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Revision of Green Public Procurement Criteria for furniture.

*Technical Report 3.0
Working document for written
consultation*

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Contents

1	EU GPP REVISION PROCESS FOR FURNITURE	5
2.	SUMMARY OF PRELIMINARY 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	UPTAKE OF FURNITURE GPP IN THE EU.....	9
2.5	CONSUMER INTERESTS FOR FURNITURE.....	10
3.	CRITERIA IDENTIFIED FOR FURNITURE GPP.....	11
3.1.	TYPES OF CRITERIA IN GPP.....	11
3.1.1	Selection criteria	11
3.1.2	Technical Specifications	11
3.1.3.	Award criteria.....	11
3.1.4.	Proposed criteria structure in EU GPP for furniture	12
4.	APPROACH 1 – REFURBISHED FURNITURE	13
	Technical Specification 1: Refurbishment requirements.....	13
	Technical specification 2: Durable upholstery coverings.....	18
	Technical Specification 3: Warranty and options for repair/ spare parts.....	20
	Award criterion 1: Low chemical residue upholstery coverings.....	22
	Award criterion 2: Extended warranty periods	25
5.	APPROACH 2 – PROCUREMENT OF NEW FURNITURE	27
	Technical specification 1: Responsibly sourced wood	28
	Technical specification 2: Formaldehyde emissions from wood-based panels	34
	Technical specifications 3 & 4: Surface treatment hazard restrictions	38
	Technical specification 5: Substances of Very High Concern (especially biocides, flame retardants and plasticisers).	43
	Technical specification 6: Durable upholstery coverings.....	47
	Technical specification 7, 8 & 9: Final product requirements	48
	Technical specification 11: Collection and End of Life (EoL) management for furniture.....	51
	Award criterion 1 & 2: Recycled wood content and contaminants.....	54
	Award criterion 3: Formaldehyde emissions from wood-based panels	57
	Award criterion 4: Marking of plastic parts	58
	Award criterion 5: Recycled plastic content	61
	Award criterion 7: Low chemical residue upholstery coverings	63
	Award criterion 8: Volatile Organic Compound (VOC) emissions.....	65
	Award criterion 9: Collection and End of Life management of furniture	68
	Award criterion 10: Extended warranty periods	69
	Appendix I: Durable upholstery materials	71
	Appendix II: Testing requirements and restrictions for dyes in textiles, coated fabrics and leather	73

Appendix III: List of relevant EN fitness for use standards	75
Appendix IV: List of abbreviations used in the ISO 1043 plastic marking scheme.....	77

List of Figures

Figure 1. GPP criteria development process.	5
Figure 2. Fraction of furniture public procurement contracts including GPP core criteria.	9
Figure 3. Furniture characteristics that consumers are willing to pay an extra 10% for (note that green bars relate to environmental concerns and blue bars to social/information concerns).....	10
Figure 4. Flow diagram of a "closed loop" refurbishment/manufacturing/refinishing operation.	15
Figure 5. Hierarchical approach promoted by the UK government for furniture procurement.	16
Figure 6. Comparison of formaldehyde emission ambition levels in different schemes for wood-based panels. PW = Plywood; MDF = Medium Density Fibreboard; PB = Particleboard.....	36
Figure 7. Comparison of the marking that would be required for a polypropylene plastic with 30% glass fibre filler content, epoxidised linseed oil plasticiser and red phosphorus flame retardant according to the SPI standard (left) and the ISO 11469 / ISO 1043 standards (right).	59

List of Tables

Table 1. Overview of GPP criteria structure	12
Table 2. Estimated average unit prices for furniture items as new, reused or refurbished	14
Table 3. Overview of GPP criteria structure for the procurement of new furniture	27
Table 4. Summary of basic CLP hazards to screen for in core and comprehensive criteria.	40
Table 5. List of phthalates currently (June 2015) included on the REACH Candidate List	44
Table 6. Nordic Ecolabel approach to VOCs in coating formulations applied to furniture	66
Table 7. Physical requirements of leather used in Ecolabel furniture (taken from Tables 1 and 2 in EN 13336)	71
Table 8. Physical requirements for textile fabric covering materials in furniture upholstery.	72
Table 9. Physical requirements for coated fabric covering materials in furniture upholstery.....	72
Table 10. Carcinogenic arylamines to be tested in textiles or leather.	73
Table 11. Dyes that are CMR or potentially sensitising.....	73
Table 12. Indicative list of dyes that may cleave to form carcinogenic arylamines	74
Table 13: ISO 1043-1 symbols for homopolymeric polymers	77
Table 14: ISO 1043-1 symbols for co-polymeric materials.....	77
Table 15: ISO 1043-2 symbols for fillers and reinforcing materials in plastics.....	78
Table 16: ISO 1043-3 abbreviations used for plasticizers	78
Table 17. List of code numbers from ISO 1043-4 for flame retardant types used in plastics	80

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. The steps in the GPP criteria development process are illustrated in Figure 1.

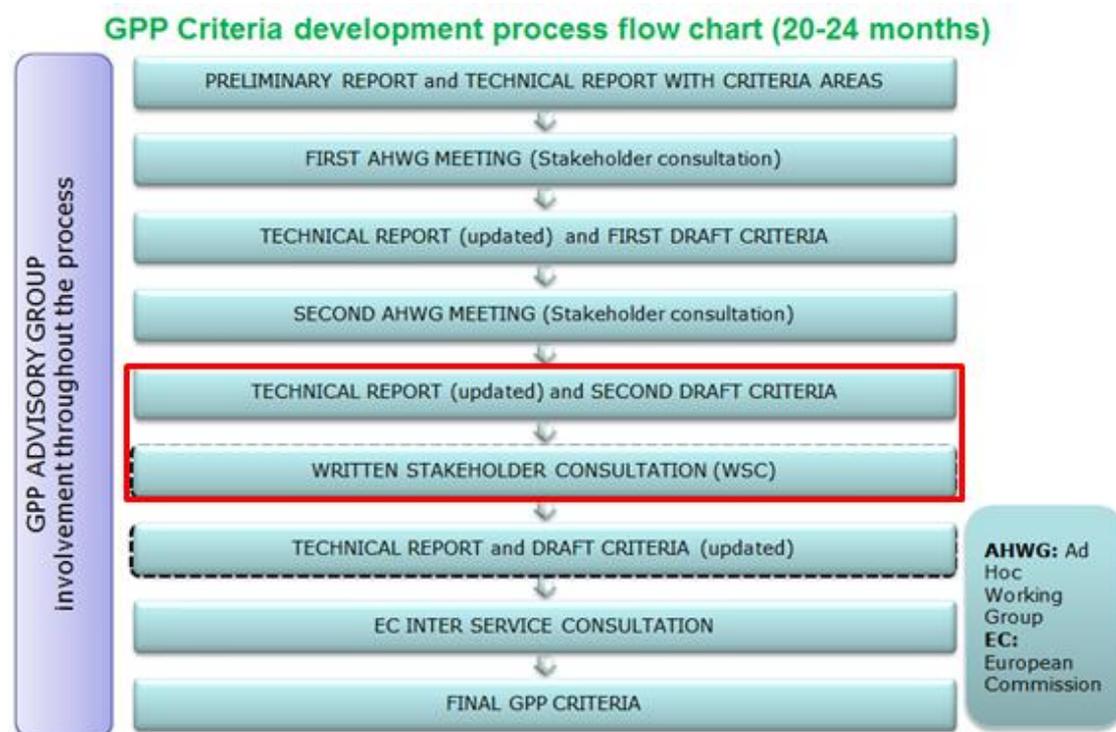


Figure 1. GPP criteria development process.

The entire criteria development/revision process generally takes around 2-3 years to complete. The process involves the writing and publication of a preliminary 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.

Following publication of the background report, a technical report was published in which possible new criteria areas for furniture were proposed and a 1st Ad-Hoc working group meeting took place in Seville 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 verbal dialogue and after the meeting via ongoing exchange of phone calls, emails and uploading of information onto the BATIS system¹ to which all registered stakeholders have access. Technical reports and other documents are also available online at the EC Joint Research Centre (JRC) website². Specifically for the purposes of engaging more with procurement experts, a group was created in February 2014 on the European procurement forum website³.

After gathering all the stakeholder feedback, new sets of technical criteria were proposed for EU Ecolabel and EU GPP furniture. The 2nd technical report regarding GPP criteria (Version 2.0, April 2014) specifically focussed on the public procurement processes for furniture and relevant environmental

¹ <http://eippcb.jrc.ec.europa.eu/batis/> - forum: furniture

² <http://susproc.jrc.ec.europa.eu/furniture/documents.html>

³ www.procurement-forum.eu – group name “EU GPP criteria revision for furniture”

criteria that are recommended for use as green public procurement criteria in calls to tender. This was made available for consultation on the BATIS system and the JRC website.

The reports were open for public consultation for approximately 1 month prior to the 2nd AHWG meeting which took place in Brussels on the 15th May, 2014. Based on feedback from stakeholders, further investigation has been made in certain criteria areas and the GPP criteria modified, as is reflected in this new technical report (Version 3.0, October 2015).

This report presents the latest set of draft GPP criteria which shall be published both on the JRC website and the BATIS system and these will be subject to a written consultation process (see red box in Figure 1). The deadline for written comments will be clearly communicated upon release of this version of the TR.

Draft

2. SUMMARY OF PRELIMINARY REPORT

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 application (for example Product Type 8 biocides apply to wood and Product Type 9 can apply to leather and textiles used in furniture⁴).

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 from sustainably managed forests 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. In terms of national fire regulations, another important standard that applies to upholstered furniture is EN 1021.

2.2 MARKET ANALYSIS

According to the World Furniture Outlook by CSIL⁵, the global furniture market was worth around **US\$420 billion** in 2010 alone. The global market is dominated by China (37%) but the 3rd and 4th 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.

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

- Increasing awareness of procurers of the potential for furniture refurbishment services.
- Incentivise the use of recycled wood fibres by including an award criterion.

⁴ http://ec.europa.eu/environment/chemicals/biocides/biocidal-products/product-types_en.htm

⁵ 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>)

- Sending a market signal to producers to increase the use of recycled plastic.
- 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 tendering companies or 3rd parties).
- Reduction of the quantities of furniture waste sent to landfill as products become easier to separate.

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 (EPDs) 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** could vary depending on the individual product but two LCA studies quoted in the preliminary report estimate total impacts due to packaging at 6%.
- **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 **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 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. The existing EU GPP criteria for furniture at the time of the survey contained 7 core criteria⁶. According to a CEPS study⁷ 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) is shown below.

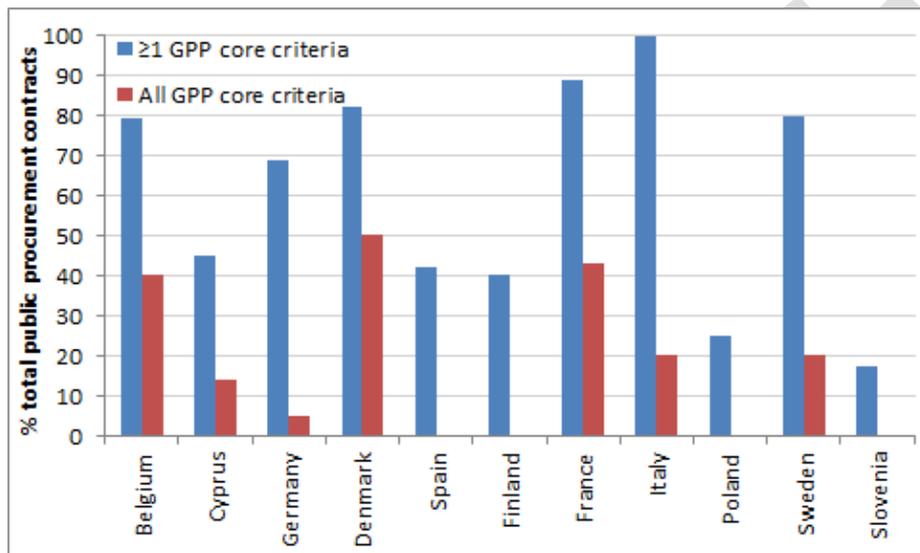


Figure 2. Fraction of furniture public procurement contracts including GPP core criteria.

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.

⁶ (i) legally sourced wood; (ii) marking of plastic parts >50g; (iii) restricted substances in surface coatings; (iv) VOC in glues <10%; (v) recyclable and (vi) separable packaging materials; (vii) Durability, reparability, fitness for use and ergonomic requirements.

⁷ *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>)

2.5 CONSUMER INTERESTS FOR FURNITURE

GPP criteria should reflect issues that are important to consumers. This will help ensure the uptake of such criteria by procurers in calls for tenders and send signals to the market. In this regard, it is worth referring to the results of a survey conducted by FederlegnoArredo shown in Figure 3 below.

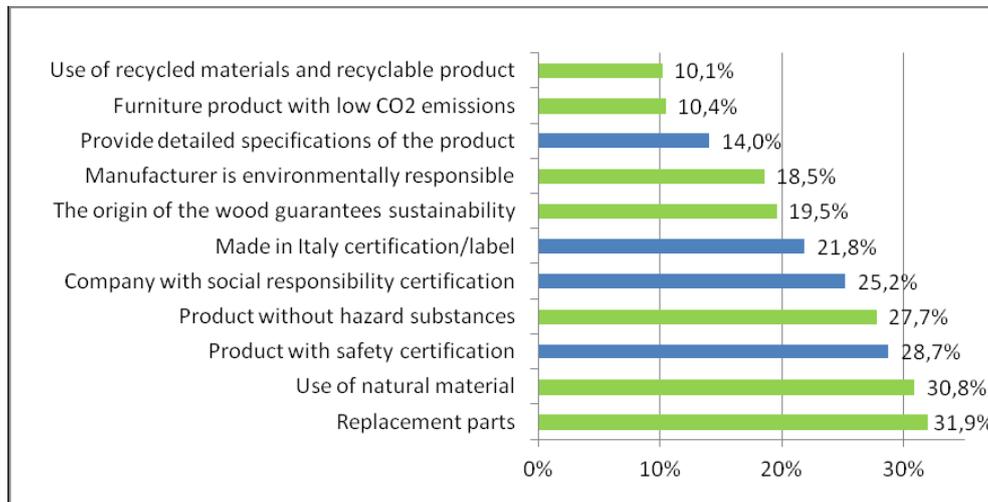


Figure 3. Furniture characteristics that consumers are willing to pay an extra 10% for⁸ (note that green bars relate to environmental concerns and blue bars to social/information concerns).

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 or for plant-based fibres versus synthetic fibres in textile fabrics or for real leather versus faux leather (coated fabrics based on PVC and/or polyurethane). Nonetheless, it is an important issue, as was the origin of the wood material. Concern was also shown about hazardous substances and so should be addressed to some extent in GPP criteria.

⁸ Adapted from the report "Voglio di Piu. Ambiente, Tecnologia e Web 2.0", 2011. An abstract to the report can be found here: <http://www.federlegnoarredo.it/it/servizi/centro-studi-dati-e-ricerche/consumatore/case-da-re-inventare>

3. CRITERIA IDENTIFIED FOR FURNITURE GPP

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 provides the product/service. 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 in their 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. In order to ensure some flexibility in the achieving this goal, two different environmental levels of ambition are defined: 1) the Core level of ambition is suitable for use by any contracting authority across the Member States and addresses the key environmental impacts. It is designed to be used with minimum additional verification effort or cost increases; 2) the Comprehensive level of ambition is intended for those contracting authorities who wish to purchase the best environmental products available on the market. These may require additional verification effort or a slight increase in cost compared to other products with the same functionality. 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 refurbished, or 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. In some criteria two different levels of ambition are specified (core and comprehensive) as mentioned above.

With furniture, GPP technical specifications 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.

3.1.4. Proposed criteria structure in EU GPP for furniture

The identification of environmental issues relevant to the GPP process for furniture products has been carried out via the following considerations:

- Input from stakeholders during the EU Ecolabel and GPP revision process for the furniture product group.
- Analysis of existing EU GPP criteria for furniture and how this has been reacted to by different Member States in developing their own national level criteria.
- Criteria that have been adopted by GPP or Type I Ecolabel documents for materials which are included in furniture (i.e. textiles, bed mattresses and paints and varnishes).
- Comparison with non-EU best practice and standards for certain criteria areas.

The proposed GPP criteria are listed in Table 1 below. The remainder of the document presents a brief background to each criteria area and rationale for why it has been chosen and why as a minimum technical specification or as an award criterion.

A major change from the existing GPP criteria for furniture is the introduction of two distinct approaches to take: i) for contracts for the **refurbishment** of existing furniture stock and ii) for contracts to procure **new** furniture stock. This separation is due to the fact that refurbished furniture cannot realistically be judged against certain criteria that could be applied to new furniture (e.g. material origin/recycled content of original parts). Where possible, approach 1 should be prioritised.

Table 1. Overview of GPP criteria structure

Criterion	Minimum technical specifications	Award criteria
Approach 1 – refurbishment of existing furniture stock		
TS-1: Refurbishment requirements	X	
TS-2: Durable upholstery coverings	X	
TS-3: Warranty and options for repair / spare parts	X	
AC-1: Low chemical residue upholstery coverings		X
AC-2: Extended warranty periods		X
Approach 2 – procurement of new furniture		
TS-1: Responsibly sourced wood	X	
TS-2: Formaldehyde emissions from wood-based panels	X	
TS-3: Coating formulation hazard restrictions	X	
TS-4: Metal treatment restrictions	X	
TS-5: Substances of Very High Concern (SVHC) restrictions	X	
TS-6: Durable upholstery coverings	X	
TS-7: Fitness for use	X	
TS-8: Design for disassembly and repair	X	
TS-9: Product guarantee and spare parts	X	
TS-10: Collection and End-of-Life (EoL) management of furniture	X	
AC-1: Recycled wood content in wood-based panels		X
AC-2: Contaminants in recycled wood		X
AC-3: Formaldehyde emissions from wood-based panels		X
AC-4: Marking of plastic parts		X
AC-5: Recycled plastic content		X
AC-7: Low chemical residue upholstery coverings		X
AC-8: Volatile Organic Compound (VOC) emissions		X
AC-9: Collection and End-of-Life (EoL) management of furniture		X
AC-10: Extended warranty periods		X

The significant number of award criteria is to encourage furniture manufacturers to innovate and become more competitive in invitations to tender in a number of areas that are strongly related to the environmental impact of furniture and which, in many cases, are already specified in ISO 14024 Type I Ecolabels, reinforcing the impact of these voluntary initiatives on the furniture industry.

4. APPROACH 1 – REFURBISHED FURNITURE

Technical Specification 1: Refurbishment requirements

Why relevant to GPP?

The Life Cycle Assessment (LCA) screening of furniture products carried out in the Preliminary Report⁹ revealed that environmental impacts are dominated by (i) the impacts of material production (i.e. wood, metal, plastic) and (ii) further processing of those materials into furniture components (i.e. cutting, drying, moulding, welding and chemical treatment).

Due to the fact that the environmental impacts of furniture during the use phase are virtually nil, any extension of the useful lifetime of the furniture has direct environmental benefits. According to Bartlett¹⁰, the typical lifetime of office furniture in the UK is 9-12 years, despite the fact that furniture is often designed with much longer function lifetimes. The premature End-of-Life (EoL) of office furniture is often determined by corporate decisions to redecorate or relocate offices and results in perfectly functional furniture being disposed of for aesthetic reasons. In general, the need for new furniture stock in a public organisation may be due to:

- New premises/staff or expansion of existing premises,
- Old furniture not being adequate after renovation of existing public buildings (for example the wrong colour, shape or size),
- Old furniture falling into disrepair (damaged furniture that is no longer safe and/or fully functional).

With the latter two situations, it may be possible to actually refurbish existing furniture instead of buying brand-new products. Recently (June 2014), the UK government published the latest version of its guidance document for furniture procurement. The document proposes taking the following hierarchical approach to address furniture needs:

The disposal of desks simply because they are not the same height as new desks or that the finish is a slightly different colour and the disposal of office chairs simply because the upholstery appears worn or the covering is the wrong colour is completely avoidable if refurbishment is considered.

Refurbishment operations avoid the need to produce new products (and their associated environmental impacts), generally result in cost savings to the procurer and encourage local skilled labour and businesses due to the importance of low transport costs on the overall cost of refurbishment.

One of the key barriers to the furniture refurbishment industry is the lack of demand from public authorities in Europe and a lack of experience with such contracts. In contrast, anecdotal evidence from one US furniture manufacturer showed that 9% of their commercial sales were due to remanufactured furniture.

Procurement guidance and best practice has focussed on new furniture, but a more holistic approach is needed which aims higher up on the waste hierarchy and helps contribute to the circular economy¹¹ within the EU. For this reason, particular emphasis is given to furniture refurbishment in the EU GPP criteria. To emphasise the potential economic benefits with this approach, some cost estimates from a UK study that furniture reuse or refurbishment could achieve are reproduced in the table below:

⁹ Preliminary Report: Revision of EU Ecolabel and Green Public Procurement criteria for the product group "Wooden furniture", JRC-IPTS, 2013, ISBN [978-92-79-04781-1](#).

¹⁰ Bartlett, 2009. "Reuse of office furniture – incorporation into the 'Quick Wins' criteria: A study of the market potential for reused and remanufactured office furniture in the UK.

¹¹ <http://ec.europa.eu/environment/circular-economy/>

Table 2. Estimated average unit prices for furniture items as new, reused or refurbished¹²

	Desks (£)	Chairs (£)	Shelving (£)	Pedestal (£)
New RRP	209	122	100	107
Reused RRP* proxy	105	86	50	53
Refurbished RRP* proxy	84	49	40	43

*RRP – Recommended Retail Price

As shown in Table 2, the potential cost savings with reused or refurbished furniture are substantial. Other figures quoted are more conservative but still mention cost savings of 25-50%¹³. Due to the fact that the major environmental impact of furniture products is associated with the materials used in production – refurbished furniture can greatly reduce these impacts too.

One study considered that the carbon footprint of a typical office chair (82kg CO₂e) and a typical office desk (146kg CO₂e) can be reduced by 45% and 35% respectively if minimal refurbishment results in the lifetime being doubled. Even complete replacement of the work surface of a desk can result in carbon emissions being reduced by 20%¹⁴.

Stakeholder Discussion

During the stakeholder meetings, the potential to include criteria that would facilitate the procurement of refurbished furniture was discussed. There was support to include such criteria since it is obvious how such products have much lower environmental impacts than new items. However, concerns were also expressed that such products cannot be properly tested for certain technical and safety requirements according to EN standards.

Ambition level and best practice

There are a number of different approaches which procurers can take to refurbished furniture:

- Procure refurbished furniture products directly from third parties.
- Procure a refurbishment service for their existing furniture stock in order to reduce or completely avoid the need to procure new furniture.
- Procure new furniture with clauses that permit 3rd parties, mainly not-for-profit organisations, to accept the furniture at EoL with the condition that it will be reused or refurbished prior to reuse.

The first point may not be appropriate for GPP at this moment due to the low quantity of suitable refurbished furniture available on the market and because of doubts over the history of the furniture products how to prove that the furniture was really refurbished in the first place.

The third point is interesting but does not actually reduce the demand for new furniture by public organisations.

The second point is considered as the optimum ambition level because the need to procure new furniture is reduced and the procurer will be assured that the refurbished furniture items originated from themselves due to the fact that it is a closed-loop service where the contracting authority actually provides the old furniture to be refurbished to the service provider and receives back the refurbished furniture product(s) as illustrated in Figure 4 below.

