OPERATIONAL SERVICES DIVISION

Guidance for Environmentally Preferable Furniture

Review of Chemicals of Concern and Certifications & Standards in Furniture

August, 2016

Table of Contents

Guidance for Environmentally Preferable Furniture

Information in this guidance is current as of the publishing date of August 2016.

I. Overview of Chemicals of Concern in Furniture

The following information was prepared by the Center for Environmental Health in collaboration with Liz Harriman, Deputy Director of the Massachusetts Toxics Use Reduction Institute, and with contributions from Dr. Ted Schettler, Science Director, Science and Environmental Health Network, and Kathryn Rodgers, Staff Scientist, Silent Spring Institute.

a) Volatile Organic Compounds (VOC's) including formaldehyde

Definitions

- **Volatile Organic Compounds (VOCs)** are carbon compounds emitted as gases from certain solids and liquids. VOCs include a variety of chemicals, including formaldehyde.
- **Formaldehyde** is a volatile organic compound used mainly in the production of resins that are used as adhesives in binders for wood products. It also is used in the production of plastics and coatings, textile finishes, and in the manufacture of industrial chemicals.

Health and Environmental Effects

- **VOCs** may have short- and long-term adverse health effects. The EPA notes that health effects may include: eye, nose, and throat irritation; headaches, loss of coordination, and nausea; damage to liver, kidney, and the central nervous system; and some VOCs are suspected or known to cause cancer in humans. Concentrations of many VOCs are consistently higher indoors than outdoors (up to ten times higher).[1]
- **Formaldehyde:** The International Agency for Research on Cancer (IARC) reclassified formaldehyde from "probably carcinogenic to humans" to "carcinogenic to humans" in 2004.[2] Exposure to formaldehyde also has been found to cause breathing problems.[3,4] The EPA stated that "the highest levels of airborne formaldehyde have been detected in indoor air, where it is released from various consumer products such as building materials and home furnishings."[5]

Alternatives/Recommendations for Those Seeking to Minimize Exposure to these Substances in Furniture

- All furniture containing composite wood materials (including hardwood plywood, hardwood plywood veneer core, hardwood plywood composite core, particleboard, or medium density fiberboard), whether raw or finished, should comply with Phase 2 of California's Code of Regulations, Title 17 §93120.2 – Airborne Toxic Control Measure to Reduce Formaldehyde Emission from Composite Wood Products.
- All furniture should meet the California Department of Public Health Standard Method v1.1., for the testing and evaluation of VOC emissions from indoor sources (Emission testing method California Specification 01350).

[1] Volatile Organic Compound's Impact on Indoor Air Quality, U.S. Environmental Protection Agency, https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality, Accessed July 2016
[2] International Agency on Research Center, Press Release No. 153, June 15, 2004, http://www.iarc.fr/en/media-centre/pr/2004/pr153.html
[3] Formaldehyde, U.S. Environmental Protection Agency, https://www3.epa.gov/airtoxics/hlthef/formalde.html, Accessed July 2016
[4] Formaldehyde-ToxFAQs, May 2015, http://www.atsdr.cdc.gov/toxfaqs/tfacts111.pdf, Accessed July 2016
[5] Formaldehyde, U.S. Environmental Protection Agency, https://www3.epa.gov/airtoxics/hlthef/formalde.html, Accessed July 2016

b) Per- and Poly-Fluorinated Compounds Used as Stain/Oil/Water Resistant Treatments

Definition:

Per-and poly-fluorinated compounds, often known as perfluorinated compounds (PFCs), include surface treatments that provide stain, oil, and water resistant properties.

