used in containers. According to a report by Plastic ZERO <sup>30</sup> , the market price for recycled plastics closely follows the prices for virgin plastics which in turn is influenced by crude oil prices. It is debateable therefore, whether or not the price of recycled plastic is truly independent of crude oil prices., Regardless, due to significant energy and raw material savings compared to plastic manufactured from virgin materials, the cost of recycled plastic should in theory, and at least where efficient recycling facilities are in place be significantly lower than that of virgin plastic. However, other factors such as economies of scale and collection and sorting costs may significantly affect the price of recycled plastic.	The production of PET or HDPE by recycling consumes around significantly less energy (up to 70-90% less) <sup>31</sup> than production from virgin raw materials.
Recycled Aluminium content	Aluminium is an energy and raw material intensive product. The production of virgin aluminium involves converting bauxite ore to alumina, then alumina to aluminium. Compared to production from virgin raw materials, recycling of aluminium is widely regarded as the most advantageous, both in environmental and economic terms, of all materials. The relatively high value (currently €650-900/tonne scrap) and demand for scrap aluminium also confers an economic incentive to end consumers to recycle aluminium furniture/components. On average in Europe, the production of recycled aluminium represented slightly more than half of total aluminium production.	The energy required to produce a certain weight of primary aluminium (the embodied energy) is around 160 GJ/t. However, aluminium produced via recycling routes has an embodied energy of around 8-16 GJ/t, some 90-95% less. The reduced energy requirements translate into not only reduced costs but also reduced emissions and waste production. To produce 1 tonne of primary aluminium requires 4000-5000 kg of bauxite and the main solid waste material is red mud slurry, a highly caustic waste that is typically stored in lined open lagoons.
Recycled	Steel is produced from iron ore, coke, limestone and specific alloying metals depending on	The embodied energy of virgin steel is undoubtedly higher than that of

<sup>29</sup> Special Chem Editorial available online at: <http://www.specialchem4adhesives.com/home/editorial.aspx?id=232>

<sup>30</sup> Plastic ZERO report accessed online at: [http://www.plastic-zero.com/media/30825/action\\_4\\_1\\_market\\_for\\_recycled\\_polymers\\_final\\_report.pdf](http://www.plastic-zero.com/media/30825/action_4_1_market_for_recycled_polymers_final_report.pdf)

Steel content	<p>the grade of steel. Primary steel production involves the costs of mining iron ore, producing pig iron at temperatures up to 2000°C in a blast furnace and then combining the pig iron with alloying elements in a second furnace operation. Different production process routes for steel are the Basic Oxygen Furnace (which can accept up to 25% recycled steel) and the Electric Arc Furnace (which can accept up to 100% recycled steel). Like aluminium, the recycling market for steel is well developed and there is an clear economic incentive for end users to recycle steel (currently €700-1000/tonne scrap). Production from recycled steel in Europe accounted for slightly more than half of European production. The energy savings of recycled steel compared to virgin steel are significant but not as large as those associated with aluminium.</p>	<p>recycled steel because it is not necessary to convert iron ore into pig iron as a preliminary step in a blast furnace. For every 1 tonne of steel that is recycled, the consumption of 1400kg of iron ore, 400kg of coal and 55kg of limestone is avoided.</p>
Durability	<p>The durability of products inherently involves better quality materials and more stringent quality control processes and/or attention to detail during furniture manufacture. These factors will increase the financial cost of production and the final product cost. When considering the life-cycle cost, product durability is a fundamental consideration since once a furniture product is broken, if it cannot be repaired easily, then it is likely to be discarded and a new product will need to be purchased. Thus, there is great potential for monetary savings for public authorities.</p>	<p>If a piece of furniture can be used over a longer time, this saves resources for production of new ones. In specific cases, improving the durability of a product may entail adverse environmental impacts. For example using higher VOC content surface coatings on wooden tables for improved scratch resistance or using wood preservatives in outdoor wooden furniture or using thicker plastic components that are less likely to snap under heavy pressure. However, these increased impacts can be offset against improved furniture lifetime.</p>
Reparability	<p>In a similar manner to durability, reparability is an important consideration for life cycle costing and includes a great potential for monetary savings. Reparability becomes more influential as the purchase cost of the furniture product increases. Except for where spare parts are cheap and the repairs can be done by the end consumer relatively easily, there is little point in repairing cheap furniture items since the cost of repair may be similar to or even exceed the cost of buying a new product in some cases.</p>	<p>If a piece of furniture can be repaired and thus used over a longer time, this saves resources for production of new ones. Where repairs are carried out, the avoided environmental impacts of buying a new piece of furniture can be weighed against the impacts associated with the production of any spare parts or substances used.</p>