¹² UK Government Buying Standards Impact Assessment: accessed: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341462/Furniture_GBS_impact_assessment_14_07.pdf

¹³ Walsh, 2011. "Public procurement of remanufactured products. An examination of the potential for increasing the use of remanufactured products by local authorities in the North East of England". See: <http://www.remanufacturing.org.uk/pdf/story/1p484.pdf>

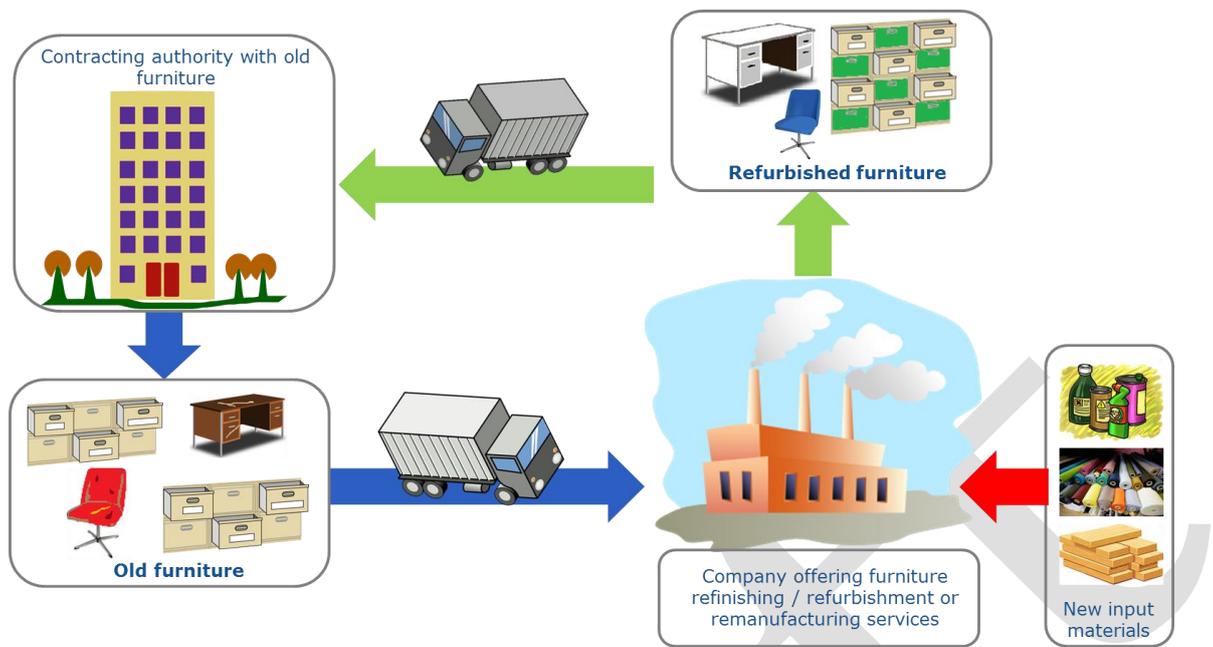


Figure 4. Flow diagram of a "closed loop" refurbishment/manufacturing/refinishing operation.

(i) Best practice with the closed loop approach – tenderer side

Discussions with a leading company in Belgium led to an understanding of what could be considered to be best practice in this area. The company was ISO 14001 and EMAS certified and with each project, discusses with the client what standard options, materials and services the company can offer although any custom requests are also welcomed. Due to the nature of most refurbishment operations, the furniture must be transported to the service providers' site, although some minor operations can be carried out at the client's site. The company keeps an inventory of any new materials and chemicals used during the refurbishment operation and uses an LCA tool to calculate the CO₂ equivalent savings due to the refurbishment operation compared to a typical scenario if new furniture was instead purchased. A certificate of the CO₂ savings is presented to the client. It was emphasised that in addition to CO₂ savings, there were considerable economic savings too. However, the potential for companies offering refurbishment services to enter into invitations for tender was completely blocked if requirements for compliance with EN testing standards or proof of origin of wood were included.

The use of existing furniture in a "closed loop" from the client greatly simplifies the calculation of the LCA savings and can allay any concerns from clients about the quality of the product provided. Some type of furniture products lend themselves better to refurbishment than others. For example, more complex refurbishment operations that require cutting and reshaping of wooden materials cannot always be carried out with lower quality wooden panels.

(ii) Best practice with the closed loop approach – procurer side

The UK can be considered as one of the leading authorities. In response to a perceived lack of demand, the UK Government has outlined plans to increase the amount of refurbished or refinished furniture, as reflected in the wording of their recently revised (June 2014) furniture buying standards¹⁴.

¹⁴ <http://sd.defra.gov.uk/advice/public/buying/products/furniture/standards/>



Figure 5. Hierarchical approach promoted by the UK government for furniture procurement.

Unfortunately, as of November 2014, no furniture refurbishment framework contract had yet been signed by the centralised UK procurement organisation (the Crown Commercial Service) although it will be very helpful in the future to understand the issues that may arise for procurers with such contracts.

(iii) Degrees of refurbishment

The term "refurbishment" is considered as a catch-all term to include the various degrees of repair, refurbishment and refinishing that may be applied to a furniture product that contribute towards the product looking and/or functioning "as new" but also for other operations (i.e. remanufacturing, reupholstering and remodelling) that may transform the product into something unrecognisable from the original product. As a guide to procurers, the following terms and definitions will be considered to fall within the scope of furniture refurbishment:

- Surface refinishing (of coated wooden surfaces): complete removal of the original finish, sanding of the freshly exposed wood, followed by staining and sanding again prior to the application of a new finish. The finish will likely include more than one coating and the type of coating(s) used in the finish will depend on the requirements of the customer. This operation will completely change the appearance of the product which will appear "as new".
- Surface refurbishing (of coated wooden surfaces): Colouring or filling of scratches and chips as well as blending of any worn areas by the application of new stain. May include a complete new top coating on top of the existing surface finish. Not as extensive a job as refinishing and cheaper. This operation may also completely change the appearance of the product depending on the nature of the top layer, if one is applied. Product will have an "as new" appearance. In certain cases, due to silicone and other contaminants, an unsatisfactory uneven surface may occur, in which case surface refinishing would be necessary.
- Touch up / spot repair (of coated wooden surfaces): Repairs made by colouring or filling of isolated scratches or other visible damage and blending into the surrounding area. Much simpler task than refinishing or surface refurbishment and may be carried out at the customers site.
- Mechanical refurbishment: Tasks will vary depending on the nature of the furniture product but may include tasks such as checking, lubrication, adjustment, tightening, repair and/or replacement of: drawer runners, table slides, joints, protective floor glides, gas-lifts, doors and drawers.
- Reupholstering: May include the basic repair of torn upholstery fabric covering material, the complete replacement of the upholstery fabric covering material, the replacement of the underlying padding material or the replacement of both the padding material and covering fabric.

- **Remodelling:** Involves the conversion of an existing furniture product (or products) into a new furniture product (or products) with different dimensions and/or functionality. For example the conversion of a large L-shaped desk into two smaller rectangular desks or conversion of a TV cabinet with open shelves into a set of drawers.

In order to estimate the cost of any refurbishment operation, it is necessary to understand clearly the initial condition of the furniture and the desired end product. Based on the difference between the starting furniture and the desired output, the refurbishment operations that are needed can be identified. This information should be provided in the Invitation to Tender (ITT) as far as possible.

The tenderer should be afforded the freedom to decide precisely how much of the original material can be used in the refurbished product(s) in order to produce good quality furniture that meets any other relevant technical specifications. However, the contracting authority may wish to fix certain requirements such as the colour and material for any upholstery or dimensional requirements.

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS1: Refurbishment requirements</p> <p>The contractor shall refurbish the furniture items provided by the contracting authority according to the specified requirements.</p> <p>Depending on the kind of furniture to be refurbished and the condition of the existing furniture, the public authority shall detail as much as possible the operations to be carried out (e.g. re-spraying of metalwork, repair and/or re-finishing of wood surfaces, re-upholstery, desk conversions etc.)</p> <p>Verification:</p> <p>The tenderer shall provide details of all the refurbishing operation(s) to be carried out.</p>	<p>TS1: Refurbishment requirements</p> <p>The contractor shall refurbish the furniture items provided by the contracting authority according to the specified requirements.</p> <p>Depending on the kind of furniture to be refurbished and the condition of the existing furniture, the public authority shall detail as much as possible the operations to be carried out (e.g. re-spraying of metalwork, repair and/or re-finishing of wood surfaces, re-upholstery, desk conversions etc.)</p> <p>Verification:</p> <p>The tenderer shall provide details of all the refurbishing operation(s) to be carried out.</p>

Summary of rationale:

- Clear potential for environmental benefits and economic savings with refurbishment.
- Necessary to clarify what scale or type of refurbishment is expected from tenderers.
- Does not necessarily limit the tenderers to specific refurbishment operations if they believe a slightly different approach can be taken to achieve the same result at a lower cost.

Technical specification 2: Durable upholstery coverings

Why relevant to GPP award criteria?

The physical requirements for upholstery covering materials are of paramount importance to upholstered furniture products. Poor quality covering materials are more likely to suffer from wear and tear and even minor damage will grow into more serious damage with continued normal use if the covering material is not repaired. Damage to upholstery covering materials is highly visual and may lead to consumer association with low quality products and perhaps result in premature end-of-life of the entire product.

This is an especially important consideration with GPP since the price is the determinant factor in the award of the tender and that lower quality and less durable upholstery materials are frequently cheaper than good quality and more durable materials. Consequently, the use of higher quality upholstery materials, due to their impact on improved durability of the entire furniture product, should be either specified as minimum requirements as a safeguard against cheaper and less durable alternative materials being used or at least as an award criterion to encourage tenderers to source more durable materials even if these are slightly more expensive.

Furniture upholstery materials (ignoring padding) generally fall into three main categories:

- Textile fabrics (such as cotton, wool, polyester);
- Coated fabrics (i.e. continuous layers of typically PVC or polyurethane that may have a textile backing – often regarded as artificial leather); or
- Genuine leather.

Stakeholder discussion

Representatives from the leather industry highlighted that there has been a long history of dialogue between furniture manufacturers and leather producers regarding what is good quality leather that is fit for use in furniture and what is not. This has resulted in the publication of *EN 13336: "Leather – Upholstery leather characteristics – Guide for selection of leather for furniture"*. Table 7 of Appendix I is identical to the physical quality requirements set out in EN 13336.

For coated fabrics, the physical quality requirements set out in Table 9 of Appendix I have been developed in collaboration with industry representatives. The values stated in Appendix I are considered to represent high quality coated fabrics that would effectively prevent the use of much cheaper and lower quality coated fabrics being used.

What relevant ecolabel criteria and other green initiatives say

The French NF 217 Ecolabel for furniture (version 10, Jan. 2014) simply requires that any textile coverings used must meet the requirements of the EU Ecolabel for textiles or any other regionally recognised ISO Type I Ecolabel or the OEKO-TEX 100 standards.

The Blue Angel RAL UZ 148 (Jan. 2010) criteria for low emission upholstery leathers simply requires that any leather should comply with requirements for safety, abrasion resistance, tensile strength, light-fastness, rub-fastness and deformation to compression as per existing ISO, EN or DIN standards.

The Nordic Ecolabel for textiles, hides/skins and leather (version 4.0, Dec. 2012) has a series of physical requirements for textile fabrics. Dimensional changes during washing of furniture fabrics should be less than or equal to 2.0% after washing according to EN 6330 and ISO 5077 tests at the temperature stated on the fabric. Colour fastness to washing for removable and washable furniture fabrics that are non-white and have been dyed or printed, should be at least level 3-4 according to ISO 105 C06. Resistance to wet rubbing and dry rubbing should be at least level 2-3 and level 3-4 respectively according to ISO 105 X12 for any non-white furniture fabrics that have been dyed or printed. Colour fastness to light must be level 5 for furniture fabrics according to EN ISO 105 B02

although a level of 4 is permitted for light coloured fabrics of certain fibre blends. The resistance to pilling of furniture fabrics needs to be at least level 4 according to EN ISO 12945-2.

The EU Ecolabel for textiles addresses the same physical requirements for textiles as mentioned for the Nordic Ecolabel and is virtually identical in the ambition level and applicable conditions.

This EU GPP award criterion follows the same criteria addressed by the Nordic and EU Ecolabel for textiles. Each of the requirements can be verified by well-established international standards. Consequently, any suppliers who make the effort to produce compliant coated fabric, leather or textile fabric upholstery covers can appeal not only to textile companies and furniture companies that are interested in applying for an EU Ecolabel license but also to those companies that want to be more competitive in relevant EU GPP ITTs.

Ambition level

The ambition level for coated fabrics and leathers has been decided in collaboration with industry standards. It should be emphasised that these standards are not legally enforced but are voluntary industry guidelines which, in the case of leather, has been published as an official EN standard.

With textiles, the ambition level broadly aligns with the physical durability criteria set out for EU Ecolabel textiles in Decision 2014/350/EU¹⁵ as far as these criteria are relevant to furniture upholstery.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>Durable upholstery coverings</p> <p><i>(This criterion shall only apply when the refurbishment operations involve the introduction or replacement of upholstery covers).</i></p> <p>Points shall be awarded for upholstery covering materials, which may be based on either textile fabrics, coated fabrics or leather, that comply with all of the physical quality requirements set out in Appendix I as appropriate.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration from the leather supplier, textile fabric supplier or coated fabric supplier as appropriate, supported by relevant test reports, that the upholstery covering material meets the physical requirements for leather, textile fabrics or coated fabrics as specified in Table 7, Table 8 or Table 9 of Appendix I respectively.</p> <p>Upholstery materials holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>	<p>Durable upholstery coverings</p> <p><i>(This criterion shall only apply when the refurbishment operations involve the introduction or replacement of upholstery covers).</i></p> <p>Points shall be awarded for upholstery covering materials, which may be based on either textile fabrics, coated fabrics or leather, that comply with all of the physical quality requirements set out in Appendix I as appropriate.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration from the leather supplier, textile fabric supplier or coated fabric supplier as appropriate, supported by relevant test reports, that the upholstery covering material meets the physical requirements for leather, textile fabrics or coated fabrics as specified in Table 7, Table 8 or Table 9 of Appendix I respectively.</p> <p>Upholstery materials holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>

Summary of rationale:

- Low quality (and cheaper) upholstery coverings can lead to premature end of life of the entire furniture product. It is necessary to incentivise the use of more durable and higher quality upholstery coverings, so that they can be competitive in invitations to tender.
- Physical requirements follow industry guidance for leather and for coated fabrics.
- Minimum requirements for textile fabrics are covered by Nordic and EU Ecolabel criteria.

¹⁵ Commission Decision of 5 June 2014 establishing the ecological criteria for the award of the EU Ecolabel for textile products. OJ L 174, 13.6.2014, p. 45-83.

Technical Specification 3: Warranty and options for repair/ spare parts

Why relevant to GPP?

As stated previously, the lifetime of a furniture product has a strong influence on its environmental impact. However, many of the EN standards relating to the functionality, safety, strength or durability of furniture entail destructive testing, which would not be practical when applying to relatively small groups of refurbished furniture. Instead, it is considered more appropriate to promote the refurbished product's durability, longevity and reparability and to use warranty and spare part availability criteria as a vehicle for improving the durability and potential useable lifetime of the furniture.

The legal guarantee of consumer goods set out in Directive 1999/44/EC only applies to consumers that are physical persons. Legal entities (companies with limited liability, public limited companies, non-profit organisations, public authorities etc.) are not consumers according to the law and thus the EU directive is not applicable.

To avoid possible confusion between legal guarantees and commercial guarantees, the term "warranty" is used instead of "commercial guarantee". It is therefore advisable (unless there are different national rules covering this issue) that the warranty period is set out in the technical specifications.

Stakeholder discussions

Only limited discussion has taken place regarding warranties for refurbished furniture but it was generally agreed that such warranties should be considered as an alternative to requirements for complying with any relevant EN technical standards relating to the product type.

Ambition level

There are several examples of companies based in North America that provide warranties ranging from 0 to 5 years for refurbished office furniture products. In the EU, there is much less information available regarding warranties with refurbished furniture. The provision of product warranties with refurbished furniture is likely to result in a cost increase to the procurer.

It would be reasonable to ask as a core level requirement that the refurbished furniture meets the same minimum legal requirements that are set out for new furniture products sold to end consumers. At the comprehensive level, it appears that 5 years would reflect the best practice currently available in North America.

Although the EU Ecolabel criteria for furniture only apply to new furniture, the comprehensive level of GPP criteria aligns with the EU Ecolabel ambition level while the core level is an identical approach, but simply for a shorter period of time.

During the warranty period, if the furniture product is found to be out of conformity with the contract specifications, spare parts or any relevant repair and replacement service needed should be provided at no additional cost to the contracting authority so long as the lack of conformity can be presumed to have arisen either before use or only after normal use.

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS2: Refurbished furniture product warranty</p> <p>The tenderer shall provide a minimum of a two year warranty, covering repair or replacement, during which time they shall ensure that the goods are in conformity with the contract specifications at no additional cost.</p> <p>Verification:</p> <p>The tenderer shall provide a copy of the warranty terms and conditions and a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p>	<p>TS2: Refurbished furniture product warranty</p> <p>The tenderer shall provide a minimum of a five year warranty, covering repair or replacement, during which time they shall ensure that the goods are in conformity with the contract specifications at no additional cost.</p> <p>Verification:</p> <p>The tenderer shall provide a copy of the warranty terms and conditions and a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p>

Summary of rationale:

- Warranties are of particular importance in refurbished products since compliance with technical standards applicable to new items cannot reasonably be expected.
- The level of ambition at the core level reflects the length of warranty that would apply to new products in the EU while the comprehensive level reflects best-practice amongst suppliers of refurbished office furniture and also aligns with the EU Ecolabel ambition level.
- The useful lifetime of refurbished furniture is an important aspect of furniture LCA.

Award criterion 1: Low chemical residue upholstery coverings

Why relevant to GPP?

Upholstery covering materials may come into direct skin contact with users and the potential presence of hazardous substance is an obvious concern. Where skin contact is possible, assessment of the extractability of substances from materials in contact with artificial sweat solutions is relevant. Of particular concern are heavy metals that may be used in dyes, residual formaldehyde and arylamines. Test methods and standards for the analysis of textiles and leather are well established and can be verified by testing of the final material.

Due to uncertainty over the market availability of upholstery fabrics and leather that meet this criterion, it was considered that this would not be suitable as a minimum technical specification but only as an award criterion. Nonetheless, furniture refurbishment is an ideal opportunity to introduce upholstery covers of good environmental performance.

Stakeholder discussion

The substances to test for and applicable limits are the same as those applied in other "green" schemes and so no detailed discussion took place amongst stakeholders. The standards apply to either leather or textile fabrics, although a representative of the coated fabric industry confirmed that the tests and limits for textiles fabrics could also be applied to coated fabrics.

What relevant ecolabel criteria and other green initiatives say

The FEMB sustainability basic level requirements for office and non-domestic furniture for indoor use (Draft 2, July 2012) list 29 azo dyes that are classified as either carcinogenic or that may cleave to form carcinogenic by-products and states that these should not be present (i.e. not exceed 20mg/kg per substance) in any textile or leather used in the furniture product if that leather or textile is used in proportions that exceed 1% of the furniture product weight. The same basic level requirements set a limit of 300 mg/kg for free formaldehyde. The advanced level requirements simply state that the textile or leather should meet the requirements of any regionally recognised ISO Type I ecolabel (including the EU Ecolabel, OEKO-TEX 100, Blue Angel RAL UZ 154 for textiles or RAL UZ 148 for leather).

The French NF 217 Ecolabel for furniture (version 10, Jan. 2014) simply requires that any textile coverings used must meet the requirements of the EU Ecolabel for textiles or any other regionally recognised ISO Type I ecolabel or the OEKO-TEX 100 standards.

The Blue Angel RAL UZ 148 (Jan. 2010) criteria for low emission upholstery leathers set the same limit of 3 mg/kg for chromium VI in leather as stated here. A list of 9 carcinogenic, mutagenic or toxic to reproduction (CMR) azo dyes, 22 azo dyes that may cleave to form CMR by-products and 20 potentially sensitising dyes are specifically banned. Furthermore, no dyes or pigments based on cadmium, mercury, lead or nickel are permitted. These same conditions apply in RAL UZ 117 for low-emission upholstered furniture (Sept. 2009).

The Nordic Ecolabel for textiles, hides/skins and leather (version 4.0, Dec. 2012) has the same limit of 3 mg/kg for chromium VI in leather but also introduces further requirements of no lead or cadmium being detectable (with 10 mg/kg considered as the limit of detection). A list of 23 azo dyes that are not permitted to be used is also provided. The limits for free or partly hydrolysable formaldehyde in textiles are set to 20 mg/kg and for leather, 75 mg/kg.

The OEKO-TEX standard defines limits for four categories of textiles (I – baby, II – direct skin contact; III- no direct skin contact and IV – decoration material). The criteria set out limits different chemical residues in the final textile product. For formaldehyde, the EU GPP limits correspond to OEKO-TEX Category III and IV textiles and for extractable heavy metals, the limits correspond to OEKO-TEX limits for Category II, III and IV textiles.

The EU Ecolabel for textiles (Decision 2014/350/EU) sets a stricter limit of 75 mg/kg for free formaldehyde in textiles and the limits for extractable heavy metals are the identical to those proposed with this EU GPP award criterion. Furthermore a list of 24 carcinogenic arylamines that should be tested for in textiles is provided as well as an indicative list of 142 dyes which may cleave to form carcinogenic arylamines and whose use is not recommended and a list of 30 dyes which are CMR and/or potentially sensitising and whose use is banned.

Ambition level

As a general note, the levels of residues in textiles have stricter limits for those products intended for use with babies or children less than 3 years old and in particular with clothing. Such products are not considered as a predominant factor in GPP for furniture and so the ambition level has been aligned with the requirements for typical furniture products used in offices and commercial environments.

The restricted arylamine compounds may be present not only due to the direct use of restricted dyes but also as by-products of a side-reaction from non-restricted dyes. These substances were included in entry 43 of XVII of REACH and are listed in Appendix II along with a list of non-restricted dyes that could create residues of these restricted arylamines via side reactions. This should help ensure that textile/leather manufacturers are more aware of certain dyes that are best not to use, even if they are non-restricted under REACH. The 30 mg/kg limits for each arylamine stated in the criteria refer to those limits above which the presence of the substances can be reliably confirmed beyond background noise and interference from other compounds.

Formaldehyde is a chemical residue that is often left after finishing treatments. The most serious hazard classification it has is H351 (suspected of causing cancer) and it is also classified as H317 (skin sensitiser), which is of concern in furniture upholstery that come into direct and prolonged skin contact with users. The free formaldehyde limit of 300 mg/kg aligns with the requirements set out in the OEKO-TEX 100 standards for Category II, III and IV textile products.

For artificial sweat extractable heavy metals, the limits are aligned with the OEKO-TEX limits for Category II (direct skin contact). The OEKO-TEX limits are identical for Category III (no direct skin contact) and Category IV (decoration materials) textiles. Chromium VI is a concern that is unique to leather due to the potential use of large quantities of chromium-based tanning agents.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>AC2: Low chemical residue upholstery coverings</p> <p>Points shall be awarded where the upholstery covering material is shown to comply, as appropriate, with the limits for restricted arylamine dyes, extractable heavy metals and free formaldehyde set out below.</p> <p>For textile fabrics and coated fabrics:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 14362-1 and 14362-3. • Free and partly hydrolysable formaldehyde ≤75 mg/kg according to EN ISO 14184-1. • Extractable heavy metals determined according to EN ISO 105-E04 being less than the following limits (in mg/kg): antimony ≤30; arsenic ≤1.0; cadmium ≤0.1; chromium ≤2.0; cobalt ≤4.0; copper ≤50; lead ≤1.0; mercury 	<p>AC2: Low chemical residue upholstery coverings</p> <p>Points shall be awarded where the upholstery covering material is shown to comply, as appropriate, with the limits for restricted arylamine dyes, extractable heavy metals and free formaldehyde set out below.</p> <p>For textile fabrics and coated fabrics:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 14362-1 and 14362-3. • Free and partly hydrolysable formaldehyde ≤75 mg/kg according to EN ISO 14184-1. • Extractable heavy metals determined according to EN ISO 105-E04 being less than the following limits (in mg/kg): antimony ≤30.0; arsenic ≤1.0; cadmium ≤0.1; chromium ≤2.0; cobalt ≤4.0; copper ≤50.0; lead ≤1.0; mercury

<p style="text-align: center;">≤0.02 and nickel ≤4.0.</p> <p>For leather:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 17234-1. • Chromium VI not detectable above 3 mg/kg according to EN ISO 17075. • Free and partly hydrolysable formaldehyde ≤300 mg/kg according to EN ISO 17226-1. • Extractable heavy metals determined according to EN ISO 17072-1 being less than the following limits (in mg/kg): antimony ≤30; arsenic ≤1.0; cadmium ≤0.1; chromium ≤200; cobalt ≤4.0; copper ≤50; lead ≤1.0; mercury ≤0.02 and nickel ≤1.0. <p>Verification:</p> <p>Points shall be awarded to tenderers that provide a declaration that the leather, textile fabric or coated fabric upholstery covering material, as appropriate, complies with the above limits, supported by results from relevant test methods either commissioned by the tenderer themselves or the material supplier.</p> <p>Furniture products or textile fabrics holding a relevant ISO Type I ecolabel fulfilling the listed requirements shall be deemed to comply.</p>	<p style="text-align: center;">≤0.02 and nickel ≤1.0.</p> <p>For leather:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 17234-1. • Chromium VI not detectable above 3 mg/kg according to EN ISO 17075. • Free and partly hydrolysable formaldehyde ≤75 mg/kg according to EN ISO 17226-1. • Extractable heavy metals determined according to EN ISO 17072-1 being less than the following limits (in mg/kg): antimony ≤30.0; arsenic ≤1.0; cadmium ≤0.1; chromium ≤200; cobalt ≤4.0; copper ≤50.0; lead ≤1.0; mercury ≤0.02 and nickel ≤1.0. <p>Verification:</p> <p>Points shall be awarded to tenderers that provide a declaration that the leather, textile fabric or coated fabric upholstery covering material, as appropriate, complies with the above limits, supported by results from relevant test methods either commissioned by the tenderer themselves or the material supplier.</p> <p>Furniture products or textile fabrics holding a relevant ISO Type I ecolabel fulfilling the listed requirements shall be deemed to comply.</p>
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Summary of rationale:

- Chemical residues are inevitable in textile, coated fabric and leather upholstery, but these should be minimised as far as is practical in materials that can be expected to come into direct skin contact, such as furniture upholstery.
- The arylamine dyes, extractable heavy metals and free formaldehyde are common chemical residues of concern in these type of materials.
- The requirements stated in this award criterion align with the relevant requirements of OEKO-TEX 100, EU Ecolabel textiles and so should help reinforce these schemes, by incentivising furniture refurbishers to try to source them in order to make their bids more competitive.