Health and Environmental Effects:

PFCs have been found to be extremely persistent and are carried by air and water currents around the world.[6] People most likely are exposed to these compounds by consuming contaminated water or food or by using products that contain these compounds[7]. Ingestion of contaminated dust may be an common route of exposure, especially for children who ingest relatively higher levels of dust due to their frequent hand-to-mouth behaviors. Workers who manufacture products or perform services that use these chemicals directly also may have significant occupational exposure.[8]

Fluorinated compounds, such as perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), have been associated with adverse health effects, such as kidney and testicular cancer, thyroid disease, high cholesterol, and obesity.[9,10] While these two compounds largely have been phased out of production in the US and in Europe, they may be used elsewhere. Additionally, although the health effects of the "new generation" of replacements chemicals have not been studied thoroughly, emerging studies reveal that the replacements also may result in adverse human health effects[11].

Alternatives/Recommendations for Those Seeking to Minimize Exposure to these Substances in Furniture

Given the ability of these chemicals to migrate out of products and into our bodies, their known and potential adverse health effects, and their persistence in the environment, purchasers should specify products/fabrics that are free of fluorinated stain/oil/water resistant treatments.

c) Antimicrobials

Definition:

The Center for Disease Control defines antimicrobial agents as any agent that kills or suppresses the growth of microorganisms. [12] Antimicrobials are heavily marketed and widely added to many household, personal care, and consumer products, including furniture. There are a wide variety of antimicrobials, including metallic compounds (such as silver and copper), chlorinated organic antimicrobials, and others.

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[6] Emerging Contaminants –Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), 2014, Environmental Protection Agency , https://www.epa.gov/sites/production/files/2014-04/documents/factsheet_contaminant_pfos_pfoa_march2014.pdf, Accessed July 2016

[7] 4 Perfluorinated Chemicals (PFCs), National Institute of Environmental Health Sciences, http://www.niehs.nih.gov/health/materials/perflourinated_chemicals_508.pdf, accessed July 2016

[8] "Environmental exposure and health impacts of highly fluorinated chemicals," 2016, Christopher Lau, National Health and Environmental Effects Research Laboratory, and Andrew B. Lindstrom National Exposure Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, PowerPoint presentation accessed http://greensciencepolicy.org/wp-content/uploads/2016/02/03-Christopher-Lau-2-11-16.pdf, July 2016

[9] Emerging Contaminants –Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), 2014, Environmental Protection Agency , https://www.epa.gov/sites/production/files/2014-04/documents/factsheet_contaminant_pfos_pfoa_march2014.pdf, Accessed July 2016

[10] Chemical Classes of Concern: Highly Fluorinated Chemicals, http://www.sixclasses.org/wp-content/uploads/2014/07/Fluorinated-Chemicals-fact-sheet.pdf. Accessed July 2016

[11] Ibid, see reference 37, 38

[12] Center for Disease Control, Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008, http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf. Accessed July 2016

Health and Environmental Effects:

The consequences of the widespread use of these chemicals on human health and the environment are not yet fully understood and there is no data to support the efficacy of these products in reducing the spread of infection through contact with furniture. There also is concern within the healthcare community that the increasing use of products containing antimicrobials may "further increase the risk of antibiotic resistance, engender a false sense of security with reduced attention to cleaning and disinfection, and increase costs of products and materials."[13]

Alternatives/Recommendation for Those Seeking to Minimize Exposure from these Substances in Furniture

Given the absence of clear benefits and the potential for harm to humans and the environment, purchasers should specify furniture that does not contain added or built-in antimicrobials.

d) Polyvinyl Chloride (PVC)

Definition:

Polyvinyl chloride, also known as PVC or vinyl, is a synthetic thermoplastic used as a base material for some furniture and also as an upholstery fabric.

Health and Environmental Effects:

PVC has a number of lifecycle concerns. It can release dioxin, a known carcinogen, during manufacturing, at disposal if incinerated, or if it catches fire during use.[14] Phthalates, which are commonly used to soften PVC, have been shown to leach, migrate, and off-gas from furniture. Phthalates cause a wide range of toxicities in animals; the most sensitive is harm to the development of the male reproductive system.[15] Human studies also suggest that maternal phthalate exposure during pregnancy may contribute to adverse developmental effects in children, including reproductive and neurobehavioral impacts.[16]

According to the National Library of Medicine, PVC exposure from consumer products, furniture, and other sources can mean exposure to PVC dust and associated phthalates, which cause adverse health effects including endocrine disruption and asthma[17].