## Appendix I: ISO 14021 definition of recycled material

ISO 14021 provides the following definition relating to recycled material and recycled content for the purposes of environmental labels and declarations / self-declared environmental claims (Type II environmental labeling).

- "Recycled content is defined as the proportion, by mass, of post-consumer and pre-consumer recycled material in a product."
- "Post-consumer recycled content is, within a product, the proportion of material recycled from an earlier product which has reached its end of life and/or of industrial waste generated after the earlier product has reached its end-users and has been discarded."
- "Pre-consumer recycled content is the percentage of material in a product that is recycled from the manufacturing waste stream. In the case of glass products, this waste originates from the processing or re-processing of glass that takes place before the final product reaches the consumer market. However, only material that would otherwise have entered the solid waste stream, but is in fact being reused qualifies as recycled content. Pre-consumer recycled content therefore excludes scrap material that can be reclaimed within the same process that generated it. "

## Appendix II: Furniture standards listed in CEN Committee (CEN/TC 207)

### A.1.1. Upholstered furniture

- EN 1021-1:2006 Furniture - Assessment of the ignitability of upholstered furniture - Part 1: Ignition source smoldering cigarette
- EN 1021-2:2006 Furniture - Assessment of the ignitability of upholstered furniture - Part 2: Ignition source match flame equivalent

### A.1.2. Office furniture

- EN 527-1:2011 Office furniture - Work tables and desks - Part 1: Dimensions
- EN 527-2:2002 Office furniture - Work tables and desks - Part 2: Mechanical safety requirements
- EN 527-3:2003 Office furniture - Work tables and desks - Part 3: Methods of test for the determination of the stability and the mechanical strength of the structure
- EN 1023-1:1996 Office furniture - Screens - Part 1: Dimensions
- EN 1023-2:2000 Office furniture - Screens - Part 2: Mechanical safety requirements
- EN 1023-3:2000 Office furniture - Screens - Part 3: Test methods
- EN 1335-1:2000 Office furniture - Office work chair - Part 1: Dimensions - Determination of dimensions
- EN 1335-1:2000/AC:2002 Office furniture - Office work chair - Part 1: Dimensions - Determination of dimensions
- EN 1335-2:2009 Office furniture - Office work chair - Part 2: Safety requirements
- EN 1335-3:2009 Office furniture - Office work chair - Part 3: Test methods
- EN 1335-3:2009/AC:2009 Office furniture - Office work chair - Part 3: Test methods
- CEN/TR 1335-4:2009 Office furniture - Office work chair - Part 4: Clarifications to EN 1335-1:2000 (Dimensions)
- CEN/TR 14073-1:2004 Office furniture - Storage furniture - Part 1: Dimensions
- EN 14073-2:2004 Office furniture - Storage furniture - Part 2: Safety requirements
- EN 14073-3:2004 Office furniture - Storage furniture - Part 3: Test methods for the determination of stability and strength of the structure
- EN 14074:2004 Office furniture - Tables and desks and storage furniture - Test methods for the determination of strength and durability of moving parts
- CEN/TR 14699:2004 Office furniture – Terminology

### A.1.3. Hardware for furniture

- CEN/TR 15349:2006 Hardware for furniture - Terms for extension elements and their components
- CEN/TR 15588:2007 Hardware for furniture - Terms for hinges and their components
- EN 15570:2008 Hardware for furniture - Strength and durability of hinges and their components - Hinges pivoting on a vertical axis
- EN 15706:2009 Hardware for furniture - Strength and durability of slide fittings for sliding doors and roll fronts
- CEN/TR 15709:2008 Hardware for furniture - Terms for slide fittings for sliding doors and roll fronts
- EN 15828:2010 Hardware for furniture - Strength and durability of hinges and their components - Stays and hinges pivoting on a horizontal axis
- EN 15939:2011+A1:2014 Hardware for furniture - Strength and loading capacity of wall attachment devices
- CEN/TR 16015:2010 Hardware for furniture - Terms for locking mechanisms
- EN 16014:2011 Hardware for furniture - Strength and durability of locking mechanisms
- EN 16337:2013 Hardware for furniture - Strength and loading capacity of shelf supports
- EN 15338:2007+A1:2010 Hardware for furniture - Strength and durability of extension elements and their components