Award criterion 2: Extended warranty periods

Why relevant to GPP?

Extended warranty periods, although not a concrete guarantee that the product is more durable, nonetheless represents a commitment from the producer that the furniture product has been designed and built in a robust and durable fashion to the extent that they are confident it can maintain its fitness for use during a longer period.

The warranty indirectly encourages that the furniture product should be straightforward to repair or to change replaceable parts for damage that has the highest probability of occurring.

As mentioned with earlier criteria, any improvement in the durability or useable lifetime of the furniture product has clear and direct benefits on the life cycle impact of the product due to the fact that most impacts are associated with the raw materials used in furniture and their processing into useable component parts or materials in the final product.

Stakeholder discussion

Stakeholders were largely against the idea of extended warranties on furniture products. They pointed out that many promises can be made to win points in an ITT but what really matters is who the terms and conditions of any extended warranty, which are often far from clear, may be applied in cases where a lack of conformity of the furniture arises. So unless the terms and conditions required in an extended warranty are made clear in an ITT and required to be essentially identical for all tenderers, then such a criterion could potentially become problematic.

What do other relevant ecolabel criteria and green initiatives say?

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) a 5 year commercial warranty be applied to furniture products at the prerequisite level or a 10 year commercial warranty at the advanced level.

The French NF 217 Ecolabel for furniture (version 10, Jan. 2104) does not make any clear provision about final product guarantees or warranties, but simply a 5 year commitment to provide spare parts.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) does not make a specific commitment to a certain minimum warranty period but only to compliance with relevant EN or ISO fitness for use standards.

The Blue Angel criteria for low emission upholstered furniture (RAL UZ 117, Sept. 2009 version) and for low emission furniture and slatted frames made of wood and wood-based materials (RAL UZ 38, Jan. 2013 version) specify a minimum 5 year guarantee of furniture parts that are subject to wear, such as hinges, locks and table leaves, but not lights or light fittings.

Ambition level

It is difficult to set a universal minimum warranty period for all furniture products because there is such a huge range of products within the scope, each with different types or use and subject to different types of wear and tear, so contracting authorities are strongly encouraged to investigate what is a reasonable warranty period to expect for the specific furniture types they are seeking to procure.

In TS9, core and comprehensive warranty periods are set out at 3 and 5 years respectively. Going beyond these would then bring the ambition level in line with the FEMB sustainability requirements for office and non-domestic furniture for indoor use.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>Extended warranty periods</p> <p>Additional points shall be awarded to each additional year of warranty offered that is more than the minimum technical specification as follows:</p> <ul style="list-style-type: none"> - 4 or more years extra warranty: x points - 3 years extra warranty: 0.75x points - 2 years extra warranty: 0.5x points - 1 year extra warranty: 0.25x points <p>Verification:</p> <p>A copy of the warranty terms and conditions shall be provided by the tenderer as well as a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p>	<p>Extended warranty periods</p> <p>Additional points shall be awarded to each additional year of warranty offered that is more than the minimum technical specification as follows:</p> <ul style="list-style-type: none"> - 4 or more years extra warranty: x points - 3 years extra warranty: 0.75x points - 2 years extra warranty: 0.5x points - 1 year extra warranty: 0.25x points <p>Verification:</p> <p>A copy of the warranty terms and conditions shall be provided by the tenderer as well as a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p>

Summary of rationale:

- Extended product warranties are a very relevant proxy measure for durable and robust products with a longer expected lifetime than other products with shorter warranties.
- The increased risk to tenderers of future repair and replacement costs caused by an extended warranty is likely to result in an increased cost of the furniture product. For this reason, if the contracting authority wishes to encourage products with longer warranties to be more competitive with other equivalent products with shorter warranties, then an award criterion should be used.

5. APPROACH 2 – PROCUREMENT OF NEW FURNITURE

As stated earlier, the procurement of new furniture should only be considered by following the hierarchical approach illustrated in Figure 5. Only if the procurement of refurbished furniture cannot meet the requirements of the contracting authority, then the procurement of new furniture should be considered.

More extensive criteria can be set for new furniture products since far more information about the materials can be known and verified. Some of the criteria are common to both refurbished furniture and new furniture, for example the award criterion for take-back schemes, but may be worded in a slightly different manner due to the nature of these schemes.

As with the criteria for refurbished furniture, a significant number of award criteria are included in order to encourage innovation amongst manufacturers and to reinforce criteria that already exist in relevant Type I ecolabels. A summary of the proposed GPP criteria for new furniture are shown below:

Table 3. Overview of GPP criteria structure for the procurement of new furniture

Criterion	Minimum technical specifications	Award criteria
TS-1: Responsibly sourced wood	X	
TS-2: Formaldehyde emissions from wood-based panels	X	
TS-3: Coating formulation hazard restrictions	X	
TS-4: Metal treatment restrictions	X	
TS-5: SVHC restrictions	X	
TS-6: Durable upholstery coverings	X	
TS-7: Fitness for use	X	
TS-8: Design for disassembly and repair	X	
TS-9: Product warranty and spare parts	X	
TS-10: Collection and End of Life management for furniture	X	
AC-1: Recycled wood content		X
AC-2: Contaminants in recycled wood		X
AC-3: Formaldehyde emissions from wood-based panels		X
AC-4: Marking of plastic parts		X
AC-5: Recycled plastic content		X
AC-6: Low chemical residue upholstery coverings		X
AC-7: Volatile Organic Compound (VOC) emissions		X
AC-8: Collection and End of Life management for furniture		X
AC-9: Extended warranty periods		X

Technical specification 1: Responsibly sourced wood

Why relevant to GPP?

Solid wood, wood chips and wood fibres are renewable raw materials sourced from forests and plantations whose continued availability should be preserved in order to both ensure a sustainable future supply and to protect the important role of forests as biological systems and habitats. The importance of ensuring that the wood and wood-based materials used in furniture products are sourced from legal and sustainable sources makes it a policy objective at national, international and EU level. Moreover, there is significant experience in Member States and within furniture manufacturers in sourcing according to the sustainable forestry criteria of established private certification schemes.

Stakeholder Discussion

The various principles, established criteria and definitions relating to the concept of sustainable forestry were discussed in detail as well as considerations across the supply chain of how to ensure traceability of legal and/or sustainable certified wood and the impact of the relatively recent implementation of the EU Timber Regulation (2010). Specific aspects related to (i) legally sourced wood and (ii) sustainable wood are provided below:

(i) Legally sourced timber

The Timber Regulation (EC) 995/2010¹⁶ introduced new requirements for the sourcing of timber products from 2013. It prohibits illegally harvested timber from being placed on the EU market and introduces requirements for 'due diligence', which it defines as comprising:

- (a) measures and procedures providing access to the [origin of] the operator's supply of timber or timber products placed on the market;*
- (b) risk assessment procedures enabling the operator to analyse and evaluate the risk of illegally harvested timber or timber products derived from such timber being placed on the market.*
- (c) except where the risk identified in course of the risk assessment procedures referred to in point (b) is negligible, risk mitigation procedures which consist of a set of measures and procedures that are adequate and proportionate to minimise effectively that risk and which may include requiring additional information or documents and/or requiring third party verification.*

The Regulation defines legally harvested as wood and wood-based materials (excluding packaging and recycled wood) that has been '*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, 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.

¹⁶ Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market

Valid EU FLEGT and UN CITES licenses are deemed to provide assurance of legality. Europe is in the process of introducing the FLEGT (Forest Law Enforcement Governance and Trade) licensing scheme. FLEGT is based on bilateral agreements between the EU and timber producing countries. Third party forest and forest products certification systems that meet the due diligence criteria set out in Article 6 of the Regulation can be used as a valuable tool in the due diligence system.

(ii) Sustainably Sourced timber

Further investigation of the basis for both European sustainable forestry policy¹⁷ and certification schemes for sustainable forestry¹⁸ confirms their basis in the UNEP and FAO principles of Sustainable Forestry Management (SFM) established at the Rio Earth Summit in 1992¹⁹. These principles, although not defined in specific detail in UNEP or FAO literature, provide an internationally agreed reference point which is used by certification schemes. The conformance of schemes with ISO/IEC 17065 is also a consideration in relation to the quality and assurance provided by the verification systems used²⁰.

In terms of market share the two most significant certification schemes are those operated by the Forestry Stewardship Council (FSC)²¹ and the Programme for the Endorsement of Forestry Certification (PEFC)²². FSC is an NGO-initiated scheme which was formally established following the Rio Earth Summit 1992. The PEFC scheme was founded by national organisations from 11 countries in 1999 and now incorporates the Sustainable Forestry Initiative (SFI), the Malaysian Timber Certification Council (MTCC) and American Tree Farm System (ATFS).

In 2009 these schemes accounted for 9% of global forestry and 26% of industrial timber supplies²³. PEFC is the most significant scheme, accounting for over two thirds of certified timber on the world market. The majority (over 90%) of certified timber originates from Europe and North America.

Belgium²⁴, Denmark, Germany²⁵, the UK²⁶ and the Netherlands²⁷ are notable for their detailed monitoring and evaluation of forestry certification schemes in support of Green Public Procurement (GPP)²⁸. These Member States use their own adapted criteria and processes to determine whether certification schemes provide sufficient assurance. The current consensus of these Member States is that, in general, FSC and PEFC provide sufficient levels of assurance based on their national criteria. Denmark, Germany, the Netherlands and the UK are currently working together to identify the common ground of their respective timber procurement policies.

¹⁷ European Commission, *EU forests and forest related products*, http://ec.europa.eu/environment/forests/home_en.htm

¹⁸ Rametsteiner, E and M, Simula, *Forest certification—an instrument to promote sustainable forest management?* Journal of Environmental Management 67 (2003) 87–98

¹⁹ Castaneda, F. *Criteria and indicators for sustainable forestry management*. UN FAO, <http://www.fao.org/docrep/x8080e/x8080e06.htm#TopOfPage>

²⁰ ISO/IEC 17065: 2012, Conformity assessment – requirements for bodies certifying products, processes or services.

²¹ Forestry Stewardship Council, <http://www.fsc.org/>

²² Programme for the Endorsement of Forestry Certification, <http://www.pefc.org/>

²³ UNECE and FAO (2010) *Forest products annual market review 2009-2010*

²⁴ UK Central Point of Expertise on Timber, *Government procurement of timber in Belgium*, <http://www.cpet.org.uk/uk-government-timber-procurement-policy/international-context/international-policies-1/belgium>

²⁵ Germany Government Procurement Policy, *Wood and paper based products*, http://www.sustainableforestprods.org/tools/german_government_procurement_policy

²⁶ UK Central Point of Expertise on Timber (2008) *Review of forestry certification schemes results*

²⁷ Timber Procurement Assessment Committee, Netherlands, <http://www.tpac.smk.nl/>

²⁸ UK Central Point of Expertise on Timber (2008) *A comparative study of the national criteria for 'legal and 'sustainable' timber and assessment of certification schemes in Denmark, UK, Netherlands and Belgium* <http://www.cpet.org.uk/uk-government-timber-procurement-policy/international-context/international-policies-1/comparativestudy-of-danish-uk-dutch-and-belgium-national-criteria>

What relevant Ecolabel criteria and other green initiatives say

The FEMB sustainability basic level requirements for office and non-domestic furniture for indoor use (Draft 2, July 2012) describes a basic pre-requisite that all wood specified in the product, with the exception of recovered or reused wood, is CITES compliant and/or compliant with the EU Timber Regulation. Advanced level requirements are split into two different ambition levels. The lower level requires that at least 70% (volume or mass) of solid wood or 50% of wood chips/fibres used in wood-based panels is certified as coming from sustainably managed forests according to FSC, PEFC or equivalent schemes. The more ambitious requirement sets a minimum of 95% (volume or mass) of sustainable certified wood or wood-based products.

The French NF 217 Ecolabel for furniture (version 10, Jan. 2014) requires that at least 70% (volume or weight) of all solid wood or 50% of all wood-based materials are certified as coming from sustainably managed forests according to FSC, PEFC or equivalent schemes. Furthermore, the standard specifically states that the percentage can be calculated using a sliding average of supplies over a maximum period of 12 months.

The Blue Angel RAL UZ 38 for low emission furniture and slatted frames made of wood and wood-based materials (Jan. 2013) states that at least 50% of the solid wood or primary raw materials used in wood-based materials shall be sourced from sustainably managed forests. A hierarchical approach to verification is used where the simplest option is for the furniture manufacturer to be CoC certified by FSC or PEFC.

The Nordic Ecolabel for furniture and fitments (version 4.9, Mar. 2011) states that at least 70% by weight of any wood from pine, spruce, birch and tropical timber or 50% by weight of any other type of wood must be derived from sustainable certified forests if the total amount of solid wood in the furniture product exceeds 10% by weight. For wood-based panels, the minimum quantity of sustainable certified wood is 50% by weight and again only applies if wood-based panels account for at least 10% by weight of the furniture product.

The revision of the EU Ecolabel for furniture proposes that at all wood or wood based materials should be legally sourced and that at least 70% by weight of wood or wood-based materials shall be sourced from sustainably managed forests or pre-consumer or post-consumer recycled material.

Ambition level

A basic requirement for all wood to be legally sourced may not seem very ambitious when considering the obligations of the EU Timber Regulation. However, there is still a risk that wood or wood-based materials in furniture provided under a public contract may come from non-legal sources. A number of exemptions apply to the application of the EU Timber Regulation, which include products that fall under the following custom codes:

- 9401: Seats (excluding those of heading 9402), whether or not convertible into beds, and parts thereof.
- 9402: Medical, surgical, dental or veterinary furniture; barbers' chairs & similar chairs, having rotating parts of the foregoing articles
- 9403 80 00: Furniture of other materials, including cane, osier, bamboo or similar materials
- 9403 90: Furniture parts

Even if it does not contravene the EU Timber Regulation, the discovery that procured furniture contains wood sourced from illegally harvested wood poses a reputational risk for the contracting authority. Public authorities, which wish to have a higher degree of reassurance that the timber is actually legally sourced, can include a selection criterion regarding the technical ability of the tenderer to ensure compliance with the obligations from the EU Timber Regulation (but not excluding the furniture

items listed above) combined with a contract performance clause requiring that the timber supplied under the contract has been legally placed on the market.

Although certified sustainable wood is available, supply chain development may be required to build relationships with alternative suppliers in some countries. The most ambitious requirement would be to request 100% certified sustainable wood. However, this could be difficult to achieve due to possible fluctuations in market supply, particularly for SMEs that are accustomed to working with a limited number of suppliers.

Criteria proposal (for furniture that consists of at least 10% by weight wood or wood-based materials)

Core criteria	Comprehensive criteria
SELECTION CRITERIA	
<p>TS1: Legal sourcing of wood or wood-based materials</p> <p>Tenderers must demonstrate their technical capacity to comply with the requirements of Regulation (EU) 995/2010 (EU Timber Regulation) in the supply of solid wood or wood-based products required under this contract, namely to demonstrate that such products are placed legally on the EU market.</p> <p>Verification:</p> <p>Technical capacity in this regard may be demonstrated by showing that the tenderer, or the operator supplying the wood if this is not the tenderer, has in place a due diligence system in accordance with Article 6 of the EU Timber Regulation. Where tenderers are Traders within the meaning of the Regulation they must also provide information regarding their technical capacity to demonstrate traceability of wood in accordance with Article 5.</p>	<p>TS1: Legal sourcing of wood or wood-based materials</p> <p>Tenderers must demonstrate their technical capacity to comply with the requirements of Regulation (EU) 995/2010 (EU Timber Regulation) in the supply of solid wood or wood-based products required under this contract, namely to demonstrate that such products are placed legally on the EU market.</p> <p>Verification:</p> <p>Technical capacity in this regard may be demonstrated by showing that the tenderer, or the operator supplying the wood if this is not the tenderer, has in place a due diligence system in accordance with Article 6 of the EU Timber Regulation. Where tenderers are Traders within the meaning of the Regulation they must also provide information regarding their technical capacity to demonstrate traceability of wood in accordance with Article 5.</p>
CONTRACT PERFORMANCE CLAUSE	
<p>Legally sourced wood or wood-based materials</p> <p>All wood or wood-based products used in the furniture product must have been placed legally on the EU market in accordance with Regulation (EU) 995/2010 (EU Timber Regulation.)</p> <p>In order to demonstrate compliance with the EU Timber Regulation, the tenderer, if a ‘trader’²⁹, shall be able to identify:</p> <ul style="list-style-type: none"> - The operators or the traders who have supplied the timber and timber products used in construction of the building; - Documents or other information indicating compliance of those timber products with the applicable legislation; - Evidence of the risk assessment and mitigation procedures put in place in accordance with Article 6(1) (b) and (c) of Regulation (EU) 995 of 2010. <p>If the lead contractor is an ‘operator’³⁰, they shall be required to provide the following information in respect</p>	<p>Legally sourced wood or wood-based materials</p> <p>All wood or wood-based products used in the furniture product must have been placed legally on the EU market in accordance with Regulation (EU) 995/2010 (EU Timber Regulation).</p> <p>In order to demonstrate compliance with the EU Timber Regulation, the tenderer, whether an ‘operator’¹⁵¹ or a ‘trader’¹⁵⁰, shall be required to provide the following information in respect of timber or timber products provided under the contract:</p> <ul style="list-style-type: none"> - A description of each type of timber used, including the trade name, type of product, the common name of tree species and, where applicable, its full scientific name; - Name and address of the trader who supplied the timber and timber products; - The country of harvest, and where applicable: <ul style="list-style-type: none"> (i) Sub-national region where the timber was

²⁹ ‘trader’ means any natural or legal person who, in the course of a commercial activity, sells or buys on the internal market timber or timber products already placed on the internal market

<p>of timber or timber products provided under the contract:</p> <ul style="list-style-type: none"> - A description of each type of timber used, including the trade name, type of product, the common name of tree species and, where applicable, its full scientific name; - Name and address of the trader who supplied the timber and timber products; - The country of harvest, and where applicable: <ul style="list-style-type: none"> (i) Sub-national region where the timber was harvested; (ii) Concession of harvest; (iii) Quantity (expressed in volume, weight or number of units); - Name and address of the supplier to the operator (trader); - Documents or other information indicating compliance of those timber products with the applicable legislation; - Evidence of the risk assessment and mitigation procedures put in place in accordance with Article 6(1) (b) and (c) of Regulation (EU) 995 of 2010 <p>Valid EU FLEGT or UN CITES licenses and/or third party certification of due diligence according to Regulation (EU) No 995/2010 shall be accepted as evidence of legal harvesting and sourcing.</p>	<ul style="list-style-type: none"> harvested; (ii) Concession of harvest; (iii) Quantity (expressed in volume, weight or number of units); <ul style="list-style-type: none"> - Name and address of the supplier to the operator (trader); - Documents or other information indicating compliance of those timber products with the applicable legislation; - Evidence of the risk assessment and mitigation procedures put in place in accordance with Article 6(1) (b) and (c) of Regulation (EU) 995 of 2010 <p>Valid EU FLEGT or UN CITES licenses and/or third party certification of due diligence according to Regulation (EU) No 995/2010 shall be accepted as evidence of legal harvesting and sourcing.</p>
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Sustainable Sourcing of Wood or wood-based materials

These GPP criteria do not include a proposal on the sourcing of wood from sustainable forestry, for the following reasons:

Several Member States are using their own GPP/SPP criteria to define sustainable management of forests and have different processes in place to determine whether certification schemes provide sufficient assurance. Work between leading Member States (Belgium, Denmark, Germany, the UK and the Netherlands) is under way to identify common ground. In this situation, it was not possible, within the framework of this criteria development process, to provide a harmonised definition of sustainable managed forestry. Once the work of the above-mentioned Member States is finalised, the Commission will evaluate the results and decide on possible steps to be taken.

The current consensus of the above-mentioned Member States is that, in general, FSC and PEFC provide sufficient levels of assurance for compliance with their national criteria. Although 100% certified sustainable wood is desirable, it could be difficult to achieve due to possible fluctuations in market demand, particularly for SMEs that are accustomed to working with a limited number of suppliers. Instead, a minimum of 25% sustainable wood should be easily achievable while more ambitious public authorities could set a minimum requirement of 70%, with a recommendation to seek feedback from the market prior to publishing the ITT.

Note to contracting authorities on the legal sourcing of wood:

Suitable remedies should be provided under the contract for cases of non-compliance with the above clause. Advice on the application of these requirements, and the monitoring organisations able to verify compliance, may be obtained from the competent national authorities listed at:

http://ec.europa.eu/environment/forests/pdf/list_competent_authorities_eutr.pdf

³⁰ ‘operator’ means any natural or legal person that places timber or timber products on the market;

Summary of rationale:

- In order to ensure compliance with the EUTR, it is required that for all furniture, even including those items that may be exempted from the requirements of the EUTR such as seating and bamboo furniture, tenderers shall provide documentary evidence of due diligence to verify legal sourcing or traceability along the supply chain. The information requested shall depend on whether the tenderers are 'operators' or 'traders' as defined by the EUTR. Moreover, in GPP, the requirement for due diligence shall be extended to the 'specifier' of wood in the comprehensive criteria in order to promote a higher level of supply chain assurance in furniture contracts.
- Both a Selection criterion and a Contract Performance Clause are proposed in order to provide contracting authorities with additional assurance and risk management that wood is sourced legally.
- For the moment, in view of the differences in national approaches to sustainable timber procurement and the on-going work aiming at identifying the communalities between different schemes, no definitions or proposed criterion addressing the sustainability of timber is proposed within this criteria set.

Draft

Technical specification 2: Formaldehyde emissions from wood-based panels

Why relevant to GPP?

The development of wood-based panels has revolutionised the furniture industry and provides very economical alternatives to solid wood in many products that can also incorporate significant quantities of recycled wood chips and fibres. The most negative aspect of wood-based panels is the use of formaldehyde emitting resins to bind together the wood chips or fibres. Formaldehyde has been previously classified as a Category 2 carcinogen (H351-suspected of causing cancer) but, following a decision by the Risk Assessment Committee in 2012 based largely on animal evidence, is now classified as a Category 1B carcinogen (H350-may cause cancer) in the EU after the 6th Adaptation to Technical Progress of the CLP Regulation³¹. The most commonly used resin formulation in wood-based panels has been urea-formaldehyde (UF). Early formulations used in the 1970's resulted in significant formaldehyde emissions to indoor environments.

With wood-based panel manufacture, most emissions occur during the initial reaction of the formaldehyde resin, which takes place under controlled conditions. As the resin cures, emissions rapidly decrease towards zero. However, unlike VOC emissions from paints, which are also high at the beginning and continually decrease towards zero, panels that use UF resins never reach zero formaldehyde emissions but instead, under constant environmental conditions, reach a steady state equilibrium concentration. This is because the thermoset UF resin can be attacked by atmospheric humidity which leads to the release of small but detectable quantities of formaldehyde that was previously bound in the resin. Ever since the term "sick-building syndrome" was coined for modern buildings, concerns about indoor air quality have increased, as is reflected in the work being carried out by the JRC³² and the ongoing efforts by different Member States such as Belgium, France and Germany with regards to VOC emissions from products. Formaldehyde is arguably the VOC of greatest concern due to its widespread use in wood-based panels, which can appear in furniture, cladding or floor coverings.

In 1985, the E1 standard was introduced in Europe and linked to the EN 717-1 standard method. This method required that after 28 days, the air in a ventilated chamber containing a specific quantity of wood-based panels should reach a steady state concentration of less than 0.1ppm (0.124mg/m³). Currently the E1 standard is defined by the Table given in Annex B of EN 13986 which describes relevant limits considered equivalent to E1 for formaldehyde emissions from wood-based panels according to EN 120, EN 717-1 and EN 717-2.