Alternatives/Recommendations for Those Seeking to Minimize Exposure to these Substances in Furniture:

Specify furniture, including fabric that does not contain PVC. Furniture companies increasingly are seeking alternatives to PVC and related additives such as phthalates. Some of the safer alternatives include: polyurethanes (PU), urethane-based thermoplastic elastomer (TPE) (PVC-free and plasticizer-free), and nylon films.

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[13] Antimicrobials in Hospital Furnishings: Do They Help Reduce Healthcare-Associated Infection, Dr. Ted, Schettler, http://sehn.org/wp-content/uploads/2016/03/Antimicrobials-Report-2016.pdf. Accessed July l 2016.

[14] Healthcare Without Harm, 2013. http://www.noharm.org/us_canada/issues/toxins/pvc_phthalates/

[15] Report to the US Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on Phthalates and Phthalate Alternatives, July 2014, US CPSC https://www.cpsc.gov/en/Regulations-Laws--Standards/Statutes/The-Consumer-Product-Safety-Improvement-Act/Phthalates/Chronic-Hazard-Advisory-Panel-CHAP-on-Phthalates/

[16] ibid

[17] "Polyvinyl chloride (PVC)." National Library of Medicine, ToxTown website. Accessed July 2016. http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=84

e) Flame Retardants

Definition:

Flame retardants are chemicals/compounds added to materials such as plastics, textiles, surface finishes, and coatings that are designed to inhibit, suppress, or delay the production of flames to prevent the spread of fire.

Health and Environmental Effects:

Flame retardant chemicals migrate out of furniture products and enter the air, dust, the environment, and our bodies. Many flame retardant chemicals have been found to be persistent (breaks down very slowly in the environment), bioaccumulative (builds up in people and animals, often magnifying at the top of the food chain) and/or toxic. Some of the most studied flame retardants have been linked to cancer, decreased fertility, hormone disruption, lowered IQs, obesity, hyperactivity, and other serious health issues.[18] There have been a number of replacements for banned or restricted flame retardant chemicals that also have proven to be harmful to human and environmental health. Some of the "replacement chemicals" have been identified as carcinogens and others show problems with neurotoxicity, reproduction, development, and ecotoxicity.[19,20]

Flame Retardants and Furniture Flammability Standards:

Currently, there are two main flammability standards for furniture:

- **California Technical Bulletin 117-2013:** Technical Bulletin 117-2013 (TB 117-2013) is a California flammability regulation[21] that has become the de facto standard across the nation. California implemented this standard in January 2014 and made it mandatory in January 2015. TB 117-2013 replaces an outdated flammability standard, TB 117, which led to the widespread use of flame retardant chemicals in furniture that did not provide added fire safety benefits. TB 117-2013 improves fire safety by addressing the largest cause of furniture fires (smoldering cigarettes on fabric) through a more realistic fire testing method. TB 117-2013 can be met without the use of flame retardant chemicals. Although the new standard does not prohibit the use of flame retardant chemicals, the furniture industry has moved away from their use in large part, and purchasers now may find a broad availability of furniture free of flame retardant chemicals. TB 117-2013 is the primary flammability standard and will apply to the vast majority of furniture for buildings.