### A.1.4. Outdoor furniture

- EN 581-1:2006 Outdoor furniture - Seating and tables for camping, domestic and contract use - Part 1: General safety requirements

- EN 581-2:2009 Outdoor furniture - Seating and tables for camping, domestic and contract use - Part 2: Mechanical safety requirements and test methods for seating
- EN 581-3:2007 Outdoor furniture - Seating and tables for camping, domestic and contract use - Part 3: Mechanical safety requirements and test methods for tables
- CEN/TR 581-4:2005 Outdoor furniture - Seating and tables for camping, domestic and contract use - Part 4: Requirements and test methods for durability under the influence of climatic conditions

#### *A.1.5. Seating furniture*

- EN 1022:2005 Domestic furniture - Seating - Determination of stability
- EN 1728:2012 Furniture - Seating - Test methods for the determination of strength and durability
- EN 1728:2012/AC:2013 Furniture - Seating - Test methods for the determination of strength and durability
- EN 12520:2010 Furniture - Strength, durability and safety - Requirements for domestic seating
- EN 12727:2000 Furniture - Ranked seating - Test methods and requirements for strength and durability
- EN 13759:2012 Furniture - Operating mechanisms for seating and sofa-beds - Test methods
- EN 14703:2007 Furniture - Links for non-domestic seating linked together in a row - Strength requirements and test methods
- EN 16139:2013 Furniture - Strength, durability and safety - Requirements for non-domestic seating
- EN 16139:2013/AC:2013 Furniture - Strength, durability and safety - Requirements for non-domestic seating

#### *A.1.6. Tables*

- EN 1730:2012 Furniture - Tables - Test methods for the determination of stability, strength and durability
- EN 12521:2009 Furniture - Strength, durability and safety - Requirements for domestic tables
- EN 15372:2008 Furniture - Strength, durability and safety - Requirements for non-domestic tables

#### *A.1.7. Kitchen furniture*

- EN 1116:2004 Kitchen furniture - Co-ordinating sizes for kitchen furniture and kitchen appliances
- EN 14749:2005 Domestic and kitchen storage units and worktops - Safety requirements and test methods

#### *A.1.8. Beds*

- EN 597-1:1994 Furniture - Assessment of the ignitability of mattresses and upholstered bed bases - Part 1: Ignition source: Smouldering cigarette
- EN 597-2:1994 Furniture - Assessment of the ignitability of mattresses and upholstered bed bases - Part 2: Ignition source: Match flame equivalent
- EN 716-1:2008+A1:2013 Furniture - Children's cots and folding cots for domestic use - Part 1: Safety requirements
- EN 716-2:2008+A1:2013 Furniture - Children's cots and folding cots for domestic use - Part 2: Test methods
- EN 747-1:2012 Furniture - Bunk beds and high beds - Part 1: Safety, strength and durability requirements
- EN 747-2:2012 Furniture - Bunk beds and high beds - Part 2: Test methods
- EN 1129-1:1995 Furniture - Foldaway beds - Safety requirements and testing - Part 1: Safety requirements
- EN 1129-2:1995 Furniture - Foldaway beds - Safety requirements and testing - Part 2: Test methods
- EN 1130-1:1996 Furniture - Cribs and cradles for domestic use - Part 1: Safety requirements
- EN 1130-2:1996 Furniture - Cribs and cradles for domestic use - Part 2: Test methods
- EN 1334:1996 Domestic furniture - Beds and mattresses - Methods of measurement and recommended tolerances
- EN 1725:1998 Domestic furniture - Beds and mattresses - Safety requirements and test methods
- EN 1957:2012 Furniture - Beds and mattresses - Test methods for the determination of functional characteristics and assessment criteria
- EN 12227:2010 Playpens for domestic use - Safety requirements and test methods