Stakeholder discussion

Stakeholder opinions can be split into two broad groups: those who consider that the existing E1 standard introduced in 1985 is still appropriate and those who think a more ambitious approach, reducing the limit to 50% of the E1 emission limit, has to be taken to reflect advances made since 1985.

Opinions in favour of the E1 standard argued that toxicological studies show that no conclusive toxic effects are demonstrated when the formaldehyde concentration of the air is below 0.1ppm, that there is limited market availability of panels that meet the 50% of the E1 emission limit and that these

³¹ See the following link for specific changes to formaldehyde classification (entry 605-001-00-5): http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ-JOL_2014_167_R_0004&from=EN To be included in part 3 of Annex VI of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures.

³² Kephelopoulou and Geiss, 2013. Environment and Quality of Life Report No 29. "Harmonisation framework for health based evaluation of indoor emissions from construction products in the European Union using the EU-LCI concept.

panels may have inferior technical properties and durability. However, no clear examples, reports or studies to back up these latter two points were cited. These stakeholders also mentioned that the production processes for wood-based panels are highly optimised and are generally tailored according to the properties of the resin used. Consequently it is not so simple for a manufacturer to simply change from one type of resin to another.

Stakeholders in favour of the lower, 50% of E1 emission limit stated that significant advances have been made in resin formulations that can reduce or even completely eliminate formaldehyde emissions, going well beyond the E1 requirement. The **UF** resin is the most susceptible to attack by atmospheric humidity but resistance can be improved by substituting part of the urea component for melamine (i.e. **MUF**). Pure melamine (**MF**) resins have greater still resistance to formaldehyde emission. This was clearly shown in a study by Kim and Kim³³. Phenol formaldehyde resins (**PF**) are so resistant to formaldehyde release that they are considered as near-zero emission resins. With polymeric diphenyl methane diisocyanate (**pMDI**), the resin itself does not contain any formaldehyde that could be released.

The relevance of any GPP criteria that simply referred to compliance with E1 emissions was questioned due to the fact that for six EU Member States (Austria, Czech Republic, Denmark, Germany, Italy and Sweden), E1 is already a mandatory requirement for all wood-based panels and thus unambitious.

What do relevant ecolabel criteria and other green initiatives say?

The availability of lower emission resins has led to the publication of more ambitious formaldehyde emission standards in Japan (JIS F-star), California (CARB) and requirements in various ecolabel initiatives (i.e. Nordic Ecolabel, Blue Angel and French NF 217). In response to this, some organisations are calling for the development of a new "E1 plus" or "E0" standard that would be equivalent to around 65% of the current E1 threshold limit but no new standard appears to be forthcoming in the foreseeable future at EU level.

The Blue Angel criteria for low emission wood based furniture and slatted frames (RAL UZ 38: Jan. 2013) permit the use of unfaced E1 panels so long as the final product formaldehyde emissions do not exceed 50% of E1 requirements. This is why two bars (one green and one blue) are plotted. However, with Blue Angel criteria for low emission composite wood panels (RAL UZ 76; Apr. 2011) it is simply stated that panels shall comply with the emission requirements of 50% of E1.

The Nordic Ecolabel criteria for furniture and fitments (Version 4.9), distinguishes between MDF and other wood-based panels based on anecdotal evidence from a major Swedish furniture manufacturer that it is extremely difficult to meet 50% E1 requirements with MDF. The exact reason for this may be a combination of the fact that MDF is traditionally made using urea formaldehyde (the highest residual formaldehyde emitting resin type) and the fact that MDF panels can be of varying thicknesses. The thicker panels may struggle to meet the EN 717-1 limits because this test requires that only a fraction of the panel edges be sealed. This could lead to emissions from edges in thicker panels dominating the final result.

Although a direct comparison of formaldehyde emission limits between the CARB, JIS F-star and E1 systems is difficult, due to the fact that they each use different testing methods, research published in the literature where the same products are tested by different methods and the numerical values correlated can allow for an approximate comparison as illustrated in Figure 6^{34,35}.

³³ Kim and Kim, 2005. Comparison of standard methods and GC method in determination of formaldehyde emission from MDF bonded with formaldehyde-based resins. *Bioresource Technol.* Vol 96, p.1457-1464.

³⁴ Groah et al., 1991. Comparative response of reconstituted wood products to European and North American test methods for determining formaldehyde emissions. *Envi. Sci. Technol.*, Vol. 25, p.117-122.

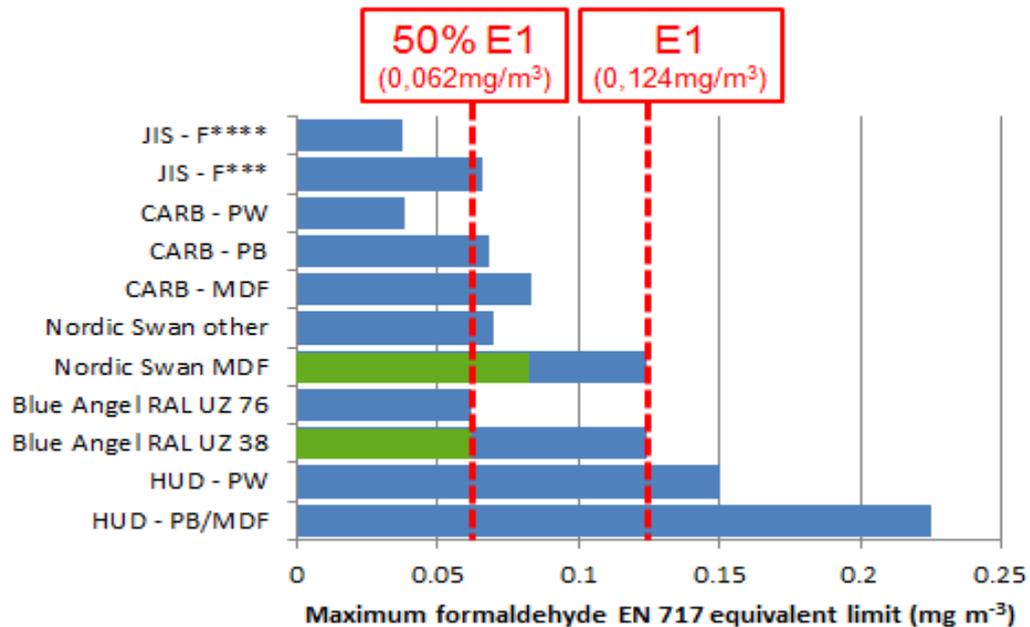


Figure 6. Comparison of formaldehyde emission ambition levels in different schemes for wood-based panels. PW = Plywood; MDF = Medium Density Fibreboard; PB = Particleboard.

The HUD limits are the mandatory maximum formaldehyde emission limits stated in the Housing and Urban Development – Manufactured Home Construction and Safety Standard in place across the US. These are considerably less ambitious (about 80% higher) than E1 although the HUD requirement for plywood (PW) is much closer to the E1 requirement (about 20% higher).

From Figure 6, it is clear that there is a significant discrepancy in formaldehyde emission limits between different schemes and that many of them go far beyond the requirements of E1.

The CARB limits also distinguish between MDF and other panel types but go one step further by also distinguishing plywood from other panels. The CARB Phase II levels are very similar to the Nordic Ecolabel level of 62-63% E1 for MDF and are very close to 50% of E1 for particleboards. With plywood, a stricter limit of around 30% E1 is stated and this can be linked to the fact that plywood manufacture traditionally uses very low emission phenol formaldehyde

The Japanese requirements show that F-3 star levels are roughly equivalent to 50% E1 and the F-4 star level to around 30% E1. The F-4 star level is often considered as the most stringent level for wood based panels constructed with formaldehyde based resins.

The proposed EU Ecolabel criteria for furniture set formaldehyde emissions to 50% of E1 for all wood-based panels except for MDF, which is set to 65% of E1. This criterion would only apply to furniture products where wood-based panels account for at least 5% by weight of the final product.

Ambition level

The E1 standard has been well established within Europe and there are no problems whatsoever with the markets ability to supply such products. Due to doubts about the market availability of "better than

³⁵ Risholm-Sundman et al., 2007. Formaldehyde emission – Comparison of different standard methods. Atmospheric Environment, Vol. 41, p.3193-3202.

E1" panels, and in particular due to a lack of information about any cost premiums that may or may not be associated with these products, the basic E1 requirement has been included as a core level technical specification.

The 65% of E1 requirement aligns well with the Nordic Swan requirements and would allow a sufficient safety margin for other schemes such as CARB and the Japanese F-3 star and 4 star ratings to be accepted as verification with little doubt as to their scientific validity for meeting the criteria.

To incentivise tenderers to try to use low-formaldehyde emission panels in their furniture products, it is proposed to link this minimum technical specification with associated award criteria with a core level awarding of points for using panels that meet 65% E1 and a comprehensive level awarding of points for using panels that meet 50% E1.

To avoid overly burdensome verification efforts, and due to the practical consideration that any formaldehyde emissions from wood-based panels are directly related to the mass fraction of wood-based panels used in the final furniture product (excluding packaging), a minimum threshold of 5% w/w. This approach also aligns with the proposed EU Ecolabel criteria for furniture.

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS2: Formaldehyde emissions from wood-based panels</p> <p><i>(This requirement applies regardless of the weight fraction of wood-based panels in the furniture product)</i></p> <p>All wood-based panels used in the furniture product shall have formaldehyde emission rates that comply with the E1 threshold limits for formaldehyde emissions as defined in Annex B of EN 13986.</p> <p>Verification:</p> <p>A declaration from the wood-based panel supplier shall be provided, stating that the panel is compliant with E1 emission limits and supported by test reports carried out according to either EN 717-1, EN 717-2 or EN 120</p> <p>Wood-based panels holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>	<p>TS2: Formaldehyde emissions from wood-based panels</p> <p><i>(This comprehensive requirement should be considered as of added value if the weight fraction of the wood-based panels in the furniture product exceeds 5%).</i></p> <p>All wood-based panels used in the furniture product shall be shown to have formaldehyde emission rates that comply with 65% of the E1 threshold limits for formaldehyde emissions as defined in Annex B of EN 13986.</p> <p>Verification:</p> <p>A declaration from the wood-based panel supplier shall be provided, stating that the panel is compliant with 65% of E1 emission limits and supported by test reports carried out according to either EN 717-1, EN 717-2 or EN 120</p> <p>Wood-based panels holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>

Summary of rationale:

- Formaldehyde is of concern as an indoor air pollutant because it is slowly released on a continuous basis from wood-based panels due to contact with atmospheric humidity, is volatile and recently classified as a Category 1B carcinogen.
- The E1 standard is included as a basic core minimum technical specification due to doubts about market availability and any possible cost premiums with lower emission panels.
- A more comprehensive requirement of 65% of E1 emissions is also included (if the furniture contains more than 5% w/w of wood based panels) which should of more relevance in the 6 Member States where E1 compliance is already mandatory and would facilitate alignment with a number of other ISO Type I ecolabels that could be used as verification.

Technical specifications 3 & 4: Surface treatment hazard restrictions

Why relevant to GPP?

The surface coating of solid wood, wood-based panels and metal is extremely important to their final aesthetic and technical properties but may involve the use of numerous hazardous substances. The properties of the coating formulation may be hazardous or it may contain certain hazardous ingredients that may or may not be present in sufficient concentrations to impart a hazard classification on the entire formulation.

With solid wood and wood-based materials, the use of certain heavy metals in coating substances can complicate the potential recycling of the wood and wood-based materials if the standard conditions for the delivery of recycled wood, published by the European Panel Federation³⁶, are considered. The continued use of REACH restricted solvents, biocides and other additives may still be the case in non-EU countries.

With metal surfaces, the application of paints is generally to prevent corrosion, this may involve the use of pigments with undesirable hazardous properties. Alternatively, metals can be electroplated with metals such as zinc, cadmium, chromium (III), chromium (VI) or nickel. Such coatings can provide special surface finishes with high scratch resistance, corrosion resistance and aesthetic properties. However, especially cadmium and chromium VI metals present strong environmental hazards.

Another option to improve the corrosion resistance of carbon steels is to alloy the steel with specific additions of chromium and/or nickel in the furnace so that the alloy (i.e. stainless steel) produced has inherent corrosion resistance properties and does not require coating. However, stainless steel is considerably more expensive than carbon steel and it may be cheaper to simply coat or electroplate carbon steel after it has been converted into its final geometric form. With treated metals, especially with nickel, there is a concern that direct skin contact may result in skin sensitization of users.

Stakeholder discussion

Stakeholders were in favour of prohibiting the use of cadmium and chromium VI in the electroplating of metal surfaces. It was stated that chromium III is in many cases a suitable alternative to chromium VI and more economical too. Significant discussion took place regarding the REACH requirements for nickel and its use in articles that are considered to come into direct and prolonged skin contact (See Entry 27 of Annex XVII). A definition of prolonged skin contact, as agreed by CARACAL³⁷, and specifically for this purpose is included below:

"as 10 minutes on three or more occasions within a two week period or 30 minutes on one or more occasions during a two week period"

While such a definition certainly applies to all jewellery, it may or may not always be directly applicable to furniture. For example, a metal desktop, chair backing or arm rest can easily be considered to meet the criteria but chair legs are not so certain.

When talking about the restriction of hazardous substances in paints and varnishes, stakeholders expressed concern that although many formulations contain some ingredients that present hazardous properties, these are often no longer present in the final coating either due to chemical reactions or the evaporation of solvents. Support was expressed for verification efforts focussing on the classification mixture of the formulation and not of all of the ingredients within the formulation. Although some stakeholders stated that certain ingredients should also be specifically banned.

³⁶ "EPF Standard for delivery conditions of recycled wood", October 2002. Can be viewed online at: <http://www.europanel.org/upload/EPF-Standard-for-recycled-wood-use.pdf>

³⁷ See: http://ec.europa.eu/enterprise/sectors/chemicals/reach/caracal/index_en.htm .

Regarding the restriction of ingredients, there was a split in opinion amongst stakeholders. Some believed that the existing requirements of REACH were sufficient and need not be repeated while others stated that REACH does not apply to coating operations carried out in non-EU countries and that REACH does not address the coatings used in coated articles when imported unless this may somehow result in the coated article containing more than 0.1% by weight of Substances of Very High Concern (SVHCs).

What do relevant ecolabel criteria and other green initiatives say?

The French NF 217 Ecolabel for furniture (version 10, Jan. 2104) does not have a specific criterion regarding coating substances used in furniture components.

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) prohibit the use of formulations labelled with "carcinogenic", "harmful to the reproductive system", "mutagenic", "toxic", "allergenic when inhaled", "harmful to the aquatic environment", "cause heritable genetic damage", "danger of serious damage to health by prolonged exposure" or "possible risks of irreversible effects". They also prohibit the use of coatings that contain >60% VOC content, >0.1% aziridine or >0.4% Cr(VI). The total VOC applied should not exceed 35g/m² coated surface area.

The Danish GPP requirements are almost identical to those of the FEMB above except that they do not permit VOC content to be greater than 5% and simply state that no Cr(VI) or aziridine shall be present, without specifying impurity thresholds.

The Belgian GPP criteria are very similar to the Danish but also states specific maximum limits for cadmium and lead concentrations of ≤ 50ppm.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Mar. 2011) distinguish between coatings for metal and wooden surfaces. For metal surfaces, coating formulations must not be classified as "Environmentally hazardous" (basically toxic to the aquatic environment or hazardous to the ozone layer), "highly toxic", "toxic", "carcinogenic", "mutagenic" or "toxic for reproduction". They must also not contain any intentionally added nanoparticles. Electroplating with cadmium, chromium, nickel or zinc is banned although plating with the latter three metals can be permitted in certain exceptional cases. Any chrome plating must be with Cr III and not Cr VI. With wood coatings, they must not be classified as stated above for metal surfaces (i.e. carcinogenic, mutagenic etc.) and must not contain a whole range of other substances, including but not limited to: bisphenol A compounds, PFOS (perfluor octane sulphonic acid and compounds thereof), halogenated organic compounds, phthalates, aziridine and pigments based on lead, tin, cadmium, chromium VI and mercury. Conditions for wooden coatings with regards to VOC content are that the coating must contain ≤5% VOC or if a higher concentration is used, then the total VOC content applied to the surface must be less than 10, 30 or 60g/m² coated surface depending on the type of furniture used.

The German Blue Angel criteria for low-emission furniture made of wood (RAL UZ 38, Jan. 2013 version) require that the coating compounds do not contain constituents that will remain in the same form in the final coating and that possess "carcinogenic", "mutagenic" or "reprotoxic" properties or be listed as substances of very high concern (SVHC) according to REACH Regulation (No. 1907/2006) Article 59(1). Exemptions are made for impurities or residual monomers.

The EU Ecolabel criteria for furniture are currently under revision but aim to take a similar approach by focussing on the CLP information to restrict coating formulations with a more extensive range of hazardous properties than mentioned in the EU GPP criteria below. The proposed EU Ecolabel criteria for furniture has the same restrictions for ingredients in paints and varnishes as mentioned in the comprehensive level criterion.

Ambition level

For ease of verification, the core criteria are set so that a formulation can be quickly screened by looking at the information on containers as per the requirements of the Classification, Labelling and Packaging (CLP) Directive (1272/2008/EU).

A new Global Harmonized System (GHS) of codes and pictograms has been introduced in June 2015. It is proposed that the restrictions should focus primarily on the classifications of highest concern, which are considered as those that are carcinogenic, mutagenic or toxic to reproduction (CMR), those that are acutely toxic and those that can cause specific target organ toxicity (STOT) after a single exposure. The associated codes and pictograms are as follows:

Table 4. Summary of basic CLP hazards to screen for in core and comprehensive criteria.

Type of hazard	Hazard code	Pictogram
Carcinogenic (Category 1A, 1B, 2)	H350, H350i, H351	
Mutagenic (Category 1A, 1B, 2)	H340, H341	
Reproductive toxicity (Category 1A, 1B), (Category 2)	H360, H360F, H360D, H360FD, H361, H361f, H361d, H361fd	
Specific Target Organ Toxicity (Category 1)	H370, H372	
Acute toxicity to aquatic environment	H400	
Acutely Toxic, Oral (Category 1,2,3) Acutely Toxic, Dermal (Category 1,2,3) Acutely Toxic, Inhalation (Category 1,2,3)	H300, H301 H310, H311 H330, H331	

With the comprehensive level criteria, it is requested that ingredients within the formulations are also screened for the presence of certain restricted ingredients. Any information relating to ingredients should be visible in an accompanying Safety Data Sheet (SDS) or, if this is not available, then via similar documentation or a declaration from the supplier of the coating formulation. It is quite common that SDSs will mention any ingredients with hazardous properties down to levels of 0.01% by weight.

The technical specifications are split into two parts, one for paints and varnishes, which may be applied to either wooden or metal components, and another for alloy properties and surface treatment that is specific to metals only. This approach is taken because both criteria may not always apply to a particular furniture product.

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS3: Coating formulation hazard restrictions</p> <p>Coating formulations used to coat any wooden or metal components of the furniture product shall meet the following requirements:</p> <ul style="list-style-type: none"> • Not be classified according to Directive 1272/2008 as Category 1 or 2 carcinogenic, mutagenic or toxic to reproduction. • Not be classified as Acutely Toxic by oral, dermal or inhalation pathways (categories 1, 2 or 3) or to the aquatic environment (category 1). • Not be classified as category 1 for specific target organ toxicity. 	<p>TS3: Coating formulation hazard restrictions</p> <p>Coating formulations used to coat any wooden or metal components of the furniture product shall meet the following requirements:</p> <ul style="list-style-type: none"> • Not be classified according to Directive 1272/2008 as Category 1 or 2 carcinogenic, mutagenic or toxic to reproduction. • Not be classified as Acutely Toxic by oral, dermal or inhalation pathways (categories 1, 2 or 3) or to the aquatic environment (category 1). • Not be classified as category 1 for specific target organ toxicity.

<p>Verification:</p> <p>The tenderer shall declare what coating formulations have been used in the furniture product (if any). This shall be supported by Safety Data Sheets or similar documentation that clearly indicates the hazard classification of the paint or varnish formulation (if any).</p>	<ul style="list-style-type: none"> • Not contain any additives based cadmium, lead, chromium VI, mercury, arsenic or selenium in concentrations exceeding 0.010% by weight. • Not contain any intentionally added phthalates that are classified with any of the hazards described in Article 57 of REACH. <p>Verification:</p> <p>The tenderer shall declare what coating formulations have been used in the furniture product (if any). This shall be supported by Safety Data Sheets or similar documentation that clearly indicates the hazard classification of the paint or varnish formulation (if any) and states whether or not the above listed ingredients have been intentionally added in quantities greater than 0.010% by weight.</p>
<p>TS4: Metal treatment restrictions</p> <p>Any metal components used in the furniture shall meet the following conditions:</p> <ul style="list-style-type: none"> • Stainless steel components that can be considered to come into direct and prolonged skin contact³⁸ shall have a nickel release rate of less than 0.5 µg/cm²/week according to EN 1811. • No metal components shall have been electroplated with cadmium, nickel or chromium VI. <p>Verification:</p> <p>The tenderer shall declare which (if any) of the component parts are made of metal and which (if any) are made of stainless steel and considered to come into direct and prolonged skin contact.</p> <p>The tenderer shall declare if any of the metal component parts have been electroplated and if so, what metal was used in the electroplating operation.</p> <p>Where stainless steel components can be considered to come into direct and prolonged skin contact, the tenderer shall provide a test report according to EN 1811 and a declaration from the supplier of the stainless steel demonstrating compliance with the nickel release rate of 0.5 µg/cm²/week.</p>	<p>TS4: Metal treatment restrictions</p> <p>Any metal components used in the furniture shall meet the following conditions:</p> <ul style="list-style-type: none"> • Stainless steel components that can be considered to come into direct and prolonged skin contact³⁹ shall have a nickel release rate of less than 0.5 µg/cm²/week according to EN 1811. • No metal components shall have been electroplated with cadmium, nickel or chromium VI. <p>Verification:</p> <p>The tenderer shall declare which (if any) of the component parts are made of metal and which (if any) are made of stainless steel and considered to come into direct and prolonged skin contact.</p> <p>The tenderer shall declare if any of the metal component parts have been electroplated and if so, what metal was used in the electroplating operation.</p> <p>Where stainless steel components can be considered to come into direct and prolonged skin contact, the tenderer shall provide a test report according to EN 1811 and a declaration from the supplier of the stainless steel demonstrating compliance with the nickel release rate of 0.5 µg/cm²/week.</p>

Summary of rationale:

- The distinction between core and comprehensive criteria is based on the level of information required. Core requirements may simply be verified by examining the container of any supplied coating formulations whereas the comprehensive requirements need to look at the ingredients listed in a SDS.

³⁸ prolonged skin contact for Nickel, as per entry 27 of REACH Annex XVII, is currently defined by CARACAL³⁸ as 10 minutes on three or more occasions within a two week period or 30 minutes on one or more occasions during a two week period.

³⁹ prolonged skin contact for Nickel, as per entry 27 of REACH Annex XVII, is currently defined by CARACAL³⁹ as 10 minutes on three or more occasions within a two week period or 30 minutes on one or more occasions during a two week period.

- The use of additives based on arsenic, cadmium, chromium VI, lead, mercury and their compounds is justified because in general less hazardous alternatives exist and the presence of these substances helps maintain demand for mining of these metal ores and once in the furniture product, could result in their emission to the environment at end of life.
- Cadmium and chromium (VI) electroplating is banned in favour of less hazardous alternatives (i.e. zinc, nickel and chromium III).

Draft

Technical specification 5: Substances of Very High Concern (especially biocides, flame retardants and plasticisers).

Why relevant to GPP?

Biocides, flame retardants and plasticisers represent the three groups of potentially hazardous substances that are most widely associated with furniture. Although the regulation of hazardous substances in the EU has been implemented under the REACH⁴⁰ and CLP⁴¹ Regulations, the process of phasing out hazardous chemicals takes time and information on precisely what chemicals biocides, flame retardants or plasticisers are actually used in furniture components is not generally communicated to customers.

Although furniture produced within the EU is likely to already comply with the latest requirements of REACH and CLP, there is concern that information regarding components or products imported from outside of the EU may not comply or simply not be accompanied by relevant information from the manufacturer regarding what type of biocides, flame retardants or plasticisers, if any, were used.

Stakeholder discussion

Much of the discussion was originally taken in relation to EU Ecolabel criteria for furniture and focussed on the impacts of REACH and CLP legislation.