- **California Technical Bulletin 133 or ASTM E 1537:** Technical Bulletin 133 (TB 133) is a California furniture flammability regulation[22] that has been incorporated by reference into other states' regulatory requirements for specific regulated public spaces. ASTM E 1537 is a similar furniture flammability

[18] "Health consequences of exposure to brominated flame retardants : a systematic review**",** Kim, Young Ran, Harden, Fiona, Toms, Leisa-Maree, & Norman, Rosana E. (2014) *Chemosphere*, *106*, pp. 1-19 and "After the PBDE phase-out: A broad suite of flame retardants in repeat house dust samples from California." Dodson, R.E., L.J. Perovich, A. Covaci, N. Van den Eede, A.C. Ionas, A.C. Dirtu, J.G. Brody, R.A. Rudel. 2012. *Environmental Science & Technology.*

[19] An Alternatives Assessment for the Flame Retardant Decabromodiphenyl Ether (DecaBDE) https://www.epa.gov/sites/production/files/2014-05/documents/decabde_final.pdf, Accessed July 2016

[20] 2015 Update of Report on Flame Retardants Used in Flexible Polyurethane Foam, https://www.epa.gov/sites/production/files/2015-08/documents/ffr_final.pdf, Accessed July 2016

[21] Bureau of Electronic and Appliance Repair, Home Furnishings, and Thermal Insulation Website, http://bearhfti.ca.gov/bureau_activities/regulatory_changes.shtml. Accessed July 2016

[22] Technical Bulletin 133 - Flammability Test Procedure for Seating Furniture for Use in Public Occupancies , State of California, Department of Consumer affairs, Bureau of Home Furnishings and Thermal Insulation, http://www.bearhfti.ca.gov/industry/tb133.pdf, website accessed July 2016

standard referenced by other states. The definition of regulated public spaces varies by state, but often includes specialized settings such as assembly areas, healthcare, or detention facilities. The requirements of TB 133 and ASTM E 1537 are met almost universally through the use of flame retardant chemicals in the foam, fabric, and/or barrier materials of upholstered furniture. These regulations require a large open flame test, but flame retardants have not been shown to improve fire safety. Compliance with TB 133 or ASTM E 1537 may be required in a limited sub-set of regulated spaces.

- **Commonwealth of Massachusetts:** As of January 1, 2015, the Massachusetts Fire Code allows most spaces to use upholstered furniture meeting TB 117-2013 instead of TB 133 or ASTM E 1537, especially if the space is fully equipped with fire sprinklers[23]. The Massachusetts Building Regulations and Standards 780 CMR 3,[24] defines regulated spaces to include assembly areas, healthcare facilities, educational facilities, dormitories, correctional institutions, and more. Some regulated spaces not fully equipped with fire sprinklers may be required to comply with TB 133 or ASTM E 1537. Check with the local Authority Having Jurisdiction (AHJ) to determine what flammability standard may applyin your regulated space, as code requirements vary based on building occupancy type.

- **City of Boston, Massachusetts:** In March 2016, the Boston City Council voted to amend the city's Fire Prevention Code to reference the state of Massachusetts' Fire Code, also allowing most regulated spaces to use TB 117-2013 furniture. This is a historic change because until March 2016, Boston was the only major city in the US that required all furniture used in regulated spaces to meet TB 133 or ASTM E1537, with no exceptions for buildings equipped with automatic sprinklers. Some regulated spaces not fully equipped with fire sprinklers still may need to comply with TB 133 or ASTM E 1537. Check with the local Authority Having Jurisdiction (AHJ) to determine the flammability standard that applies to your regulated space, as code requirements vary based on building occupancy type.

Furniture Flammability Standards for the State of Massachusetts and City of Boston

	Public Building or Assembly Area Including healthcare facilities, dormitories, schools, etc.	**Office and Residential (Non-public) Areas**
Fully sprinklered	**Check with the Authority Having Jurisdiction (AHJ) to confirm TB 117-2013**. TB 133/ASTM E 1537 is **not** required in most buildings	**Comply with TB 117-2013**
Not fully sprinklered	**Check with the Authority Having Jurisdiction (AHJ)** to determine which standard is required	**Comply with TB 117-2013**

Alternatives/Recommendations for Those Seeking to Minimize Exposure to these Substances in Furniture:

Select furniture that meets TB 117-2013 **without** the use of flame retardant chemicals, except for furniture used in regulated spaces that are required to meet TB 133 or ASTM E 1537. Furniture that meets TB 133 and ASTM E 1537 typically contains flame retardant chemicals in one or more components of the furniture. These standards may reduce design and fabric choices, in addition to being significantly more expensive (on average about 30% more) than TB 117-2013 furniture due to added materials and labor. Check with your

[23] 527 CMR: Board of Fire Prevention Regulations, 527 CMR 1.00: Massachusetts Comprehensive Fire Safety Code http://www.mass.gov/eopss/docs/dfs/osfm/cmr/527cmr1-00.pdf. Accessed July 2016

[24] State Board of Building Standards and Regulations, CMR 3, http://www.mass.gov/eopss/docs/dps/inf/780cmr-1/780003.pdf. Accessed July 2016.

local authority having jurisdiction (AHJ) if you are unsure about the flammability standard that is appropriate for your facility.

II. Single and Multi-Attribute Certification Programs and Standards for Furniture

The following list of third-party certification programs and standards was compiled using a majority of the information listed in the Responsible Purchasing Network's publication **Green Purchasing Best Practices: Office and Dorm Furniture** written by Sarah Church, Josh Saunders, and Alicia Culver, in December 2013, and updated by Judy Levin, Center for Environmental Health, in July 2016. This information is provided as a resource and should not be construed as an endorsement by the OSD.

a) Single and Multi-Attribute Certifications

i. BIFMA level® Certified

BIFMA is the not-for-profit trade association for business and institutional furniture manufacturers. BIFMA sponsors the development and refining of standards including the BIFMA level® multi-attribute certification. The certification is based on the ANSI/BIFMA e3 standard, which addresses material use, energy, and atmosphere, human and ecosystem health, and social responsibility at the product, facility, and organizational level. Certification to the Level standard is conducted by independent third-party certifiers. The certification is based on a points system with three different levels of achievement, based on the number of requirements met in the standard. Purchasers also should contact the manufacturer for the product scorecard to understand the attributes of each product. See website for more information and for a listing of products that are level® certified.

ii. Cradle to Cradle™

The Cradle to Cradle Products Innovation Institute is a non-profit organization that administers the Cradle to Cradle Certified™ Products Standard. The standard is a multi-attribute eco-label that evaluates a wide range of products across five categories of human and environmental health. The standard includes: Material Health, Material Reutilization, Renewable Energy and Carbon Management, Water Stewardship, and Social Fairness. Product certification is awarded at five levels (Basic to Platinum), in which products are certified to the lowest level achieved in each of the five categories. Cradle to Cradle Certified emphasizes the importance of continuous improvement; as a result, their Basic standard includes an inventory and a commitment to ongoing assessment, while higher standards carry guaranteed minimum thresholds reached in the five categories. See website for more information.

iii. Forest Stewardship Council (FSC)

The FSC's mission is to promote environmentally sound, socially beneficial, and economically prosperous management of the world's forests. This third-party certification program ensures forest products used in certified furniture are managed and harvested responsibly. Any wood product used in a piece of certified furniture, no matter how small, must be produced sustainably and traded through approved channels. For wood to maintain its FSC certification,

each participant in its supply chain must be FSC Chain of Custody certified. See website for more information.

iv. GREENGUARD Gold

This is a certification program developed by GREENGUARD and operated by UL Environment, which provides a third-party testing program for manufacturers and a registry of interior products and materials that have low chemical emissions, thus improving the quality of the air in which the products are used. The program addresses chemical emissions that affect indoor air quality. It is considered an industry standard for low-emission certification. GREENGUARD Gold is equivalent to the reduced VOC and formaldehyde emission requirements of California Department of Public Health Standard Method v1.1 (Section 01350). See website for more information.