#### *A.1.9. Storage Furniture*

- EN 16121:2013 Non-domestic storage furniture - Requirements for safety, strength, durability and stability
- EN 16122:2012 Domestic and non-domestic storage furniture - Test methods for the determination of strength, durability and stability

#### *A.1.10. Glass in furniture*

- EN 14072:2003 Glass in furniture - Test methods

#### *A.1.11. Surface resistance and characteristics*

- EN 12720:2009+A1:2013 Furniture - Assessment of surface resistance to cold liquids
- EN 12721:2009+A1:2013 Furniture - Assessment of surface resistance to wet heat
- EN 12722:2009 Furniture - Assessment of surface resistance to dry heat
- EN 12722:2009+A1:2013 Furniture - Assessment of surface resistance to dry heat
- EN 13721:2004 Furniture - Assessment of the surface reflectance
- EN 13722:2004 Furniture - Assessment of the surface gloss
- EN 15185:2011 Furniture - Assessment of the surface resistance to abrasion
- EN 15186:2012 Furniture - Assessment of the surface resistance to scratching
- EN 15187:2006 Furniture - Assessment of the effect of light exposure
- CEN/TS 16209:2011 Furniture - Classification for properties for furniture surfaces

#### *A.1.12. Other types of furniture*

- EN 1729-1:2006 Furniture - Chairs and tables for educational institutions - Part 1: Functional dimensions
- EN 1729-2:2012 Furniture - Chairs and tables for educational institutions - Part 2: Safety requirements and test methods
- EN 13150:2001 Workbenches for laboratories - Dimensions, safety requirements and test methods
- EN 14434:2010 Writing boards for educational institutions - Ergonomic, technical and safety requirements and their test methods
- EN 14727:2005 Laboratory furniture - Storage units for laboratories - Requirements and test methods

## Appendix III: criteria and verification for latex foams

- a) Latex foams shall not contain any of the restricted substances in concentrations exceeding those stated below:

**Table 4. Restricted substance criteria for latex foams.**

GROUP OF SUBSTANCES	SUBSTANCE	LIMIT VALUE (ppm)
Chlorophenols (Method A)	mono- and di-chlorinated phenols (salts and esters)	1
	Other chlorophenols	0.1
Heavy metal (Method B)	As (Arsenic)	0.5
	Cd (Cadmium)	0.1
	Co (Cobalt)	0.5
	Cr (Chromium), total	1
	Cu (Copper)	2
	Hg (Mercury)	0.02
	Ni (Nickel)	1
	Pb (Lead)	0.5
	Sb (Antimony)	0.5
Pesticides* (only applies when natural latex constitutes at least 20% of the foam). (Method C)	Aldrin	0.04
	o,p-DDE	0.04
	p,p-DDE	0.04
	o,p-DDD	0.04
	p,p-DDD	0.04
	o,p-DDT	0.04
	p,p-DDT	0.04
	Diazinone	0.04
	Dichlorfenthion	0.04
	Dichlorvos	0.04
	Dieldrin	0.04
	Endrin	0.04
	Heptachlor	0.04
	Heptachlorepoxyde	0.04
	Hexachlorbenzene	0.04
	Hexachlorcyclohexane	0.04
	Lindane	0.04
	Malathion	0.04
	Methoxichlor	0.04
	Mirex	0.04
Parathion-ethyl	0.04	
Parathion-methyl	0.04	
Others (Method D)	Butadiene	1

**Assessment and verification:** Test reports by the latex foam supplier shall demonstrate that the material complies with the above limits using the methods A-D described below. These methods may be used for random quality control testing in final furniture products.

For **chlorophenols, Method A**: 5 g of sample shall be milled and chlorophenols extracted in phenol form (PCP), sodium salt form (SPP) or as esters. The extracts shall be analysed by means of Gas Chromatography using a mass spectrometer or electron capture detector.

For **heavy metals, Method B**: A known weight of milled sample material is eluted in accordance with DIN 38414-S4 or equivalent in a ratio of 1:10. The resultant filtrate shall be passed through a 0.45 µm membrane filter (if necessary by pressure filtration). The solution obtained shall be examined for the content of heavy metals by an inductively coupled plasma instrument coupled with (optical/atomic emission spectrometry or mass spectrometry detectors) or by atomic absorption spectrometry using a hydride/cold vapour process.