One of the priorities is to ensure that furniture products do not contain Substances of Very High Concern (SVHCs). The definition of SVHCs can be considered as substances that exhibit at least one of the hazards described in Article 57 of REACH (i.e. carcinogenic, mutagenic, toxic for reproduction, persistent, bioaccumulative and toxic (PBT), very persistent and very bioaccumulative (vPvB) or endocrine disrupting) **AND** that has been identified and passed through the procedure defined in Article 59 of REACH. Any Member State may request that substances they believe to possess such properties and provide dossiers supporting this conclusion to the European Chemicals Agency (ECHA) who are responsible for managing the consultation process. If no objections are made after following the procedure defined in Article 59 of REACH, the substance shall be placed on the Candidate List. As of **June 2015**, a total of **163** substances are listed on the Candidate List⁴².

It was pointed out that under Articles 7 and 33 of REACH, provision is made for gathering information about the presence of SVHCs in supplied articles. If a supplied article contains any SVHC in quantities greater than 0.1% by weight, the supplier is required to communicate this information to the recipient of the article. Specifically under article 33(2) of REACH, final consumers can also request information from sellers about the quantity of SVHCs in the final product.

The key discussion point regarding SVHCs has been whether the 0.1% limit should apply to the entire product or component parts thereof. The original wording in REACH and the wording after the 2011 revision both applied the 0.1% by weight limit to the final product. This has led to criticism by many stakeholders who claim that much information about the presence of SVHCs in complex articles can be lost under such a requirement where small components that contain high quantities of SVHCs may be assembled outside of the EU together with larger and heavier components that effectively "dilute" the overall SVHC content to below 0.1% prior to their import into the EU. Formal opposition to the initial application of the SVHC limit only to the final product was expressed by Austria, Belgium, Denmark, France, Germany and Sweden. Very recently (September 2014), the European Court of Justice ruled that the 0.1% declaration requirements for SVHCs in articles applied to individual components in complex articles and not only to the complex article as a whole.

⁴⁰ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency

⁴¹ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures

⁴² See: <http://echa.europa.eu/web/guest/candidate-list-table>

Regarding biocides, many stakeholders supported the non-use of biocides in indoor furniture for the purposes of adding a final disinfective effect although some opposition was expressed by industry representatives in the special cases of hospital and catering furniture. It was generally accepted that biocides could be accepted as in-can preservatives in water-borne coating formulations because the function was to preserve the coating formulation while it was in its liquid state "in the can" and not once present as a solid film in the furniture product. The need for biocides in outdoor furniture was generally accepted wherever this would improve the durability of the product although, due to concerns about the possible import to the EU of furniture components treated with biocides otherwise banned in the EU, it was requested that any biocidal formulations used should be approved under the Biocidal Products Regulation (EC) No 528/2012. However, a review of the BPR revealed under point 52 of the recitals that:

"To protect human health, animal health and the environment, and to avoid discrimination between treated articles originating in the Union and treated articles imported from third countries, all treated articles placed on the internal market should contain only approved active substances."

Consequently, it can be seen that any requirement to only use BPR approved biocidal products in GPP criteria would be an unnecessary duplication of a legal requirement. Although it remains to be discussed if there are any strong views on the exclusion of biocides from certain furniture types/uses.

With regards to flame retardants, some stakeholders wanted a specific ban on all halogenated flame retardants although it was countered that any restrictions should be based on the hazard classification of substances and not on specific atoms present in molecules. Mention was made of the potential to "design out" the need for flame retardants by introducing barriers to flame propagation within upholstered furniture. However, due to strict fire safety regulations in many MSs and the responsibility of public organisations to adhere to these regulations, it was deemed most appropriate that the only restriction to flame retardants in GPP should be at the level of SVHCs.

With plasticisers, these substances are normally added to PVC or polyurethane polymers to modify their physical properties. A number of plasticisers have been placed on the ECHA candidate list and will be phased out in the EU. Most of these compounds belong to the phthalate group and can demonstrate endocrine disrupting effects and/or behave as reproductive toxins.

Industry stakeholders emphasised that it is important to distinguish between low molecular weight phthalates (such as DEHP, DBP, DIBP and BBP) which have been recognised as SVHCs for some time and high molecular weight phthalates (such as DINP, DIDP and DPHP) which are not REACH restricted because they have different toxicity profiles. The actual distinction between high weight and low weight phthalates is not clear if the current Candidate List phthalates are considered in Table 5.

Table 5. List of phthalates currently (June 2015) included on the REACH Candidate List

(Abbreviation) name	CAS No	Weight (g/mol)	Properties	Date
(DEHP) Bis(2-ethylhexyl)phthalate	117-81-7	390.56	57c + 57f	17-Dec-2014
(DHP) Dihexyl phthalate	84-75-3	334.45	57c	16-Dec-2013
(DPP) Dipentyl phthalate	131-18-0	306.40	57c	20-June-2013
(DIPP) Diisopentylphthalate	605-50-5	306.40	57c	19-Dec-2012
(PIPP) N-pentyl-isopentylphthalate	776297-699	306	57c	19-Dec-2012
(DMEP) Bis(2-methoxyethyl) phthalate	117-82-8	282.29	57c	19-Dec-2011
(DIBP) Diisobutyl phthalate	84-69-5	278.34	57c	13-Jan-2010
(BBP) Benzyl butyl phthalate	85-68-7	312.36	57c	28-Oct-2008
(DBP) Dibutyl phthalate	84-74-2	278.34	57c	28-Oct-2008

Considerable debate took place regarding the situation with DINP and DIDP plasticisers due to the fact that these are restricted as per entry 52 of REACH Annex XVII for use in toys and childcare articles and that this Decision was upheld by ECHA in 2013. Industry stakeholders stated that extending the restriction of DIDP and DINP to other articles, such as furniture, would go against the spirit of the ruling of ECHA which also found that DIDP and DINP did not represent significant risks to users when used in erasers, food containers plastic bags, shower curtains and sex toys.

What do relevant ecolabel criteria and other "green initiatives" say?

The French NF 217 Ecolabel for furniture (version 10, Jan. 2014) requires that any flame retardants used are not listed on the Candidate List, listed in the Restricted Substances List or forbidden for use in OEKOTEX 100 class IV products. Regarding phthalates, the criteria specifically excludes DNOP, DINP and DIDP as well as any other phthalates with the hazardous properties R60, R61, R62, R50, R51, R52, R50, R50/53, R51/53 or R52/53.

The Danish GPP requirements state that any outdoor wooden furniture classified as durability class 1 or 2 must not be treated with preservatives and that any other outdoor wooden furniture must not use substances that are not classified as "carcinogenic", "toxic for reproduction", "mutagenic" or "allergenic when inhaled". They must also not be based on arsenic, chromium or organic compounds.

The Belgian GPP criteria are very similar to the Danish but also specifically mention the exclusion of organo-tin based preservatives.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) exclude the use of biocides to provide a disinfective or antibacterial effect and that no halogenated compounds can be used in flame retardants or biocides with the notable exception 3:1 mixtures of CMIT/MIT if the in-can concentration is less than 0.0015% by weight.

The German Blue Angel criteria for low-emission furniture made of wood (RAL UZ 38, Jan. 2013 version) prohibit the use of halogenated flame retardants but permit others such as ammonium phosphates, dehydrating minerals such as aluminium hydroxide and expandable graphite. Biocides are not permitted except as in-can preservatives in water-based coating formulations.

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TSS: SVHC restrictions</p> <p>No biocides, flame retardants or plasticisers or any other substances shall be used in the manufacture or treatment of the furniture product that:</p> <ul style="list-style-type: none"> (a) are listed on the latest versions of the ECHA Candidate List at the date of the invitation to tender if they (b) account for more than 0.1% w/w of the final furniture product weight or of any individual component thereof. <p>Verification:</p> <p>The tenderer shall declare that the furniture product does not contain any individual SVHC in quantities greater than 0.1% by weight of the furniture product.</p> <p>This declaration shall be supported by similar declarations from all suppliers of component parts⁴³ and component materials⁴⁴ that remain in the final product.</p>	<p>TSS: SVHC restrictions</p> <p>No biocides, flame retardants or plasticisers or any other substances shall be used in the manufacture or treatment of the furniture product that:</p> <ul style="list-style-type: none"> (a) are listed on the latest versions of the ECHA Candidate List at the date of the invitation to tender if they (b) account for more than 0.1% w/w of the final furniture product weight or of any individual component thereof. <p>Verification:</p> <p>The tenderer shall declare that the furniture product does not contain any individual SVHC in quantities greater than 0.1% by weight of the furniture product.</p> <p>This declaration shall be supported by similar declarations from all suppliers of component parts and component materials that remain in the final product.</p>

⁴³ "Component parts" are considered as rigid and discrete units whose shape and form does not need to be altered prior to assembly of the final product in its fully functional form, although its position may change during use of the final product.

⁴⁴ "Component materials" are considered as non-rigid materials whose shape and form may change prior to furniture assembly or during use of the furniture product. Obvious examples include upholstery material but also potentially timber, which may be considered as a component material but be later sawn and treated to be converted into a component part.

Summary of rationale:

- Biocides, flame retardants and plasticisers are three of the most common groups of potentially hazardous substances that customers are aware of in furniture.
- The intentional use of biocides is only necessary under certain conditions and these should be stated clearly to tenderers in the ITT.
- The use of flame retardants is of most relevance in upholstered furniture, but due to different national regulations regarding fire safety, it is not possible to specify precisely when or how flame retardants should be used.
- None of these chemicals used (biocides, flame retardants or plasticisers) should be used in quantities greater than 0.1% by weight in GPP furniture if they have been identified as substances of very high concern and have been subsequently placed on the ECHA Candidate List, Authorisation List or Restricted Substance List. This requirement is reinforced by provisions made in REACH Articles 7 and 33.

Draft

Technical specification 6: Durable upholstery coverings

Background technical discussion and rationale

The reasons why this criterion is relevant to GPP, previous stakeholder discussion and what relevant ecolabel criteria and other green initiatives say are the same as those previously stated in TS2 for refurbished furniture.

Criteria proposal (for upholstered furniture)

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>TS6: Durable upholstery coverings</p> <p>Points shall be awarded for furniture that uses upholstery covering materials, which may be based on either textile fabrics, coated fabrics or leather, that comply with all of the physical quality requirements set out in Appendix I as appropriate.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration from the leather supplier, textile fabric supplier or coated fabric supplier as appropriate, supported by relevant test reports, that the upholstery covering material meets the physical requirements for leather, textile fabrics or coated fabrics as specified in Table 7, Table 8 or Table 9 of Appendix I respectively.</p> <p>Upholstery materials holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>	<p>TS6: Durable upholstery coverings</p> <p>Points shall be awarded for furniture that uses upholstery covering materials, which may be based on either textile fabrics, coated fabrics or leather, that comply with all of the physical quality requirements set out in Appendix I as appropriate.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration from the leather supplier, textile fabric supplier or coated fabric supplier as appropriate, supported by relevant test reports, that the upholstery covering material meets the physical requirements for leather, textile fabrics or coated fabrics as specified in Table 7, Table 8 or Table 9 of Appendix I respectively.</p> <p>Upholstery materials holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>

Summary of rationale:

- Low quality (and cheaper) upholstery coverings can lead to premature end of life of the entire furniture product. It is necessary to incentivise the use of more durable and higher quality upholstery coverings, so that they can be competitive in invitations to tender.
- Physical requirements follow industry guidance for leather and for coated fabrics.
- Minimum requirements for textile fabrics are covered by Nordic and EU Ecolabel criteria.

Technical specification 7, 8 & 9: Final product requirements

Why relevant to GPP?

The main conclusion from life cycle studies regarding furniture in general is that the majority of the environmental impacts are associated with the production of the materials, components and substances used in the manufacture of the product. Consequently, much of the criteria are focused on materials.

However, it must be noted that the lifetime of the product is also extremely important. Due to the fact that almost none of the lifetime environmental impacts are associated with furniture during the use phase, a furniture item that is used for 10 years has half the environmental impact of a similar product that only lasts 5 years and is then replaced by a brand new identical product. More durable products may be more expensive in up-front investment but could be cheaper options overall if they last considerably longer than less durable products. Therefore it is very important to consider the durability of furniture items.

The durability of a furniture product is linked both to the quality of the materials and components used and to the quality of the assembly work carried out. More durable products of a higher quality tend to cost more than less durable alternatives. Therefore it is especially important in GPP, where the lowest bid (or the most economically advantageous tender) wins, that cheaper furniture of an unacceptable quality is not favoured over more expensive furniture of adequate quality. The contracting authority should set minimum quality requirements where this is feasible.

When a furniture product is broken, it is only normally a single part of the product that has failed and that is impairing the functionality of the entire product. Therefore the availability of spare parts is of importance since in many cases this could lead to the simple and economic replacement of the part prolonging the lifetime of the entire product. For this to be viable, it is important that the furniture product is designed with disassembly in mind and that spare parts are made available by the furniture manufacturer. Design for disassembly is also highly relevant if more significant repairs are necessary or if the furniture refurbishment, remanufacturing or remodelling is a desirable future option.

With regards to guarantees, it must be repeated that Directive 1999/44/EC, relating to certain aspects of the sale of consumer goods and guarantees, does not apply to goods procured by public authorities via ITTs. To avoid possible confusion between a legal guarantee and a commercial guarantee, the term "warranty" is used in place of "commercial guarantee". A minimum provision for product warranty is required as a technical specification for new furniture or for refurbished furniture.

Stakeholder discussion

A very clear message from industry stakeholders was to not propose criteria that relate to individual materials but instead that apply to the final assembled product. A long list of EN standards related to the fitness for use of certain furniture products is listed in Appendix III. It should be noted that only a small number of these standards may actually apply to any one particular furniture product.

When asking what exactly does the term "fit for use" mean, stakeholders considered this to relate to factors such as strength, safety, durability and ergonomics. The relevance of safety and ergonomics to environmental considerations was questioned although it was responded that these would be relevant if poor safety or ergonomics would result in a premature End-of-Life of the product.

Unlike many other products, most furniture is not sold with a CE marking and so the fact that it is available on the EU market cannot be assumed as proof of compliance with any relevant EN standards.

What do relevant ecolabel criteria and other green initiatives say?

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) states that furniture should comply with any relevant EN or ISO standards related to durability.

The French NF 217 Ecolabel for furniture (version 10, Jan. 2014) requires fitness for use reports or certificates to be submitted for furniture products but does not specify relevant standards. Furthermore, any components weighing more than 50g must be separable from different materials for recycling. Spare parts should be made available for a period of at least 5 years after purchase.

The Danish GPP requirements state that any office work chairs or office work desks meet the requirements for Type A products as defined in EN 1335-1 and EN 527-1 respectively. This is in compliance with Danish legislation and it should be noted that a similar basic legal requirement is in place in the Netherlands. Danish GPP requirements also refer to other appropriate quality standards based on safety, wear resistance, tensile strength, colour fastness, etc.

The Belgian GPP criteria require that furniture products come with a 5 year guarantee and that spare parts are made available for at least 10 years after purchase. With fitness for use, the criteria refer to the provision of any relevant documents relating to durability, reparability, safety and ergonomics.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) refer to mandatory compliance with any relevant EN and ISO technical standards for assessing the durability, strength, safety and stability of seating, tables, internal doors, kitchen cabinets and other cabinets. Where no specific EN or ISO standard exists, provision is made for the use of other similar tests and standards. In addition to final product standards, where a significant quantity of VOCs have been used in the application of surface coatings (i.e. 30 – 60 g/m²) compliance with defined surface properties must be demonstrated (such as scratch resistance and resistance to dry or wet heat).

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS7: Fitness for use</p> <p>The furniture product shall comply with the requirements set out in the latest versions of the following relevant EN standards that may relate to the durability, dimensional requirements, safety and strength of the product:</p> <p><i>(contracting authority to make reference to specific standards from Appendix III or other sources that are most relevant to the furniture being procured)</i></p> <p>Verification:</p> <p>The tenderer shall provide a declaration of compliance with any relevant EN standards, supported by test reports from either the furniture manufacturer or component part/material suppliers, as appropriate.</p>	<p>TS7: Fitness for use</p> <p>The furniture product shall comply with the requirements set out in the latest versions of the following relevant EN standards that may relate to the durability, dimensional requirements, safety and strength of the product:</p> <p><i>(contracting authority to make reference to specific standards from Appendix III or other sources that are most relevant to the furniture being procured)</i></p> <p>Verification:</p> <p>The tenderer shall provide a declaration of compliance with any relevant EN standards, supported by test reports from either the furniture manufacturer or component part/material suppliers, as appropriate.</p>
<p>TS8: Design for disassembly and repair</p> <p>For furniture consisting of multiple component parts/materials, the product shall be designed for ease of disassembly and reassembly. Disassembly and replacement operations should be capable of being carried out using common and basic manual tools and unskilled labour.</p> <p>Verification:</p> <p>The tenderer shall provide technical drawings that illustrate how the furniture item can be assembled/disassembled using basic tools and unskilled labour. In the case of upholstery, such disassembly may include the use of zip fastenings, clips and/or velcro to attach/detach cushions from the frame and interior padding from covering materials. If necessary, provision must be made for screw fittings that go directly into wood-based panels so that the screw can be re-inserted</p>	<p>TS8: Design for disassembly and repair</p> <p>For furniture consisting of multiple component parts/materials, the product shall be designed for ease of disassembly and reassembly. Disassembly and replacement operations should be capable of being carried out using common and basic manual tools and unskilled labour.</p> <p>Verification:</p> <p>The tenderer shall provide technical drawings and/or videos that illustrate how the furniture item can be assembled/disassembled using basic tools and unskilled labour. In the case of upholstery, such disassembly may include the use of zip fastenings, clips and/or velcro to attach/detach cushions from the frame and interior padding from covering materials. If necessary, provision must be made for screw fittings that go directly into wood-based panels so that the screw can be re-inserted</p>

during reassembly at a different point than where it was removed from during disassembly.	during reassembly at a different point than where it was removed from during disassembly.
<p>TS9: Product warranty and spare parts</p> <p>The tenderer shall provide a minimum of three year warranty, covering repair or replacement, during which time they shall warranty that the goods are in conformity with the contract specifications at no additional cost. This warranty shall be provided without prejudice to the legal obligations of the manufacturer and seller under national law.</p> <p>Availability of spare parts:</p> <p>The tenderer shall make original spare parts available for a period of at least five years from the date of delivery of the furniture product. The cost (if any) of spare parts shall be proportional to the total cost of the furniture product. Contact details that should be used in order to arrange the delivery of spare parts shall be provided.</p> <p>Verification:</p> <p>A copy of the warranty terms and conditions shall be provided by the tenderer as well as a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p> <p>The tenderer shall also provide a copy of the user manual, which shall include clear and well-illustrated assembly and disassembly instructions on how the furniture product can be assembled/disassembled using basic tools and unskilled labour and also a list of spare parts with the period during which they will remain available under the contract.</p>	<p>TS9: Product warranty and spare parts</p> <p>The tenderer shall provide a minimum of five year warranty, covering repair or replacement, during which time they shall warranty that the goods are in conformity with the contract specifications at no additional cost. This warranty shall be provided without prejudice to the legal obligations of the manufacturer and seller under national law.</p> <p>Availability of spare parts:</p> <p>The tenderer shall make original spare parts available for a period of at least five years from the date of delivery of the furniture product. The cost (if any) of spare parts shall be proportional to the total cost of the furniture product. Contact details that should be used in order to arrange the delivery of spare parts shall be provided.</p> <p>Verification:</p> <p>A copy of the warranty terms and conditions shall be provided by the tenderer as well as a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p> <p>The tenderer shall also provide a copy of the user manual, which shall include clear and well-illustrated assembly and disassembly instructions on how the furniture product can be assembled/disassembled using basic tools and unskilled labour and also a list of spare parts with the period during which they will remain available under the contract.</p>

Summary of rationale:

- Compliance with fitness for use standards ensures that products meet minimum quality requirements that can be linked to more durable products.
- Without such criteria, cheaper (but lower quality and less durable) products may win the tender and result in a premature End-of-Life and increased overall life cycle cost to the contracting authority.
- Criteria relating to design for disassembly help ensure that the product can be easily refurbished, remanufactured or remodelled in the future and that distinct materials can easily be separated from each other for recycling or energy recovery
- Warranties are a measure of the confidence a manufacturer has in their product. Such a criterion allows the contracting authority to distinguish between durable and robust products and other products that may be cheaper but of lower durability.
- The commitment to the provision of spare parts helps ensure that the useful lifetime of the furniture product can be extended with minimum additional effort or cost.

Technical specification 10: Collection and End of Life (EoL) management for furniture

Why relevant to GPP?

When new furniture is procured, it is quite likely that it will be to directly replace some old furniture, which is considered as no longer fit for purpose by the contracting authority. This may be due to fundamental functional issues due to the furniture being damaged or the office layout being significantly changed or due to more subjective issues such as redecoration of office facilities.

Furniture items are bulky and in their fully functional form, occupy significant volumes during transport. There is a clear opportunity to make optimum use of environmental and economic costs related to transport if the same vehicle that delivers new furniture can be used to collect old and obsolete furniture.

The collection and EoL management of furniture that has reached the end of its service life is of no additional environmental benefit if it is simply disposed of to a landfill or a municipal solid waste incinerator. However, obvious environmental benefits and possible social benefits arise if the furniture is reused directly or refurbished prior to further reuse. Such an approach has clear links to the EU-wide objective of shifting towards a circular economy.

Because the true value of furniture is not in the materials present but rather in the specific dimensions of furniture components and how they come together into a functional unit, simple recycling of components is of much lower added-value than reuse or refurbishment approaches.

Stakeholder discussion

Support was expressed for criteria relating to the EoL management of furniture although it was noted that this will generally imply an added cost to the contracting authority in the majority of cases. For this reason, there was uncertainty whether this should only be considered as an award criterion or as a minimum technical specification. It was stated that in Finland, it is common practice to include any related costs for furniture take-back in the tender.

Some experience with EoL furniture contracts with not-for-profit organisations revealed that arrangements would typically offer the used furniture for free and that the procurer would pay a fee to cover transport costs so long as the receiving organisation agreed to use the furniture for "humanitarian purposes", which is considered as making the furniture available to the most impoverished people in society, either in a local, national or international context.

Other stakeholders pointed out the potential financial value of used furniture items, citing the example of one Dutch company which guarantees at least €50 for buying back any one of its range of office chairs. It was assumed that the client would have to bring the chair to a designated location.

What do relevant ecolabel criteria and other green initiatives say?

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) only state that relevant national rules, statutes and/or industry specific agreements concerning recycling schemes for products and packaging must be fulfilled in the country where the product is placed on the market.

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) consider the award of points to tenderers that provide information regarding the highest value recovery opportunities for its legacy product lines and the materials that comprise them. The requirements also make provision for the award of points if tenderers demonstrate the implementation and use of buy-back or take-back programmes as part of its strategic sales strategy for furniture products that they sell or lease.

Ambition level

Any tenderer can, in principle, commit to the collection of used furniture as part of a contract when delivering new furniture. However, it is unlikely that most tenderers will have systems in place to

refurbish used furniture themselves. In these cases, such tenderers would need to collaborate with not-for-profit organisations or private enterprises. Therefore, requirements linked to refurbishment are set at the comprehensive level.

The core level is less ambitious, simply stating that the collected used furniture must, at least have metal recovered prior to sending the remainder to an energy recovery facility (option b). More extensive recycling is described (option a) where the regional recycling infrastructure allows for this.

Criteria proposal

Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS10: Collection and reuse of existing furniture stock</p> <p><i>An assessment of the condition of the furniture to be collected (if any) shall be provided by the contracting authority (CA) in the ITT which also may define a minimum re-use target to be met (e.g. 50% of provided furniture).</i></p> <p>Tenderers shall collect the furniture directly from a site specified by the contracting authority and provide a re-use and recycling service for furniture that has reached the end of its service life.</p> <p>The tenderer shall demonstrate how they will extend the service life of the furniture by supplying it for reuse.</p> <p>For furniture items/parts that are considered not suitable to reuse, and according to the knowledge of the CA about appropriate recycling facilities in the region, one of the following options shall be chosen:</p> <p>Option a. Furniture items/parts that are not possible to re-use shall be disassembled into different material streams, as a minimum plastics, metals, textiles and wood before being sent to different recycling facilities⁴⁵. Any remaining materials shall be sent to energy recovery facilities.</p> <p>Option b. Metal parts from furniture items/parts that are not possible to re-use shall be recycled and the remainder of the furniture product shall be sent to energy recovery facilities.</p> <p>Verification:</p> <p>The tenderer shall provide details of the arrangements for the collection of the furniture, as well as re-use and recycling routes to be used. This shall include the details of all involved parties in the re-use and recycling of the furniture.</p>	<p>TS10: Collection and reuse of existing furniture stock</p> <p><i>An assessment of the condition of the furniture to be collected (if any) shall be provided by the contracting authority (CA) in the ITT which also may define a minimum re-use target to be met (e.g. 70% of provided furniture).</i></p> <p>Tenderers shall collect the furniture directly from a site specified by the contracting authority and provide a re-use and recycling service for furniture that has reached the end of its service life.</p> <p>The tenderer shall demonstrate how they will extend the service life of the furniture by supplying it for reuse.</p> <p>Furniture items/parts that are not possible to re-use shall be disassembled into different material streams, as a minimum plastics, metals, textiles and wood before being sent to different recycling facilities⁴⁶. Any remaining materials shall be sent to energy recovery facilities.</p> <p>Verification:</p> <p>The tenderer shall provide details of the arrangements for the collection of the furniture, as well as re-use and recycling routes to be used. This shall include the details of all involved parties in the re-use and recycling of the furniture.</p>

Summary of rationale:

- When purchasing new furniture, the public authority will likely want to dispose of a similar quantity of old furniture. It is more than likely that the old furniture can be reused, perhaps with or perhaps without the need for some degree of refurbishment.
- Furniture items are bulky and with significant transport costs, by linking the collection of old furniture with the delivery of new furniture, transport requirements can be minimised.