v. Healthier Hospitals Healthy Interiors Goal

The Healthy Interiors goal is one of six pillars of activity in Healthier Hospitals, a program of Practice GreenHealth. Practice GreenHealth is a membership and networking organization for the healthcare community that has made a commitment to sustainable, environmentally preferable practices. The Healthy Interiors goal is to promote public and environmental health, and to help accelerate the transformation of the furnishings market to develop safer products, while also reducing disposal costs and liability. Products that meet the Healthy Interiors goal contain none of the following chemicals/materials of concern above specified de minimus levels: formaldehyde, perfluorinated compounds, polyvinyl chloride (PVC), antimicrobials, and flame retardant chemicals. See the Guidance to Achieve HH Safer Chemicals Challenge for Healthy Interiors, Version 2.0, December 2015 for more information, and visit the Healthy Interiors website for a list of products that meet these requirements.

vi. The Health Product Declaration® (HPD)

The Health Product Declaration® Collaborative (HPDC) is a membership organization committed to the continuous improvement of the building industry's performance – through transparency, openness, and innovation in the practices of reporting, disclosure, specification, and selection of building products. They administer the HPD program which is an open standard consisting of a defined format and rules for reporting about the contents of building products along with the potential associated hazards and other related information. A completed HPD is created and published by companies/manufacturers about their products. The HPD allows varying levels of information disclosure regarding the product. A fully-completed HPD will include a report of hazard associations, based on the HPD Priority Hazard Lists, the GreenScreen List Translator, and when available, full GreenScreen assessments. HPDs allow for the reporting of these hazard screening results, even when the underlying chemical substances may not be fully disclosed due to intellectual property and/or other concerns. See website for more information.

vii. SCS Indoor Advantage Gold

This certification program is run by Scientific Certification Systems (SCS) for the chemical emissions of furniture that affects indoor air quality. Products that meet

the Gold level may not meet the reduced formaldehyde levels required by the California Department of Public Health Standard Method v1.1 (Section 01350), although some products may do so. Ask for the product certificate to determine the level of reduced emissions met by the product. See website for more information.

b) Standards

i. California Department of Public Health Standard Method v1.1 (Section 01350)

The California Department of Public Health is the primary health regulatory agency dedicated to optimizing the health and well-being of the people in California. This Department sets and oversees many health-related standards, including the Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1 (2010) (also known as California Section 01350), which includes environmental specifications for low-emitting building and furniture products. The standard practice document has become widely adopted by industry, manufacturers, and the US Green Building Council's LEED program for conducting VOC testing in small-scale environmental chambers. This is not a certification, but a standard set of VOC criteria to which third-party certifiers or qualified independent test labs test and verify. See Specification for more information.

ii. California Formaldehyde Emissions Standards from Composite Wood Products (CCR, Title 17) - Phase 2 Compliance

The California Air Resources Board (CARB) establishes and maintains air quality standards in California. The Board approved the airborne toxic control measure (ATCM) to reduce formaldehyde emissions from composite wood products including hardwood plywood, particleboard, medium density fiberboard, thin medium density fiberboard (thickness ≤ 8mm), and also furniture and other finished products made with composite wood products. This standard is a state regulation. See the *Frequently Asked Questions for Consumers: Reducing Formaldehyde from Composite Wood Products* from CARB for more information.

iii. California Technical Bulletin 117-2013 Labeling of Upholstered Furniture for Flame Retardant Chemicals

The State of California passed legislation that requires the labeling of upholstered furniture that meets the furniture flammability standard (Technical Bulletin 117-2013) to clearly indicate the presence or absence of flame retardant chemicals in the product. Although this label is required only for products sold within the State of California, a large number of office furniture manufacturers are labeling their products sold nationwide in accordance with this requirement. Products that meet the furniture flammability standard and are labeled as not containing flame retardant chemicals are preferred. Clear product labeling may assist purchasers in identifying flame retardant-free products, especially when considering whether a product should be retained. See the *Senate Bill (SB) 1019: Upholstered Furniture, Flame Retardant Chemicals Industry Advisory* for more information.