For **pesticides, Method C**: This method is only required where the latex foam is composed of at least 20 % natural latex by weight. A 2 g sample is extracted in an ultrasonic bath with a hexane/dichloromethane mixture (85/15). The extract is cleaned up by agitation in acetonitrile or by adsorption chromatography over florisil. Measurement is determined by gas chromatography with a mass spectrometry or electron capture detector.

For **Butadiene, Method D**: Milled latex foam material is placed in a headspace analyser and the headspace gas analysed by gas chromatography with a flame ionisation detector.

- b) Emission of specified volatile organic compounds (SVOV, VOC, VVOC). Where latex foam is used as padding material, the limits for the compounds listed in Table 4 shall be respected.

**Table 5. List of VOC emission limits for latex foams.**

SUBSTANCE	LIMIT VALUE (mg/m <sup>3</sup> )
1,1,1 – trichloroethane	0.2
4-Phenylcyclohexene	0.02
Carbon Disulphide	0.02
Formaldehyde*	0.005
Nitrosamines**	0.0005
Styrene	0.01
Tetrachloroethylene	0.15
Toluene	0.1
Trichlorethylene	0.05
Vinyl chloride	0.0001
Vinyl cyclohexene	0.002
Aromatic hydrocarbons (total)	0.30
VOCs (total)	0.5
* Alternatively, the concentration of formaldehyde shall not exceed 20 ppm as measured with EN ISO 14184-1.	
** n-nitrosodimethylamine (NDMA), n-nitrosodiethylamine (NDEA), n-nitrosomethylethylamine (NMEA), n-nitrosodi- i-propylamine (NDIPA), n-nitrosodi- n- propylamine (NDPA), n-nitrosodi- n- butylamine (NDBA), n-nitrosopyrrolidinone (NPYR), n-nitrosopiperidine (NPIP), n-nitrosomorpholine (NMOR)	

**Assessment and verification:** Test reports by the latex foam supplier shall demonstrate that the material complies with the limits in Table 4 using a test chamber method in accordance with ISO 16000-9 and analytical techniques as described below.

A sample of latex foam shall be wrapped for a period of at least 24 hours prior to being unwrapped and immediately transferred to a test chamber where it is placed on a sample holder that facilitates air access from all sides. The climatic factors of the chamber shall be adjusted as per ISO 16000-9. For comparison of test results, the area specific ventilation rate ( $q=n/l$ ) shall be 1. The ventilation rate shall be between 0.5 and 1. Air sampling shall be carried out 24 +/-1 hour after loading the sample in the chamber. Air samples will be passed across DNPH cartridges for 1 hour for subsequent analysis of formaldehyde and other aldehydes and for 1 hour on Tenax TA cartridges for the analysis of other volatile organic compounds. Sampling durations may be longer for other compounds but shall in all cases be completed before 30 hours have elapsed in the test.

Analysis of formaldehyde and other aldehydes shall comply with ISO 16000-3. Unless otherwise specified, analysis of other volatile organic compounds shall comply with ISO 16000-6. Tests that follow CEN/TS 16516 methods shall be considered as equivalent to those of the ISO 16000 series.

The analysis of nitrosamines shall be done by means of gas chromatography in combination with a thermal energy analysis detector in accordance with the BGI 505-23 method (formerly ZH 1/120.23) or equivalent.

## Appendix IV: Criteria and verification for PU foams

- a) Latex foams shall not contain any of the restricted substances in concentrations exceeding those stated below:

**Table 6. List of restricted substances in PU foam in Ecolabel furniture.**

	SUBSTANCE (ACRONYM, CAS No., ELEMENT NAME)	LIMIT VALUE
Biocides	Criterion 2 (a), (b) and 2 (c) (ii) on hazardous substances shall be respected.	Not added intentionally
Heavy Metals	As (Arsenic)	0.2 ppm
	Cd (Cadmium)	0.1 ppm
	Co (Cobalt)	0.5 ppm
	Cr (Chromium), total	1 ppm
	Cr VI (Chromium VI)	0.01 ppm
	Cu (Copper)	2 ppm
	Hg (Mercury)	0.02 ppm
	Ni (Nickel)	1 ppm
	Pb (Lead)	0.2 ppm
	Sb (Antimony)	0.5 ppm
	Se (Selenium)	0.5 ppm
Plasticizers	Di-iso-nonylphthalate (DINP, 28553-12-0)	-
	Di-n-octylphthalate (DNOP, 117-84-0)	-
	Di (2-ethylhexyl)-phthalate (DEHP, 117-81-7)	-
	Di-iso-decylphthalate (DIDP, 26761-40-0)	-
	Butylbenzylphthalate (BBP, 85-68-7)	-
	Dibutylphthalate (DIBP, 84-74-2)	-
	Sum	0.01 % w/w
Phthalate plasticizers	Not added intentionally	
TDA and MDA	2,4 Toluenediamine (2,4 TDA, 95-80-7)	5.0 ppm
	4,4'' Diaminodiphenylmethane (4,4'' MDA, 101-77-9)	5.0 ppm
Tinorganic substances	Tributyltin (TBT)	50 ppb
	Dibutyltin (DBT)	100 ppb
	Monobutyltin (MBT)	100 ppb
	Tetrabutyltin (TeBT)	-
	Monooctyltin (MOT)	-
	Dioctyltin (DOT)	-
	Tricyclohexyltin (TcyT)	-
	Triphenyltin (TPhT)	-
	Sum	500 ppb
Others	Chlorinated or brominated dioxines or furans	Not added intentionally
	Chlorinated hydrocarbons (1,1,2,2-Tetrachloroethane, Pentachloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethylene)	Not added intentionally
	Chlorinated phenols (PCP, TeCP, 87-86-5)	Not added intentionally
	Hexachlorocyclohexane (58-89-9)	Not added intentionally



Monomethyldibromo-Diphenylmethane (99688-47-8)	Not added intentionally
Monomethyldichloro-Diphenylmethane (81161-70-8)	Not added intentionally
Nitrites	Not added intentionally
Polybrominated Biphenyls (PBB, 59536-65-1)	Not added intentionally
Pentabromodiphenyl Ether (PeBDE, 32534-81-9)	Not added intentionally
Octabromodiphenyl Ether (OBDE, 32536-52-0)	Not added intentionally
Polychlorinated Biphenyls (PCB, 1336-36-3)	Not added intentionally
Polychlorinated Terphenyls (PCT, 61788-33-8)	Not added intentionally
Tri-(2,3-dibromo-propyl)-phosphate (TRIS, 126-72-7)	Not added intentionally
Trimethylphosphate (512-56-1)	Not added intentionally
Tris-(aziridinyl)-phosphin oxide (TEPA, 5455-55-1)	Not added intentionally
Tris(2-chloroethyl)-phosphate (TCEP, 115-96-8)	Not added intentionally
Dimethyl methylphosphonate (DMMP, 756-79-6)	Not added intentionally

**Assessment and verification:** The applicant shall provide test reports demonstrating that the foam material complies with the limits stated above using the appropriate method described below (A-E). These methods are also appropriate for random quality control testing in final furniture products.

For biocides, phthalates and other specified substances above, the applicant shall provide a declaration from the foam manufacturer confirming that the listed substances have not been intentionally added to the PUR foam material.

For the heavy metals listed above, the method consists of eluting a sample of milled PUR foam in accordance with the DIN 38414-S4 procedure or equivalent where the solid:liquid ratio is 1:10. The resultant filtrate shall be passed through a 0.45 µm membrane filter (if necessary by pressure filtration). The solution obtained shall be examined for the content of heavy metals by an inductively coupled plasma instrument coupled with (optical emission/atomic emission spectrometry or mass spectrometry detectors) or by atomic absorption spectrometry using a hydride or cold vapour process.

For the total amount of plasticisers, a composite sample of 6 pieces to be taken from beneath each sample face (up to a maximum of 2 cm from each face surface) is analysed. Extraction shall be performed with dichloromethane using a validated method and followed by analysis with gas chromatography with a mass spectrometry detector or by high performance liquid chromatography with an ultraviolet detector.