⁴⁵ All recycling facilities shall be permitted in compliance with Article 23 of Directive 2008/98/EC.

⁴⁶ All recycling facilities shall be permitted in compliance with Article 23 of Directive 2008/98/EC.

- From an environmental point of view, and in line with the waste hierarchy, reuse or refurbishment of furniture has a higher environmental benefit than recycling.
- The allowance of EoL collection schemes being linked to third parties ensures that large international companies specialised in the manufacture of new furniture can potentially apply this award criterion to their tenders by collaborating with more specialised companies or organisations that are local to the contracting authority.

Draft

Award criterion 1 & 2: Recycled wood content and contaminants

Why relevant to GPP?

The minimum technical specifications cover the responsible sourcing of wood. This generally refers to the requirements to ensure that virgin wood comes from legal sources and provides some outline recommendation for approaches to take with sourcing sustainable wood. The two main certification schemes for sustainable wood are the FSC and the PEFC. Both schemes are strongly focussed on aspects of sustainable forest management with relation to sourcing virgin wood. However, both schemes also make provision for recycled wood.

This is only logical since it would be misleading to only consider sustainable wood as virgin wood sourced from sustainably managed forests. Recycled wood can, in principle, be considered as superior to sustainable virgin wood simply because it does not directly require the felling of trees.

Furniture is the dominant market for wood-based panels and although only particleboard and fibreboard manufacturing processes are suitable for using recycled wood, these account for over 80% of wood-based panel production. According to Verhaeghe⁴⁷, the average recycled wood content of particleboards varies strongly between different countries, perhaps influenced by different political priorities, historical efforts and existing infrastructure in place to facilitate wood recycling networks. For example, in Belgium, recovered wood accounted for around 49% of raw wood supply while this was 0% for countries such as Romania and Finland. In other countries such as Greece, the UK and Denmark, the recovered wood content was in the range 19-25%.

The use of recycled wood in particleboard has clear environmental benefits. For example, Saravia-Cortez et al.,⁴⁸ quoted an estimated reduction in total energy requirements of 2944 to 1741 MJ/m³ of particleboard (i.e. a 41% reduction) if the recycled content is altered from 0% to 100%.

Stakeholder Discussion

Due to biomass combustion being considered as contributing to EU renewable energy targets, there is increased competition for virgin and recovered wood on the market. The benefit of using recovered wood in a "cascading" approach, where intermediate uses are found prior to energy recovery from waste wood, were demonstrated to be advantageous from an LCA perspective but would be influenced by collection and reuse efficiency as well as any additional transport requirements⁴⁹. Representatives of woodworking industries argue that cascading of recovered wood into new products instead of directly to energy recovery has substantial benefits in terms of job creation and added value.

It was stated that wood-based panels are commonly used in furniture and can contain recycled wood contents of up to 40% w/w without any major technical challenges although care needed to be taken regarding the introduction of certain impurities with recycled wood, such as wood preservatives, paints and PVC foils. Specific reference was made to the testing requirements in place across the EU for deliveries of recycled wood that were developed by the European Panel Federation⁵⁰.

⁴⁷ Gus Verhaeghe, AIDIMA. Presentation, see: <http://interreg.iff.fraunhofer.de/media/pdf/verhaege.pdf>

⁴⁸ A.M. Saravia-Cortez et al., 2013. Assessing environmental sustainability of particleboard production process by ecological footprint. *Journal of Cleaner Production*, Vol. 52, pp. 301-308.

⁴⁹ Heglmeier et al., 2015. LCA-based optimization of wood utilization under special consideration of a cascading use of wood. *Journal of Environmental Management*, Vol. 152, pp.158-170.

⁵⁰ EPF Standard for delivery conditions of recycled wood (2002) see: <http://www.europanel.org/upload/EPF-Standard-for-recycled-wood-use.pdf>

It was stated that both FSC and PEFC have systems in place for tracing the contents of pre-consumer and post-consumer recycled wood materials through the supply chain and the presence of "FSC recycled" or "PEFC recycled" could be used as simple verification for recycled wood contents of 100% or >70% respectively. However, it remains to be clarified if FSC and PEFC have the same definition of recycled materials as the wood-based panel industry. Many different terms are used such as "recovered material", "reclaimed material" "recycled material", "co-products" and "by-products".

What do relevant ecolabel criteria and other green initiatives say?

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) sets two levels for recycled content in furniture products. The lower level requires a minimum wood recycled content of 30% by weight if wood or wood-based materials account for more than 40% of the total furniture product weight. The more ambitious requirement sets a minimum recycled content requirement of 50% but this can be weighted across any glass, metal, wood or wood-based panel components. FSC and PEFC are suggested as ways to demonstrate compliance with the wood recycled content while self-declared environmental claims in line with ISO 14021 are permitted for metal and glass recycled contents.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) state minimum requirements for recycled metal content and recycled plastic content but not specifically for recycled wood, although the use is indirectly encouraged by the energy consumption requirement for wood-based panel production which applies if wood-based panels account for at least 10% of the final furniture product weight.

Ambition level

The main purpose of this award criterion is to test the market in order to see what recycled contents can be offered. The risk that tenderers push the recycled content too high is quite small since they would run the risk of lowering the technical performance of the product.

Criteria proposal (for furniture consisting of at least 20% by weight wood or wood-based materials)

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>AC1: Recycled wood content in wood-based panels</p> <p>Maximum points shall be awarded to tenderers where solid wood or wood-based panel components used in the furniture product contain an average content of at least 40% pre-consumer and/or post-consumer recycled wood that is covered by third party chain of custody certificates. Points shall be awarded to the recycled wood content of solid wood or wood-based panels that reach 40% by weight.</p> <p>By-products or co-products from logging or sawmilling operations and any wastes that can be reused within the same processes that generated them shall not be considered as recycled materials.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration stating the following information:</p> <ul style="list-style-type: none"> • All components in the product made of solid wood or wood-based panels and their total weight as a % of the furniture product weight. • The actual average recycled wood content of each of the different wood or wood-based panel 	<p>AC1: Recycled wood content in wood-based panels</p> <p>Maximum points shall be awarded to tenderers where solid wood or wood-based panel components used in the furniture product contain an average content of at least 70% pre-consumer and/or post-consumer recycled wood that is covered by third party chain of custody certificates. Points shall be awarded to the recycled wood content of solid wood or wood-based panels that reach 70% by weight.</p> <p>By-products or co-products from logging or sawmilling operations and any wastes that can be reused within the same processes that generated them shall not be considered as recycled materials.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration stating the following information:</p> <ul style="list-style-type: none"> • All components in the product made of solid wood or wood-based panels and their total weight as a % of the furniture product weight.. • The actual average recycled wood content of each of the different wood or wood-based panel

<p>component(s).</p> <ul style="list-style-type: none"> A calculation of the average recycled wood content across all solid wood and wood-based components. <p>Products or component parts certified as “FSC Recycled”, will be accepted as have a recycled wood content of 100%. Products or components certified as “PEFC Recycled”, will be accepted as having a minimum recycled content of 70%. Claims below these thresholds (or above the PEFC threshold) may be made if adequate documentation according to claims of particular recycled wood contents linked to delivery invoices according to the requirements set out by relevant third party certification schemes can be produced.</p> <p>Alternatively, equivalent schemes or other schemes that are approved by the EU Member State where the contracting authority is based or where the furniture being purchased is to be used (if different).</p>	<p>component(s).</p> <ul style="list-style-type: none"> A calculation of the average recycled wood content across all solid wood and wood-based components. <p>Products or component parts certified as “FSC Recycled”, will be accepted as have a recycled wood content of 100%. Products or components certified as “PEFC Recycled”, will be accepted as having a minimum recycled content of 70%. Claims below these thresholds (or above the PEFC threshold) may be made if adequate documentation according to claims of particular recycled wood contents linked to delivery invoices according to the requirements set out by relevant third party certification schemes can be produced.</p> <p>Alternatively, equivalent schemes or other schemes that are approved by the EU Member State where the contracting authority is based or where the furniture being purchased is to be used (if different).</p>																																												
<p>AC2.: Contaminants in recycled wood</p> <p>Points shall be awarded to the tenderer if it can be demonstrated that any recycled wood content that is claimed to be used in the product has meet the EPF standard delivery condition limits for the contaminants stated below</p> <table border="1" data-bbox="304 904 858 1240"> <thead> <tr> <th>Chemical contaminant</th> <th>Limit value (mg/kg recycled wood)</th> </tr> </thead> <tbody> <tr><td>Arsenic (As)</td><td>25</td></tr> <tr><td>Cadmium (Cd)</td><td>50</td></tr> <tr><td>Chromium (Cr)</td><td>25</td></tr> <tr><td>Copper (Cu)</td><td>40</td></tr> <tr><td>Lead (Pb)</td><td>90</td></tr> <tr><td>Mercury (Hg)</td><td>25</td></tr> <tr><td>Fluorine (F)</td><td>100</td></tr> <tr><td>Chlorine (Cl)</td><td>1000</td></tr> <tr><td>Pentachlorophenol (PCP)</td><td>5</td></tr> <tr><td>Creosote (Benzo(a)pyrene)</td><td>0.5</td></tr> </tbody> </table> <p>Verification</p> <p>The tenderer shall provide a declaration that all recycled wood fibres used have been tested in accordance with the 2002 "EPF Standard conditions for the delivery of recycled wood" or equivalent, supported by appropriate test reports that demonstrate compliance of the recycled wood samples with the limits specified in this sub-criterion.</p>	Chemical contaminant	Limit value (mg/kg recycled wood)	Arsenic (As)	25	Cadmium (Cd)	50	Chromium (Cr)	25	Copper (Cu)	40	Lead (Pb)	90	Mercury (Hg)	25	Fluorine (F)	100	Chlorine (Cl)	1000	Pentachlorophenol (PCP)	5	Creosote (Benzo(a)pyrene)	0.5	<p>AC2. Contaminants in recycled wood</p> <p>Points shall be awarded to the tenderer if it can be demonstrated that any recycled wood content that is claimed to be used in the product has meet the EPF standard delivery condition limits for the contaminants stated below</p> <table border="1" data-bbox="895 904 1449 1240"> <thead> <tr> <th>Chemical contaminant</th> <th>Limit value (mg/kg recycled wood)</th> </tr> </thead> <tbody> <tr><td>Arsenic (As)</td><td>25</td></tr> <tr><td>Cadmium (Cd)</td><td>50</td></tr> <tr><td>Chromium (Cr)</td><td>25</td></tr> <tr><td>Copper (Cu)</td><td>40</td></tr> <tr><td>Lead (Pb)</td><td>90</td></tr> <tr><td>Mercury (Hg)</td><td>25</td></tr> <tr><td>Fluorine (F)</td><td>100</td></tr> <tr><td>Chlorine (Cl)</td><td>1000</td></tr> <tr><td>Pentachlorophenol (PCP)</td><td>5</td></tr> <tr><td>Creosote (Benzo(a)pyrene)</td><td>0.5</td></tr> </tbody> </table> <p>Verification</p> <p>The tenderer shall provide a declaration that all recycled wood fibres used have been tested in accordance with the 2002 "EPF Standard conditions for the delivery of recycled wood" or equivalent, supported by appropriate test reports that demonstrate compliance of the recycled wood samples with the limits specified in this sub-criterion.</p>	Chemical contaminant	Limit value (mg/kg recycled wood)	Arsenic (As)	25	Cadmium (Cd)	50	Chromium (Cr)	25	Copper (Cu)	40	Lead (Pb)	90	Mercury (Hg)	25	Fluorine (F)	100	Chlorine (Cl)	1000	Pentachlorophenol (PCP)	5	Creosote (Benzo(a)pyrene)	0.5
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Summary of rationale:

- Recycled wood can be considered as “more sustainable” than sustainable virgin wood if it can be sourced within similar distances. So recycled wood should be rewarded.
- It is important to encourage tenderers to use recycled wood in products instead of simply for energy recovery since this aims higher in the value chain and waste hierarchy. There is a large discrepancy in practice between different MSs.
- Third party certification should be allowed via specific national schemes where these exist in EU Member States or via well-established international schemes such as FSC and PEFC.
- Contamination of recycled wood is a concern and so some safeguards must be in place to ensure that the environmental benefits of recycled wood are not offset by the introduction of unwanted contaminants. The current limits are well accepted in the EU but would also send a signal to non-EU based panel manufacturers who use recycled wood.

Award criterion 3: Formaldehyde emissions from wood-based panels

The reasons why this criterion is relevant to GPP, stakeholder discussion and what other relevant ecolabel criteria and green initiatives say has already been presented earlier in TS2 for new furniture.

With regards to the ambition level, it is worth emphasising that any requirement to comply with the E1 emission limits is quite straightforward and even mandatory in six EU Member States. For lower emission products, a distinction has to be made between medium density fibreboard (MDF) and other wood-based panels (i.e. plywood, oriented strand board and particleboard). Anecdotal evidence suggests that MDF cannot meet the 50% of E1 emission requirements without possible technical performance issues arising. This is reflected by the approaches taken by several ecolabel standards, which state a requirement of 65% of E1 for MDF panels but a lower 50% of E1 (or lower) for all other panel types,

Consequently, by setting the core award criteria to 65% of E1, verification could be achieved simply by the presence of any of the following labels on wood-based panels: EU Ecolabel, Nordic Ecolabel, Blue Swan, CARB or Japanese F 3-star or F 4-star. It would not be necessary to determine whether the wood-based panel was of the MDF type or not. With the comprehensive level requirement, it would be necessary to examine whether or not any MDF panels are used and if so, if the individual test report meets 50% of E1 requirements or not.

Criteria proposal (for furniture consisting of at least 5% by weight of wood-based panels)

Core criteria	Comprehensive criteria
MINIMUM TECHNICAL SPECIFICATION	
<p>AC3: Formaldehyde emissions from wood-based panels</p> <p>All wood-based panels used in the furniture product shall be shown to have formaldehyde emission rates that comply with 65% of the E1 threshold limits for formaldehyde emissions as defined in Annex B of EN 13986.</p> <p>Verification:</p> <p>A declaration from the wood-based panel supplier shall be provided, stating that the panel is compliant with 65% of E1 emission limits and supported by test reports carried out according to either EN 717-1, EN 717-2 or EN 120</p> <p>Wood-based panels holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>	<p>AC3: Formaldehyde emissions from wood-based panels</p> <p>All wood-based panels used in the furniture product shall be shown to have formaldehyde emission rates that comply with 50% of the E1 threshold limits for formaldehyde emissions as defined in Annex B of EN 13986.</p> <p>Verification:</p> <p>A declaration from the wood-based panel supplier shall be provided, stating that the panel is compliant with 50% of E1 emission limits and supported by test reports carried out according to either EN 717-1, EN 717-2 or EN 120</p> <p>Wood-based panels holding a relevant ISO Type I ecolabel directly fulfilling the listed requirements, or using equivalent methods, shall be deemed to comply.</p>

Summary of rationale:

- Where core level requirements are set, the minimum technical specification shall be compliance with E1 with award points for meeting 65% of E1. This will allow all wood-based panels (i.e. including particleboards) to potentially achieve award points.
- Where comprehensive level requirements are set, the minimum technical specification shall be compliance with 65% of E1 with award points for meeting 50% of E1. This does not exclude any type of wood-based panel from the product *per se*, but makes it very difficult for furniture using MDF to gain award points.

Award criterion 4: Marking of plastic parts

Why relevant to GPP?

The correct marking of plastic parts provides useful information for users but the main purpose is so that plastic can be separated and recycled in the optimum way at the end of life.

Stakeholder discussion

This criteria area was discussed in some detail during stakeholder meetings. Opinions against this requirement were based on the argument that marking of a plastic component has little or no consequence on whether or not it will actually be recycled, since most furniture is sent to landfill or incinerators and even if plastics are recycled, they are generally sorted and separated by automated systems based on infra-red technology and/or floatation and sedimentation processes. Some other stakeholders stated that plastic marking is often incorrect and for that reason there is a need to use automated systems.

Arguments in favour of the marking scheme were that this is useful information to the customer and, if different, the end user. Large plastic parts may be manually separated during pre-sorting, which is more efficient than mixing with all sorts of different plastics, shredding them together and separating the shreds according to their physical properties via automated systems. It was also stated that marking of PVC could help divert this waste from incinerators or energy from waste plants where it can, due to its high chloride content, contribute to potential increases in dioxin emissions either in the exhaust gas or via ash residues and will cause problems due to the formation of hydrochloric acid vapours, increase the cost of neutralisation chemicals needed and increase the quantity of hazardous air pollution control residues generated during exhaust gas abatement⁵¹.

Feedback from plastics recyclers stated that there were some problems with automated systems due to the addition of fillers and other additives in plastics (generally in quantities above 10% w/w) changing the density of the materials and causing it to be separated with the wrong type of polymer, contaminating the recycle batch and lowering its market value considerably. This was a particular concern with PVC contaminating PET batches and a lesser concern with PP entering into PE batches and vice versa. Therefore it would be considered useful to plastic recyclers if large plastic components, which can be manually pre-sorted, would be labelled to indicate the type of filler or any other additives used, such as flame retardants or plasticisers.

Caution was urged against any mandatory requirement for plastic marking since furniture may contain plastic parts that are not suitable for marking either because they were extruded instead of injection moulded, that there is not sufficient clear and flat surface area available or for aesthetic reasons.

What do relevant ecolabel criteria and other green initiatives say?

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) require that all plastic parts >50g be marked for recycling according to ISO 11469 or equivalent and do not contain additions of other materials that may hinder their recycling although exemption from marking requirements is made for certain components on the basis of aesthetic reasons so long as the marking information is included in the user manual of similar documentation.

The Italian GPP criteria also require marking of plastic components >50g according to ISO 11469 but do not mention any exemptions to marking for technical or aesthetic reasons.

⁵¹ Bertin Technologies, 2000. The influence of PVC on the quantity and hazardousness of flue gas residues from incineration.

The Danish GPP criteria are the same as the Italian criteria but specifically mention that no additives that would impede plastic recycling should be added.

The French NF 217 Ecolabel for furniture (version 10, Jan. 2104) requires that all plastic components >50g and any plastic components that may weigh less than 50g but whose combined weight adds up to more than 100g in the furniture product, must be marked in accordance with ISO 11469 and ISO 1043. Furthermore, plastic components must not contain any pigments based on cadmium, chromium VI or mercury and the polymer type must be suitable for recycling.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) states that plastic parts >50g must be marked according to ISO 11469, including details of any fillers and reinforcements used. Furthermore, surface treatment of plastics shall only be permitted if it does not adversely affect the recyclability of the plastic. No PVC plastic is permitted in Nordic Ecolabel furniture.

Ambition level

By setting the requirement as an award criterion, there are no concerns about possible exclusion of furniture products from ITTs but producers who make the effort to mark the plastic components can be rewarded. In terms of plastic marking, there are two main choices for which system to use:

- The system developed by the Society of the Plastics Industry (SPI) or
- The system set out in ISO 11469 and supported by ISO 1043.

The SPI system is widely known to consumers due to its widespread use in food and beverage containers but only provides specific information about the six polymers i.e. polyethylene terephthalate (PETE), high-density polyethylene (HDPE), polyvinyl chloride (PVC), low-density polyethylene (LD-PE), polypropylene (PP) or polystyrene (PS). This labelling scheme is not helpful if co-polymers are used, if other single polymers are used or if significant quantities of additives are used.

ISO 11469 and ISO 1043 (parts 1-4) provide polymer abbreviations for all commercially important polymers and co-polymers and also have lists of codes for fillers, reinforcing materials, plasticisers and flame retardants that may be added to the plastic (see Appendix IV). An example of the greater level of detail afforded by the ISO 11469 / ISO 1043 system is illustrated in Figure 7 below.

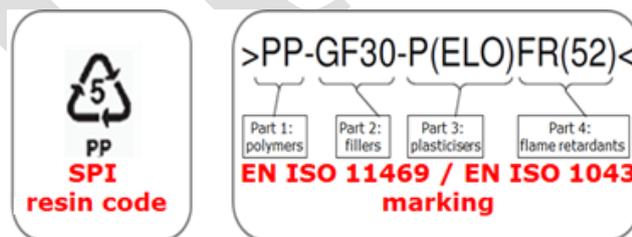


Figure 7. Comparison of the marking that would be required for a polypropylene plastic with 30% glass fibre filler content, epoxidised linseed oil plasticiser and red phosphorus flame retardant according to the SPI standard (left) and the ISO 11469 / ISO 1043 standards (right).

Clearly it can be seen that the marking requirements under ISO 11469 / ISO 1043 can lead to much more complicated codes/labels than those specified under the SPI system. Thus it is proposed that the threshold for plastic marking be raised to 100g rather than 50g.

It is important to understand that the inclusion of recycled plastic may unintentionally introduce certain impurities. For this reason, the marking criteria for fillers, reinforcing materials, plasticisers and flame retardants should only refer to such substances that are "*intentionally added*".

The ISO 11469 and 1043 standards do not specify minimum heights for lettering, although based on examples of companies that have introduced mandatory plastic marking for components as small as 25g, it seems that a minimum letter height of 2.5mm is appropriate for visual identification.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>AC4: Plastic marking</p> <p>Plastic parts with a mass greater than 100g shall be marked in accordance with EN ISO 11469 and EN ISO 1043 (parts 1-4). The lettering used in markings should be at least 2.5 mm high.</p> <p>Where any fillers, flame retardants or plasticisers are intentionally incorporated into the plastic in proportions greater than 1 % w/w, their presence should also be included in the marking as per EN ISO 1043 parts 2-4.</p> <p>In exceptional cases, non-marking of plastic parts with a weight greater than 100g is permitted if:</p> <ul style="list-style-type: none"> • Marking would impact on the performance or functionality of the plastic part; • Where marking is not technically possible due to the production method; • Where parts cannot be marked because of insufficient appropriate surface area available for the marking to be of a legible size to be identified by a recycling operator. <p>In the above cases, where non-marking is justified, further details about the polymer type and any additives as per the requirements of EN ISO 11469 and EN ISO 1043 (parts 1-4) shall be included with consumer information.</p> <p>Assessment and verification:</p> <p>The tenderer shall provide a declaration of compliance with this criterion, listing all the plastic components with a weight greater than 100g in the furniture product and stating whether or not they have been marked according to EN ISO 11469 and EN ISO 1043 (parts 1-4).</p> <p>The marking of any plastic components shall be clearly visible upon visual examination of the plastic component. Marking does not necessarily need to be clearly visible in the final assembled furniture product.</p> <p>In the case of non-marking of any plastic parts with a weight greater than 100g, the tenderer shall justify this and indicate where relevant information is included in consumer information.</p>	<p>AC4: Plastic marking</p> <p>Plastic parts with a mass greater than 100g shall be marked in accordance with EN ISO 11469 and EN ISO 1043 (parts 1-4). The lettering used in markings should be at least 2.5 mm high.</p> <p>Where any fillers, flame retardants or plasticisers are intentionally incorporated into the plastic in proportions greater than 1 % w/w, their presence should also be included in the marking as per EN ISO 1043 parts 2-4.</p> <p>In exceptional cases, non-marking of plastic parts with a weight greater than 100g is permitted if:</p> <ul style="list-style-type: none"> • Marking would impact on the performance or functionality of the plastic part; • Where marking is not technically possible due to the production method; • Where parts cannot be marked because of insufficient appropriate surface area available for the marking to be of a legible size to be identified by a recycling operator. <p>In the above cases, where non-marking is justified, further details about the polymer type and any additives as per the requirements of EN ISO 11469 and EN ISO 1043 (parts 1-4) shall be included with consumer information.</p> <p>Assessment and verification:</p> <p>The tenderer shall provide a declaration of compliance with this criterion, listing all the plastic components with a weight greater than 100g in the furniture product and stating whether or not they have been marked according to EN ISO 11469 and EN ISO 1043 (parts 1-4).</p> <p>The marking of any plastic components shall be clearly visible upon visual examination of the plastic component. Marking does not necessarily need to be clearly visible in the final assembled furniture product.</p> <p>In the case of non-marking of any plastic parts with a weight greater than 100g, the tenderer shall justify this and indicate where relevant information is included in consumer information.</p>

Summary of rationale:

- Marking of plastic parts according to ISO 11468 / ISO 1043 instead of the SPI system may provide a lot more information of potential interest users and plastic recyclers.
- Due to longer marking codes being required and the fact that manual pre-sorting is most likely to occur with larger pieces the 50g threshold has been raised to 100g.

Award criterion 5: Recycled plastic content

Why relevant to GPP?

The vast majority of plastics are produced from non-renewable crude oil and present high embodied energies (of the order of 30-100MJ/kg) depending on what polymer resin is used, the method by which it is formed into a compounded plastic and any other additives used.

The recycling of plastic by combination with virgin polymer resin and any necessary additives prior to re-extrusion or injection moulding is the most desirable environmental option for plastics. The embodied energy of the plastic product is reduced in a manner that is directly proportional to the recycled plastic content.

The recycling rates for plastic are relatively low compared to other materials and this is mainly for the following reasons:

- There are so many different types of resin polymers available and each individual polymer or polymer blend can also contain any number of a wide range of special additives tailored to provide the product with certain aesthetic and technical properties.
- Plastic is a relatively cheap, lightweight and a low density material. The collection of post-consumer plastic is often not cost effective, especially in low density suburban areas.
- The high calorific value of plastic coupled with its difficulty to separate into pure polymer streams has made it much more economical to simply recover energy from plastic waste either in energy from waste plants or in cement kilns.

In an analogous situation to recycled wood (see AC1 for new furniture), the recycling of plastic is a better environmental option than energy recovery during combustion because it extends the useful life of plastic material without negating its future potential for energy recovery. An additional advantage of recycling plastic is the reduction of demand on finite supplies of crude oil.

Stakeholder discussion

Some concerns were expressed about the Nordic Ecolabel requirements being too ambitious for furniture (i.e. that if the furniture is at least 10% by weight plastic, the recycled plastic content shall be 50%) and essentially limiting the plastic content of Nordic Ecolabel furniture to a maximum of 10%.

Concerns were also raised about the potential introduction of unwanted hazardous substances via recycled plastic materials, which was especially a concern for cadmium and lead with recycled PVC. Although other stakeholders questioned the practicality of testing plastic recyclates for certain hazardous substances, the use of batch delivery information according to EN 15343 "*Recycled Plastics – Plastics recycling traceability and assessment of conformity and recycled content*", was suggested as a possible approach to take. Other concerns about the use of recycled plastic affecting the aesthetics of white coloured components and mechanical properties were raised. It was responded that furniture products that contain high contents of plastic furniture tend to be darker coloured, are used outdoors where aesthetics is generally less of a concern and often have redundancy built into the product design with regards to mechanical properties (i.e. thicker profiles being used for chair legs).

What do relevant ecolabel criteria and other green initiatives say?

The French NF 217 Ecolabel for furniture (version 10, Jan. 2104) does specifically require the use of any minimum quantity of recycled plastic but encourages its use indirectly via a criterion about the total embodied energy of the furniture product.

As mentioned above, the Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) requires that any furniture containing more than 10% by weight plastic shall have a plastic recycled content of at least 50% and that recycled PP, PE and PET must be from post-consumer materials and that no halogenated flame retardants must be present as impurities in quantities above 0.01% by weight.

The current proposal for EU Ecolabel criteria for furniture require that any furniture product consisting of at least 20% by weight plastic (excluding packaging) shall have a minimum recycled plastic content of 30% (again excluding packaging).

Ambition level

There are examples of furniture products on the market with specified recycled plastic contents and the aim of this award criterion is to encourage furniture manufacturers to look for plastics with pre- or post-consumer recycled contents as a means of being more competitive in invitations to tender by public authorities. For ease of verification, the requirement is aligned with the EU Ecolabel approach, which would also fall within the ambition level of the Nordic Ecolabel criteria.

Criteria proposal (for furniture where the plastic content exceeds 20% by weight)

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>ACS: Recycled plastic content</p> <p>The average recycled content of plastic parts (not including packaging) shall be at least 30 % w/w.</p> <p>Points shall be awarded in proportion to the actual recycled plastic content, with maximum points being applied for 100% recycled plastic content.</p> <p>Verification:</p> <p>The tenderer shall provide a declaration from the plastic supplier(s) stating the average recycled content in the final furniture product. Where plastic components come from different sources or manufacturers, the average recycled content shall be stated for each plastic source and the overall average recycled plastic content in the final furniture product shall be calculated.</p> <p>The declaration of recycled content from the plastic manufacturer(s) shall be supported by traceability documentation for plastic recyclates. An example approach would be to provide batch delivery information as per the framework set out in Table 1 of EN 15343.</p>	<p>ACS: Recycled plastic content</p> <p>The average recycled content of plastic parts (not including packaging) shall be at least 30 % w/w.</p> <p>Points shall be awarded in proportion to the actual recycled plastic content, with maximum points being applied for 100% recycled plastic content. .</p> <p>Verification:</p> <p>The tenderer shall provide a declaration from the plastic supplier(s) stating the average recycled content in the final furniture product. Where plastic components come from different sources or manufacturers, the average recycled content shall be stated for each plastic source and the overall average recycled plastic content in the final furniture product shall be calculated.</p> <p>The declaration of recycled content from the plastic manufacturer(s) shall be supported by traceability documentation for plastic recyclates. An example approach would be to provide batch delivery information as per the framework set out in Table 1 of EN 15343.</p>

Summary of rationale:

- Recycled plastic has a significantly lower embodied energy than virgin plastic and reduces demands on finite crude oil resources.
- Plastic recycling rates are low compared to those for metal or paper, so such an award criterion should send the right signal to the market.
- Points should be higher for products with a higher recycled plastic content.

Award criterion 7: Low chemical residue upholstery coverings

Background technical discussion and rationale

The reasons why this criterion is relevant to GPP, previous stakeholder discussion and what relevant Ecolabel criteria and other green initiatives say are the same as those previously stated in AC2 for refurbished furniture.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>AC7: Low chemical residue upholstery coverings</p> <p>Points shall be awarded where the upholstery covering material is shown to comply, as appropriate, with the limits for restricted arylamine dyes, extractable heavy metals and free formaldehyde set out below.</p> <p>For textile fabrics and coated fabrics:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 14362-1 and 14362-3. • Free and partly hydrolysable formaldehyde ≤ 75 mg/kg according to EN ISO 14184-1. • Extractable heavy metals determined according to EN ISO 105-E04 being less than the following limits (in mg/kg): antimony ≤ 30.0; arsenic ≤ 1.0; cadmium ≤ 0.1; chromium ≤ 2.0; cobalt ≤ 4.0; copper ≤ 50.0; lead ≤ 1.0; mercury ≤ 0.02 and nickel ≤ 1.0. <p>For leather:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 17234-1. • Chromium VI not detectable above 3 mg/kg according to EN ISO 17075. • Free and partly hydrolysable formaldehyde ≤ 300 mg/kg according to EN ISO 17226-1. • Extractable heavy metals determined according to EN ISO 17072-1 being less than the following limits (in mg/kg): antimony ≤ 30.0; arsenic ≤ 1.0; cadmium ≤ 0.1; chromium ≤ 200; cobalt ≤ 4.0; copper ≤ 50.0; lead ≤ 1.0; mercury ≤ 0.02 and nickel ≤ 1.0. <p>Verification:</p> <p>Points shall be awarded to tenderers that provide a declaration that the leather, textile fabric or coated fabric upholstery covering material, as appropriate, complies with the above limits, supported by results from relevant test methods either commissioned by the tenderer themselves or the material supplier.</p> <p>Furniture products or textile fabrics holding a relevant ISO Type I ecolabel fulfilling the listed requirements shall be deemed to comply.</p>	<p>AC7: Low chemical residue upholstery coverings</p> <p>Points shall be awarded where the upholstery covering material is shown to comply, as appropriate, with the limits for restricted arylamine dyes, extractable heavy metals and free formaldehyde set out below.</p> <p>For textile fabrics and coated fabrics:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 14362-1 and 14362-3. • Free and partly hydrolysable formaldehyde ≤ 75 mg/kg according to EN ISO 14184-1. • Extractable heavy metals determined according to EN ISO 105-E04 being less than the following limits (in mg/kg): antimony ≤ 30.0; arsenic ≤ 1.0; cadmium ≤ 0.1; chromium ≤ 2.0; cobalt ≤ 4.0; copper ≤ 50.0; lead ≤ 1.0; mercury ≤ 0.02 and nickel ≤ 1.0. <p>For leather:</p> <ul style="list-style-type: none"> • No restricted arylamines (see Appendix II) present above 30 mg/kg (limit applies to each individual amine) according to EN ISO 17234-1. • Chromium VI not detectable above 3 mg/kg according to EN ISO 17075. • Free and partly hydrolysable formaldehyde ≤ 300 mg/kg according to EN ISO 17226-1. • Extractable heavy metals determined according to EN ISO 17072-1 being less than the following limits (in mg/kg): antimony ≤ 30; arsenic ≤ 1.0; cadmium ≤ 0.1; chromium ≤ 200; cobalt ≤ 4.0; copper ≤ 50.0; lead ≤ 1.0; mercury ≤ 0.02 and nickel ≤ 1.0. <p>Verification:</p> <p>Points shall be awarded to tenderers that provide a declaration that the leather, textile fabric or coated fabric upholstery covering material, as appropriate, complies with the above limits, supported by results from relevant test methods either commissioned by the tenderer themselves or the material supplier.</p> <p>Furniture products or textile fabrics holding a relevant ISO Type I ecolabel fulfilling the listed requirements shall be deemed to comply.</p>

Summary of rationale:

- Chemical residues are inevitable in textile, coated fabric and leather upholstery materials but these should be minimised as far as is practical in materials that can be expected to come into direct skin contact, such as furniture upholstery.
- The arylamine dyes, extractable heavy metals and free formaldehyde are common chemical residues of concern in these type of materials.
- The requirements stated in this award criterion align with the minimum relevant requirements of OEKO-TEX 100, EU Ecolabel textiles and EU Ecolabel furniture and so should help reinforce these schemes, by incentivising furniture refurbishers to try to source them in order to make their bids more competitive.

Draft

Award criterion 8: Volatile Organic Compound (VOC) emissions

Why relevant to GPP?

Many different chemical mixtures and formulations can be used during the production and finishing treatment of furniture that contain significant contents of VOCs. This can result in the emission of small but not insignificant quantities of VOCs from the final furniture product once it is unpackaged and installed at the site of the contracting authority. For indoor furniture, VOC emissions may be sufficient to cause adverse health effects on occupants of the building. The EU LCI Working Group⁵² has published a list of approximately 85 VOCs of concern and set LCI limits⁵³ relating to their emission from products. The substances on the list and their associated LCI limits are updated on a periodical basis as new supporting toxicological evidence is produced.

The importance of VOC emissions from products in indoor environments is reflected by "EC Mandate 366, a horizontal approach to indoor VOC emissions", which is currently being implemented under the Construction Products Regulation (EC) No 305/2011, although it must be added that furniture does not fall within the scope of the mandate.

Stakeholder discussion

The subject of VOCs was debated in detail amongst furniture stakeholders. The first issue to mention would be to decide at what stage of the furniture life cycle VOCs should be tackled in GPP criteria. Industry stakeholders were concerned about strict limits on maximum VOC contents of formulations because this could result in products with inadequate technical properties, particularly in the case of public furniture subject to high wear. Nonetheless, one industry stakeholder stated that they could currently comply with a limit of 6% VOC content. Stakeholders in favour of requirements for low-VOC content coatings cited the advances in powder coating and UV-cured coating technologies which can reach almost zero VOC content and easily below an arbitrary limit of say, 5%.

Arguments in favour of final product testing stated that this was far more relevant to the overall aim of reducing user exposure to VOCs and that just because high VOC content formulations may or may not be used during production, this does not automatically translate into a final product with high VOC emissions – ultimately it will depend on the quantities involved and the curing and drying steps involved. Stakeholders who were against final testing requirements mentioned the high costs of testing, which can range from €2000-5000 for ISO 16000 chamber testing with results after 3 days and 28 days. The lack of a standard EU method for final product testing for furniture was also mentioned. Due to this lack, there would be doubts about what exactly would be considered as an acceptable limit to apply and what would be an acceptable loading rate in the chamber. Stakeholders in favour of final product emission testing pointed out the BIFMA (in the US) and Blue Angel have VOC emission limits that are set to final furniture products and that it would be possible to also apply ISO 16000 or CEN/TS 16516 limits and loading rates specifically to wood-based panels used in furniture if this was desired.

What do relevant ecolabel criteria and other green initiatives say?

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) place an upper limit of 60% VOC content for coating formulations. For adhesives, the basic

⁵² See: http://www.eu-lci.org/EU-LCI_Website/EU-LCI_Values.html

⁵³ LCI = Lowest Concentration of Interest (of individual VOCs). The LCI concept was first developed by the European Collaborative Action on 'Indoor Air Quality and its Impact on Man' when considering the best way to evaluate emissions from solid flooring materials. It was defined (see ECA Report No.18, 1997) as "the lowest concentration above which, according to best professional judgement, the pollutant may have some effect on people in the indoor environment".

requirements are that any water-based formulations must be $\leq 10\%$ VOC content or $\leq 30\%$ VOC content for solvent-based formulations. The advanced requirement states that all adhesives used must have a VOC content less than 10%.

The French NF 217 Ecolabel for furniture (version 10, Jan. 2104) does not have any requirements on the VOC content of coating formulations or adhesives or on final product VOC emission. However, the future intention to have final product VOC emission criteria is explicitly mentioned.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) do not address final product VOC emissions but instead the quantity of VOCs in coating formulations or applied to the furniture. Where components are coated and these components account for at least 5% of the furniture weight, one of the following conditions in the second or third columns of the table below must apply.

Table 6. Nordic Ecolabel approach to VOCs in coating formulations applied to furniture

Furniture type	Quantity VOC applied	if	VOC content of coating formulation
Bedroom furniture, reception room furniture, doors, MDF panels and contoured surfaces	≤ 10 g/m ²		> 5%
Tables, chairs and other product groups	≤ 30 g/m ²		> 5%
Contract furniture and furniture of high quality	≤ 60 g/m ²		> 5%

The Blue Angel criteria for low emission upholstered furniture (RAL UZ 117, Sept. 2009 version) define specific chamber test conditions that can be applied to a textile covered armchair or pieces of leather upholstery and associated air concentrations limits for formaldehyde (60 $\mu\text{g}/\text{m}^3$), other aldehydes ((60 $\mu\text{g}/\text{m}^3$)), total VOCs (450 $\mu\text{g}/\text{m}^3$), total SVOCs (80 $\mu\text{g}/\text{m}^3$) and carcinogenic VOCs (1 $\mu\text{g}/\text{m}^3$ per substance). The Blue Angel also permits the use of emission rate limits (with units in $\mu\text{g}/\text{h}$ instead of chamber air concentrations (in $\mu\text{g}/\text{m}^3$) when the whole armchair is tested.

In the US, the BIFMA scheme (set out in the ANSI/BIFMA M7.1-2011 standard) has been set up for VOC emission testing of office furniture and defines two product groups "systems furniture", and "seating". Emissions are measured in a ventilated chamber test and a series of measurements are taken at periods between 3 and 14 days after placement in the chamber. Emission rates can be calculated ($\mu\text{g}/\text{m}^2\cdot\text{h}$) or ($\mu\text{g}/\text{m}^3\cdot\text{h}$) depending on how the product being tested is defined, and 7 day limits for TVOC, formaldehyde, total aldehydes and 4-phenylcyclohexane are set in the ANSI/BIFMA M7.1-2011 standard.

Ambition level

Due to doubts about the market availability of low-VOC emission furniture or the degree of use of low-VOC content coatings in furniture products, it was considered that VOC-related criteria would be best addressed as an award criterion only. Trying to align directly with the requirements of the proposed EU Ecolabel would difficult to translate into GPP award criteria and so an initial simple approach is presented.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
AC8: Low VOC emission furniture Points will be awarded for demonstrating that the total VOC (TVOC) emissions from the entire furniture product or from particular component parts considered to be the most significant sources of VOC emissions from the furniture product (such as upholstery or wood-based	AC8: Low VOC emission furniture Points will be awarded for demonstrating that the total VOC (TVOC) emissions from the entire furniture product or from particular component parts considered to be the most significant sources of VOC emissions from the furniture product (such as upholstery or wood-based

panels) result in chamber concentrations of TVOCs are less than 500 µg/m³ after 28 days testing according to ISO 16000 or equivalent standards.

Verification:

The tenderer shall provide a copy of a chamber test report carried out by an accredited laboratory and in accordance with the requirements of the ISO 16000 series of standards. The tenderer shall make it clear whether the test was applied to the entire furniture product or only to defined components parts.

Experimental details such as loading rate, air flow and chamber temperature and humidity shall also be included in the report.

Other standards that can be considered as equivalent to ISO 16000 shall include the method developed by CEN/TS 16516, the method described in the ANSI/BIFMA M7.1-2011 standard and

Furniture products or upholstery materials holding a relevant ISO Type I ecolabel fulfilling the listed requirements shall be deemed to comply.

panels) result in chamber concentrations of TVOCs are less than 500 µg/m³ after 28 days testing according to ISO 16000 or equivalent standards.

Verification:

The tenderer shall provide a copy of a chamber test report carried out by an accredited laboratory and in accordance with the requirements of the ISO 16000 series of standards. The tenderer shall make it clear whether the test was applied to the entire furniture product or only to defined components parts.

Experimental details such as loading rate, air flow and chamber temperature and humidity shall also be included in the report.

Other standards that can be considered as equivalent to ISO 16000 shall include the method developed by CEN/TS 16516, the method described in the ANSI/BIFMA M7.1-2011 standard and

Furniture products or upholstery materials holding a relevant ISO Type I ecolabel fulfilling the listed requirements shall be deemed to comply.

Summary of rationale:

- VOC emissions from furniture products are of direct relevance to indoor air quality and potential adverse health effects on users.
- Due to the high costs of VOC emission testing, a flexible approach is afforded with regards to which standard test is followed. The limit of 500 µg/m³ for TVOC after 28 days means that the Blue Angel and BIFMA standards would demonstrate compliance.
- The provisional EU Ecolabel criteria for furniture could also be used as proof of compliance depending on the nature of the individual application and materials in the product.

Award criterion 9: Collection and End of Life management of furniture

Background technical discussion and rationale

For reasons why this is relevant to GPP, what relevant stakeholder discussion has taken place and what relevant ecolabel criteria or other green initiatives say on this matter, the reader is referred to TS10 for new furniture, where such text has already been presented.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
Improvement in the re-use targets	Improvement in the re-use targets
Points shall be awarded to tenderers offering higher levels of re-use than those stated in the Technical Specification.	Points shall be awarded to tenderers offering higher levels of re-use than those stated in the Technical Specification.
Verification:	Verification:
The tenderer shall provide details of how the additional level of re-use will be achieved	The tenderer shall provide details of how the additional level of re-use will be achieved
CONTRACT PERFORMANCE CLAUSES	
The tenderer shall provide the contracting authority with suitable evidence about the percentages of furniture resold, donated, recycled and disposed of at the latest 12 months after the signature of the contract.	The tenderer shall provide the contracting authority with suitable evidence about the percentages of furniture resold, donated, recycled and disposed at the latest 12 months after the signature of the contract.

Summary of rationale:

- When purchasing new furniture, the public authority will likely want to dispose of a similar quantity of old furniture. It is more than likely that the old furniture can be reused, perhaps with or perhaps without the need for some degree of refurbishment.
- Furniture items are bulky and with significant transport costs, by linking the collection of old furniture with the delivery of new furniture, transport requirements can be minimised.
- From an environmental point of view, and in line with the waste hierarchy, reuse or refurbishment of furniture has a higher environmental benefit than recycling and so should be associated with the highest award of points.
- The allowance of EoL collection schemes being linked to third parties ensures that large international companies specialised in the manufacture of new furniture can potentially apply this award criterion to their tenders by collaborating with more specialised companies or organisations that are local to the contracting authority.

Award criterion 10: Extended warranty periods

Why relevant to GPP?

Extended warranty periods, although not a concrete guarantee that the product is more durable, nonetheless represents a commitment from the producer that the furniture product has been designed and built in a robust and durable fashion to the extent that they are confident it can maintain its fitness for use during a longer period.

The warranty indirectly encourages that the furniture product should be straightforward to repair or to change replaceable parts for damage that has the highest probability of occurring.

As mentioned with earlier criteria, any improvement in the durability or useable lifetime of the furniture product has clear and direct benefits on the life cycle impact of the product due to the fact that most impacts are associated with the raw materials used in furniture and their processing into useable component parts or materials in the final product.

Stakeholder discussion

Stakeholders were largely against the idea of extended warranties on furniture products. They pointed out that many promises can be made to win points in an ITT but what really matters is who the terms and conditions of any extended warranty, which are often far from clear, may be applied in cases where a lack of conformity of the furniture arises. So unless the terms and conditions required in an extended warranty are made clear in an ITT and required to be essentially identical for all tenderers, then such a criterion could potentially become problematic.

What do other relevant ecolabel criteria and green initiatives say?

The FEMB sustainability requirements for office and non-domestic furniture for indoor use (Draft 2, Jul. 2012) a 5 year commercial warranty be applied to furniture products at the prerequisite level or a 10 year commercial warranty at the advanced level.

The French NF 217 Ecolabel for furniture (version 10, Jan. 2104) does not make any clear provision about final product guarantees or warranties, but simply a 5 year commitment to provide spare parts.

The Nordic Ecolabel criteria for furniture and fitments (version 4.9, Dec. 2011) does not make a specific commitment to a certain minimum warranty period but only to compliance with relevant EN or ISO fitness for use standards.

The Blue Angel criteria for low emission upholstered furniture (RAL UZ 117, Sept. 2009 version) and for low emission furniture and slatted frames made of wood and wood-based materials (RAL UZ 38, Jan. 2013 version) specify a minimum 5 year guarantee of furniture parts that are subject to wear, such as hinges, locks and table leaves, but not lights or light fittings.

Ambition level

It is difficult to set a universal minimum warranty period for all furniture products because there is such a huge range of products within the scope, each with different types or use and subject to different types of wear and tear, so contracting authorities are strongly encouraged to investigate what is a reasonable warranty period to expect for the specific furniture types they are seeking to procure.

In TS9, core and comprehensive warranty periods are set out at 3 and 5 years respectively. Going beyond these would then bring the ambition level in line with the FEMB sustainability requirements for office and non-domestic furniture for indoor use.

Criteria proposal

Core criteria	Comprehensive criteria
AWARD CRITERION	
<p>Extended warranty periods</p> <p>Additional points shall be awarded to each additional year of warranty offered that is more than the minimum technical specification as follows:</p> <ul style="list-style-type: none"> - 4 or more years extra warranty: x points - 3 years extra warranty: 0.75x points - 2 years extra warranty: 0.5x points - 1 year extra warranty: 0.25x points <p>Verification:</p> <p>A copy of the warranty terms and conditions shall be provided by the tenderer as well as a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p>	<p>Extended warranty periods</p> <p>Additional points shall be awarded to each additional year of warranty offered that is more than the minimum technical specification as follows:</p> <ul style="list-style-type: none"> - 4 or more years extra warranty: x points - 3 years extra warranty: 0.75x points - 2 years extra warranty: 0.5x points - 1 year extra warranty: 0.25x points <p>Verification:</p> <p>A copy of the warranty terms and conditions shall be provided by the tenderer as well as a declaration that they cover the conformity of the goods with the contract specifications, including all indicated usage.</p>

Summary of rationale:

- Extended product warranties are a very relevant proxy measure for durable and robust products with a longer expected lifetime than other products with shorter warranties.
- The increased risk to tenderers of future repair and replacement costs caused by an extended warranty is likely to result in an increased cost of the furniture product. For this reason, if the contracting authority wishes to encourage products with longer warranties to be more competitive with other equivalent products with shorter warranties, then an award criterion should be used.

Appendix I: Durable upholstery materials

Requirements for good physical quality upholstery materials in furniture are defined in Tables 7, 8 and 9 below.