For TDA (2,4-Toluenediamine) and MDA (4,4-Diaminodiphenylmethane) a composite sample of 6 pieces to be taken from beneath each sample face (up to a maximum of 2cm from each face surface) is analysed. Extraction is carried out with 1 % aqueous acetic acid solution at sample weight to liquid volume ratio of 1:5 and repeated three further times. The four extracts are then combined and diluted to a known volume, filtered and analysed by high performance liquid chromatography with an ultraviolet detector or mass spectrometry detector.

For Organotin substances, a composite sample of 6 pieces to be taken from beneath each sample face (up to a maximum of 2 cm from each face surface) is analysed. Extraction shall be performed for 1 hour in an ultrasonic bath at room temperature. The extracting agent shall be a mixture

composed as follows: 1750 ml methanol + 300 ml acetic acid + 250 ml buffer (pH 4.5). The buffer shall be a solution of 164 g of sodium acetate in 1200 ml of water and 165 ml acetic acid, to be diluted with water to a volume of 2000ml. After extraction, the alkyl-tin species shall be derivatized by adding sodium tetraethylborate solution in tetrahydrofuran. The derivative shall be extracted with n-hexane and the sample shall be submitted to a second extraction procedure. Both hexane extracts shall be combined and further used to determine the organotin compounds by gas chromatography with mass selective detection in SIM modus.

- b) Emission of specified volatile organic compounds (SVOV, VOC, VVOC). Where latex foam is used as padding material, the limits for the compounds listed below shall be respected.

**Table 7. Limits for VOC emissions from PU foam samples**

SUBSTANCE (CAS NUMBER)	LIMIT VALUE ( $\mu\text{g}/\text{m}^3$ )
Formaldehyde (50-00-0)	5
Toluene (108-88-3)	100
Styrene (100-42-5)	50
Each detectable compound classified as categories C1A or C1B according to the Regulation (EC) No 1272/2008	5
Sum of all detectable compound classified as categories C1A or C1B according to the Regulation (EC) No 1272/2008	40
Aromatic hydrocarbons	500
VOCs (total)	500

**Assessment and verification:** Test reports by the polyurethane foam supplier shall demonstrate that the material complies with the limits above using the following procedure or equivalent:

The foam sample is placed on the bottom of an emission test chamber and is conditioned for 3 days at 23 °C and 50 % relative humidity, applying an air exchange rate (n) of 0.5 per hour and a chamber loading rate (L) of 0.4  $\text{m}^2/\text{m}^3$  (i.e. the total exposed sample surface area divided by the chamber volume in accordance with ISO 16000-9 and 16000-11. Sampling shall be done 72 +/- 2 hours after loading of the chamber and samples collected during a period of 1 hour on Tenax TA and DNPH cartridges for VOC and formaldehyde analysis respectively.

Determination of formaldehyde concentrations shall be determined as per ISO 16000-3. The determination of VOC emissions trapped in the Tenax TA cartridge shall in accordance with ISO 16000-6. Results are semi-quantitatively expressed as toluene equivalents. All results above the limit of 0.001  $\text{mg}/\text{m}^3$  shall be reported.

Total VOC content shall be the sum of all individual VOC values with results greater than 0.001  $\text{mg}/\text{m}^3$  that elute within the retention time window from n-hexane (C6) to n-hexadecane (C16) inclusive.

The sum of all detectable compounds classified as categories C1A or C1B according to EC Regulation No. 1272/2008 shall be the sum of all such substances with a concentration >0.001  $\text{mg}/\text{m}^3$ . In case the test results exceed the standard limits, substance specific

quantification needs to be reported. CEN/TS tests shall be considered as equivalent to the ISO 16000 series.

c) Total chlorine content of isocyanates

Should mixed isomers of toluene diisocyanate be used in the production of the PUR foam, the total chlorine content of these isocyanates shall not exceed 0.07 % by weight.

**Assessment and verification:** The applicant shall provide either a declaration of non-use from the foam manufacturer or the results of test methods carried out in accordance with ASTM D4661-93 or equivalent.

d) Blowing agents

Halogenated organic compounds shall not be used as blowing agents or as auxiliary blowing agents.

**Assessment and verification:** The applicant shall provide a declaration of non-use from the foam manufacturer