Table 7. Physical requirements of leather used in Ecolabel furniture (taken from Tables 1 and 2 in EN 13336)

Fundamental characteristics	Test method		Recommended values		
			Nubuck, Suede and Aniline*	Semi-aniline*	Coated, pigmented and other*
pH and ΔpH	EN ISO 4045		≥ 3.5 (if the pH is ≤4.0, ΔpH shall be ≤ 0.7)		
Tear load, average value	EN ISO 3377-1		> 20 N		
Colour fastness to to-and-fro rubbing	EN ISO 11640. Total mass of finger 1000g. Perspiration alkaline solution as defined in EN ISO 11641.	Aspects to be evaluated	Change of leather colour and felt staining	Change of leather colour and felt staining No destruction of finish	
		using dry felt	50 cycles, ≥ 3 grey scale	500 cycles, ≥ 4 grey scale	
		using wet felt	20 cycles, ≥ 3 grey scale	80 cycles, ≥ 3/4 grey scale	250 cycles, ≥ 3/4 grey scale
		using felt wetted with artificial perspiration	20 cycles, ≥ 3 grey scale	50 cycles, ≥ 3/4 grey scale	80 cycles, ≥ 3/4 grey scale
Colour fastness to artificial light	EN ISO 105-B02 (method 3)		≥ 3 blue scale	≥ 4 blue scale	≥ 5 blue scale
Dry finish adhesion	EN ISO 11644		--	≥ 2N / 10mm	
Dry flex resistance	EN ISO 5402-1		For aniline leather with non-pigmented finish only, 20 000 cycles (no finish damage cracks)	50 000 cycles (no finish damage cracks)	50 000 cycles (no finish damage cracks)
Colour fastness to water spotting	EN ISO 15700		≥ 3 grey scale (no permanent swelling)		
Cold crack resistance of finish	EN ISO 17233		--	-15°C (no finish crack)	
Fire resistance	EN 1021 or relevant national standards		Pass		

*Definitions of these leather types are according to EN 15987.

Table 8. Physical requirements for textile fabric covering materials in furniture upholstery.

Test factor	Method	Removable and washable coverings	Non-removable and washable coverings
Dimensional changes during washing and drying	Domestic washing: ISO 6330 + EN ISO 5077 (three washes at temperatures as indicated in the product with tumble drying after each washing cycle) Commercial washing: ISO 15797 + EN ISO 5077 (at minimum of 75 °C)	+/- 3.0% for woven fabrics +/- 6.0% for non-woven fabrics	N/A
Colour fastness to washing	Domestic washing: ISO 105-C06 Commercial washing: ISO 15797 + ISO 105-C06 (at minimum of 75 °C)	≥ level 3-4 for colour change ≥ level 3-4 for staining	N/A
Colour fastness to wet rubbing*	ISO 105 X12	≥ level 2-3	≥ level 2-3
Colour fastness to dry rubbing*	ISO 105 X12	≥ level 4	≥ level 4
Colour fastness to light	ISO 105 B02	≥ level 5**	≥ level 5**
Fabric resistance to pilling and abrasion	Knitted and non-woven products: ISO 12945-1 Woven fabrics: ISO 12945-2	ISO 12945-1 result >3 ISO 12945-2 result >3	ISO 12945-1 result >3 ISO 12945-2 result >3

* does not apply to white products or products that are neither dyed nor printed

** A level of 4 is nevertheless allowed when furniture covering fabrics are both light coloured (standard depth ≤ 1/12) and made of more than 20 % wool or other keratin fibres, or more than 20 % linen or other bast fibres.

Table 9. Physical requirements for coated fabric covering materials in furniture upholstery

Property	Method	Requirement
Tensile strength	ISO 1421	CH ≥ 35daN and TR ≥ 20daN
Tear resistance of plastic film and sheeting by the trouser tear method	ISO 13937/2	CH ≥ 2,5daN and TR ≥ 2daN
Colour fastness to artificial weathering – Xenon arc fading lamp test	EN ISO 105-B02	Indoor use ≥ 6; Outdoor use ≥ 7
Textiles – abrasion resistance by the Martindale method	ISO 5470/2	≥ 75,000
Determination of coating adhesion	EN 2411	CH ≥ 1,5daN and TR ≥ 1,5daN

Where: daN = deca Newtons, CH = Warp and TR = Weft

Appendix II: Testing requirements and restrictions for dyes in textiles, coated fabrics and leather

1. Testing requirements

Included here are the substances listed in Entry 43 that should be tested for in any dyed leather (using the EN 17234 standard) or textiles (using the EN 14362-1 and -3 standards).

Table 10. Carcinogenic arylamines to be tested in textiles or leather.

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-naphthylamine	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

2 - Excluded dyes

Regardless of the results from testing for the substances in part 1, the following dyes compounds that are classified as either CMR or potentially sensitising shall not be used during the production of the textile fabrics, leather or coated fabrics.

Table 11. Dyes that are CMR or potentially sensitising

Dyes that are carcinogenic, mutagenic or toxic to reproduction		
C.I. Acid Red 26	C. I. Direct Black 38	C.I. Disperse Blue 1
C.I. Basic Red 9	C.I. Direct Blue 6	C. I. Disperse Orange 11
C. I. Basic Violet 14	C. I. Direct Red 28	C.I. Disperse Yellow 3
Disperse dyes that are potentially sensitising		
C. I. Disperse Blue	C. I. Disperse Blue 124	C. I. Disperse Red 11
C. I. Disperse Blue 3	C. I. Disperse Brown 1	C. I. Disperse Red 17
C. I. Disperse Blue 7	C. I. Disperse Orange 1	C. I. Disperse Yellow 1
C.I. Disperse Blue 26	C. I. Disperse Orange 3	C. I. Disperse Yellow 3
C. I. Disperse Blue 35	C. I. Disperse Orange 37	C. I. Disperse Yellow 9
C. I. Disperse Blue 102	C. I. Disperse Orange 76	C. I. Disperse Yellow 39
C.I. Disperse Blue 106	C. I. Disperse Red 1	C. I. Disperse Yellow 49

3 - Dyes recommended to not use

A number of dye compounds, although not directly restricted themselves, are known to cleave to form some of the prohibited substances listed in Table 10 above. Thus it is strongly recommended that their use be avoided in leather and textile dyeing processes in order to comply with the requirements for carcinogenic arylamines.

As a guide to applicants, the following dyes should not be used:

Table 12. Indicative list of dyes that may cleave to form carcinogenic arylamines

Disperse dyes		Basic dyes	
Disperse Orange 60	Disperse Yellow 7	Basic Brown 4	Basic Red 114
Disperse Orange 149	Disperse Yellow 23	Basic Red 42	Basic Yellow 82
Disperse Red 151	Disperse Yellow 56	Basic Red 76	Basic Yellow 103
Disperse Red 221	Disperse Yellow 218	Basic Red 111	
Acid dyes			
CI Acid Black 29	CI Acid Red 4	CI Acid Red 85	CI Acid Red 148
CI Acid Black 94	CI Acid Red 5	CI Acid Red 104	CI Acid Red 150
CI Acid Black 131	CI Acid Red 8	CI Acid Red 114	CI Acid Red 158
CI Acid Black 132	CI Acid Red 24	CI Acid Red 115	CI Acid Red 167
CI Acid Black 209	CI Acid Red 26	CI Acid Red 116	CI Acid Red 170
CI Acid Black 232	CI Acid Red 26:1	CI Acid Red 119:1	CI Acid Red 264
CI Acid Brown 415	CI Acid Red 26:2	CI Acid Red 128	CI Acid Red 265
CI Acid Orange 17	CI Acid Red 35	CI Acid Red 115	CI Acid Red 420
CI Acid Orange 24	CI Acid Red 48	CI Acid Red 128	CI Acid Violet 12
CI Acid Orange 45	CI Acid Red 73	CI Acid Red 135	
Direct dyes			
Direct Black 4	Direct Blue 192	Direct Brown 223	Direct Red 28
Direct Black 29	Direct Blue 201	Direct Green 1	Direct Red 37
Direct Black 38	Direct Blue 215	Direct Green 6	Direct Red 39
Direct Black 154	Direct Blue 295	Direct Green 8	Direct Red 44
Direct Blue 1	Direct Blue 306	Direct Green 8.1	Direct Red 46
Direct Blue 2	Direct Brown 1	Direct Green 85	Direct Red 62
Direct Blue 3	Direct Brown 1:2	Direct Orange 1	Direct Red 67
Direct Blue 6	Direct Brown 2	Direct Orange 6	Direct Red 72
Direct Blue 8	Basic Brown 4	Direct Orange 7	Direct Red 126
Direct Blue 9	Direct Brown 6	Direct Orange 8	Direct Red 168
Direct Blue 10	Direct Brown 25	Direct Orange 10	Direct Red 216
Direct Blue 14	Direct Brown 27	Direct Orange 108	Direct Red 264
Direct Blue 15	Direct Brown 31	Direct Red 1	Direct Violet 1
Direct Blue 21	Direct Brown 33	Direct Red 2	Direct Violet 4
Direct Blue 22	Direct Brown 51	Direct Red 7	Direct Violet 12
Direct Blue 25	Direct Brown 59	Direct Red 10	Direct Violet 13
Direct Blue 35	Direct Brown 74	Direct Red 13	Direct Violet 14
Direct Blue 76	Direct Brown 79	Direct Red 17	Direct Violet 21
Direct Blue 116	Direct Brown 95	Direct Red 21	Direct Violet 22
Direct Blue 151	Direct Brown 101	Direct Red 24	Direct Yellow 1
Direct Blue 160	Direct Brown 154	Direct Red 26	Direct Yellow 24
Direct Blue 173	Direct Brown 222	Direct Red 22	Direct Yellow 48

Appendix III: List of relevant EN fitness for use standards

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

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

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

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

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

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

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

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

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

Glass in furniture

- EN 14072:2003 Glass in furniture - Test methods

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

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 IV: List of abbreviations used in the ISO 1043 plastic marking scheme

Table 13: ISO 1043-1 symbols for homopolymeric polymers

Symbol	Material	Symbol	Material	Symbol	Material
CMC	Carboxymethylcellulose	POM	Poly(oxymethylene);Polyformadehyde	PEEKK	Polyetheretherketoneketone
CA	Celluloseacetate	PPE	Poly(phenyleneEther)	PEEST	Polyesterester
CAB	Celluloseacetatebutyrate	PPS	Poly(phenylenesulfide)	PEEK	Polyetheretherketone
CAP	Celluloseacetatepropionat	PPSU	Poly(phenylenesulfone)	PEI	Polyetherimide
CN	Cellulosenitrate	PVAC	Poly(vinylacetate)	PEK	Polyetherketone
CP	Cellulosepropionate	PVAL	Poly(vinylalcohol)	PEKEKK	Polyetherketoneetherketoneketone
CTA	Celluloseetriacetate	PVB	Poly(vinylbutyral)	PEKK	Polyetherketoneketone
CF	Cresol-formaldehyde	PVK	Poly(vinylcarbazole)	PES	Polyethersulfone
EP	Epoxide;Epoxy	PVC	Poly(vinylchloride)	PEUR	Polyetherurathane
EC	Ethylcellulose	PVF	Poly(vinylfluoride)	PE	Polyethylene
FF	Furan-formaldehyde	PVFM	Poly(vinylformal)	PI	Polyimide
PS-HI	Highimpactmodifiedpolystyrene	PVDF	Poly(vinylidene fluoride)	PIB	Polyisobutylene
MF	Melamine-formaldehyde	PVP	Poly(vinylpyrrolidone)	PIR	Polyisocyanurate
MC	Methylcellulose	PVDC	Poly(vinylidenechloride)	PMI	Polymethacylimide
PFA	Perfluoroalkoxalkane polymer	PMS	Poly-(α -methylstyrene)	PP	Polypropylene
PF	Phenol-formaldehyde	PAN	Polyacrylonitrile	PS	Polystyrene
PBAK	Poly(butylacrylate)	PAEK	Polyacetherketone	PSU	Polysulfone
PBT	Poly(butylene terephthalate)	PA	Polyamide	PTFE	Polytetrafluorouethylene
PDAP	Poly(diallylphthalate)	PAI	Polyamidimide	PUR	Polyurethane
PEOX	Poly(ethyleneoxide)	PB	Polybutene	SI	Silicone
PET	Poly(ethylene terephthalate)	PC	Polycarbonate	UP	Unsaturated polyester
PMMA	Poly(methylmethacrylate)	PCTFE	Polychlorotrifluoroethylene	UF	Urea-formaldehyde

Table 14: ISO 1043-1 symbols for co-polymeric materials

Symbol	Material	Symbol	Material
ABAK	Acrylonitrile-butadiene-acrylate	PEBA	Poly(etherblockamide)
ABS	Acrylonitrile-butadiene-styrene	PESTUR	Polyesterurethane
ACS	Acrylonitrile-chlorinatedpolyethylene-styrene	PFEP	Perfluoro(ethylene-propylene)
AEPDS*	Acrylonitrile/ethylene-propylene-diene/styrene	PMMI	Poly(N-methylmethacylimide)
AMMA	Acrylonitrile-methylmethacrylate	PMP	Poly(4-methylpent-1-ene)
ASA	Acrylonitrile-styrene-acrylate	SAN	Styrene-acrylonitrile
CFS	Casein-formaldehyde	SB	Styrene-butadiene
E/P	Ethylene-propylene	SMAH	Styrene-maleicanhydride
EEAK	Ethylene-ethylacrylate	SMS	Styrene- α -methylstyrene
EMA	Ethylene-methacrylicacid	VCE	Vinylchloride-ethylene
ETFE	Ethylene-tetrafluoroethylene	VCEMAK	Vinylchloride-ethylene-methylacrylate
EVAC	Ethylene-vinylacetate	VCEVAC	Vinylchloride-ethylene-vinylacetate
EVOH	Ethylene-vinylalcohol	VCMAC	Vinylchloride-methylacrylate
LCP	Liquid-crystalpolymer	VCMMA	Vinylchloride-methylmethacrylate
MBS	Methacrylate-butadiene-styrene	VCOAK	Vinylchloride-octylacrylate
MMABS	Methylmethacrylate-acrylonitrile-butadiene-styrene	VCVAC	Vinylchloride-vinylacetate
MPF	Melamine-phenol-formadehyde	VCVDC	Vinylchloride-vinylidenechloridire
PAR	Polyarylate		

*AEPDS was known as EDPM

Table 15: ISO 1043-2 symbols for fillers and reinforcing materials in plastics

Symbol	Material [1]	Symbol	Form/Structure
B	Boron	B	Beads, spheres, balls
C	Carbon	C	Chips, cuttings
D	Alumina trihydrate	D	Fines, powders
E	Clay	F	Fiber, fibre
G	Glass	G	Ground
K	Calcium carbonate	H	Whisker
L	Cellulose	K	Knitted fabric
M	Mineral: metal [2]	L	Layer
N	Natural organic (cotton, sisal: hemp: flax: and so forth.)	M	Mat (thick)
P	Mica	N	Non-woven (fabric, thin)
Q	Silica	P	Paper
R	Aramid	R	Roving
S	Synthetic organic (finely divided PTFE: polyimides or thermoset resins)	T	Talcum
S	Flake	W	Wood
T	Twisted or braided fabric, cord	X	Not specified
V	Veneer	Z	Others (not included on this list)
W	Woven fabric	X	Not specified
Y	Yarn	Z	Others, not included on this list

[1] Materials may be further defined; for example by their chemical symbols or by additional symbols defined in the relevant International Standard.

[2] In the case of metals (M), the type of metal must be indicated by its chemical symbol.

Table 16: ISO 1043-3 abbreviations used for plasticizers

Abbreviation	Common name	IUPAC* equivalent	CAS-RN**
ASE	Alkylsulfonic acid ester	Alkylsulfonates or Alkyl alkanesulfonates	not known
BAR	butylo-acetylricinoleate	Butyl [®] -12-acetoxyoleate	140-04-5
BBP	Benzyl butyl phthalate	same	85-68-7
BCHP	Butyl cyclohexyl phthalate	same	84-64-0
BNP	Butyl nonyl phthalate	same	not known
BOA	Benzyl octyladipate	benzyl2-ethylhexyl adipate	3089-55-2
BOP	Butyl octyl phthalate	butyl2-ethylhexyl phthalate	85-69-8
BST	Butyl stearate	same	123-95-5
DBA	Dibutyl adipate	same	105-99-7
BEP	di-(2-butoxyethyl) phthalate	bis(2-butoxyethyl) phthalate	117-83-9
DBF	dibutyl fumarate	same	105-75-9
DBM	dibutyl maleate	same	105-76-0
DBP	dibutyl phthalate	same	84-74-2
DBS	dibutyl sebacate	same	109-43-3
DBZ	dibutyl azelate	same	2917-73-9
DCHP	dicyclohexyl phthalate	same	84-61-7
DCP	dicapryl phthalate	bis(1-methylheptyl) phthalate	131-15-7
DDP	didecyl phthalate	same	84-77-5
DEGDB	diethylene glycol dibenzoate	oxydiethylene dibenzoate	120-55-8
DEP	diethyl phthalate	same	84-66-2
DHP	diheptyl phthalate	same	3648-21-3
DHXP	dihexyl phthalate	same	84-75-3
DIBA	diisobutyl adipate	same	141-04-8
DIBM	diisobutyl maleate	same	14234-82-3
DIBP	diisobutyl phthalate	same	84-69-5
DIDA	diisobutyl adipate	***	27178-16-1
DIDP	diisodecyl phthalate	***	26761-40-0
DIHP	diisoheptyl phthalate	as above	41451-28-9
DIHXP	diisohexyl phthalate	same	71850-09-4
DINA	diisononyl adipate	***	33703-08-1
DINP	diisononyl phthalate	***	28553-12-0
DIOA	diisooctyl adipate	***	1330-86-5
DIOM	diisooctyl maleate	***	1330-76-3
DIOP	diisooctyl phthalate	***	27554-26-3
DIOS	diisooctyl sebacate	***	27214-90-0
DIOZ	diisooctyl azelate	***	26544-17-2
DIPP	diisooctyl phthalate	same	605-50-5
DMEP	di-(2-methoxyethyl)	bis(2-methoxyethyl)	117-82-8

DMP	dimethyl phthalate	same	131-11-3
DMS	dimethyl sebacate	same	106-79-6
DNF	dinonyl fumarate	same	2787-63-5
DMN	dinonyl maleate	same	2787-64-6
DNOP	di-n-octyl phthalate	dioctyl phthalate	117-84-0
DNP	dinonyl phthalate	same	14103-61-8
DNS	dinonyl sebacate	same	4121-16-8
DOA	dioctyl adipate	bis(2-ethylhexyl) adipate	103-23-1
DOIP	dioctyl isophthalate	bis(2-ethylhexyl) isophthalate	137-89-3
DOP	dioctyl phthalate	bis(2-ethylhexyl) phthalate	117-81-7
DOS	dioctyl sebacate	bis(2-ethylhexyl) sebacate	122-62-3
DOTP	dioctyl terephthalate	bis(2-ethylhexyl) terephthalate	6422-86-2
DOZ	dioctyl azelate	bis(2-ethylhexyl) azelate	2064-80-4
DPCF	diphenyl cresyl phosphate	diphenyl x-tolyl orthophosphate where x denotes o, m, p or mixture	26444-49-5
DPGDB	di-x-propylene glycol dibenzoate	not possible	not known
DPOF	diphenyl octyl phosphate	2-ethylhexyl diphenyl orthophosphate or octyl diphenyl orthophosphate	1241-94-7
DPP	diphenyl phthalate	same	84-62-8
DTDP	diisotridecyl phthalate (see note X)	***	27253-26-5
DUP	diundecyl phthalate	same	3648-20-2
ELO	epoxidized linseed oil	not possible	8016-11-3
ESO	epoxidized soya bean oil	not possible	8013-07-8
GTA	glycerol triacetate	same	102-76-1
HNUA	heptyl nonyl undecyl adipate (=711A)	not possible	Not known
HNUP	heptyl nonyl undecyl phthalate (=711P)	not possible	68515-42-4
HXODA	heptyl octyl decyl adipate (=610A)	not possible	not known
HXODP	heptyl octyl decyl phthalate (=610P)	not possible	68515-51-5
NUA	nonyl undecyl adipate (=911A)	not possible	not known
NUP	nonyl undecyl phthalate (=911P)	not possible	not known
ODA	octyl decyl adipate	decyl octyl adipate	110-29-2
ODP	octyl decyl phthalate	decyl octyl phthalate	68515-52-6
ODTM	n-octyl decyl trimellitate	decyl octyl hydrogen Benzene-1,2,4-tricarboxylate	not known
PO	paraffin oil	not possible	8012-95-1
PPA	poly(propylene adipate)	same	not known
PPS	poly(propylene sebacate)	not possible	not known
SOA	sucrose octa-acetate	sucrose octaacetate	126-14-7
TBAC	tributyl o-acetylcitrate	same	77-90-7
TBEP	tri-(2-butoxyethyl) phosphate	tris(2-butoxyethyl) orthophosphate	78-51-3
TBP	tributyl phosphate	tributyl orthophosphate	126-73-8
TCEF	trichloroethyl phosphate	tris(2-chloroethyl) orthophosphate	6145-73-9
TCF	tricresyl phosphate	tri-x-tolyl orthophosphate where x denotes o, m, p or mixture	1330-78-5
TDBPP	tri-(2,3-dibromopropyl) phosphate	tris(2,3-dibromopropyl) orthophosphate	126-72-7
TDCPP	tri-(2,3-dichloropropyl) phosphate	tris(2,3-dichloropropyl) orthophosphate	78-43-3
TEAC	triethyl o-acetylcitrate	same	77-89-4
THFO	tetrahydrofurfuryl oleate	same	5420-17-7
THTM	triheptyl trimellitate	triheptyl benzene-1,2,4-tricarboxylate	1528-48-9
TIOTM	triisooctyl trimellitate	tris(6-methylheptyl) Benzene-1,2,4-tricarboxylate	27251-75-8
TOF	trioctyl phosphate	tris(2-ethylhexyl) orthophosphate	78-42-2
TOPM	tetraoctyl pyromellitate	tetrakis(2-ethylhexyl) benzene-1,2,4,5-tetracarboxylate	3126-80-5
TOTM	trioctyl trimellitate	tris(2-ethylhexyl) benzene-1,2,4,5-tetracarboxylate	89-04-3
TPP	triphenyl phosphate	triphenyl orthophosphate	115-86-6
TXF	trixyl phosphate	tri-x,y-xylyl orthophosphate, where x and y denotes o, m, p or mixture	25155-23-1

* IUPAC = International Union of Pure and Applied Chemicals

** CAS-RN = Chemical Abstracts Service – Registry Number

*** Several plasticizers having "iso" names indicating branched groups may consist of several isomers. For this reason, no single IUPAC name can describe the detailed chemical composition of each of these plasticizers.

Table 17. List of code numbers from ISO 1043-4 for flame retardant types used in plastics

HALOGONATED COMPOUNDS	
10	aliphatic/alicyclic chlorinated compounds
11	aliphatic/alicyclic chlorinated compounds in combination with antimony compounds
12	aromatic chlorinated compounds
13	aromatic chlorinated compounds in combination with antimony compounds
14	aliphatic/alicyclic brominated compounds
15	aliphatic/alicyclic brominated compounds in combination with antimony compounds
16	aromatic brominated compounds (excluding brominated diphenyl ether and biphenyls)
17	aromatic brominated compounds (excluding brominated diphenyl ether and biphenyls) in combination with antimony compounds
18	polybrominated diphenyl ether
19	polybrominated diphenyl ether in combination with antimony compounds
20	polybrominated biphenyls
21	polybrominated biphenyls in combination with antimony compounds
22	aliphatic/alicyclic chlorinated and brominated compounds
23, 24	not allocated
25	aliphatic fluorinated compounds
26 to 29	not allocated
NITROGEN COMPOUNDS	
30	nitrogen compounds (confined to melamine, melamine cyanurate, urea)
31 to 39	not allocated
ORGANIC PHOSPHORUS COMPOUNDS	
40	Halogen-free organic phosphorus compounds
41	Chlorinated organic phosphorus compounds
42	Brominated organic phosphorus compounds
43 to 49	not allocated
INORGANIC PHOSPHORUS COMPOUNDS	
50	ammonium orthophosphates
51	ammonium polyphosphates
52	red phosphorus
53 to 59	not allocated
METAL OXIDES, METAL HYDROXIDES, METAL SALTS	
60	aluminum hydroxide
61	magnesium hydroxide
62	antimony (III) oxide
63	alkali-metal antimonate
64	magnesium/calcium carbonate hydrate
65 to 69	not allocated
BORON AND ZINC COMPOUNDS	
70	inorganic boron compounds
71	organic boron compounds
72	zinc borate
73	organic zinc borate
74	not allocated
SILICA COMPOUNDS	
75	inorganic silica compounds
76	organic silica compounds
77 to 79	not allocated
OTHERS	
80	graphite
81 to 89	not allocated
90 to 99	not allocated



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