



Apparel and Footwear International RSL Management Group



PACKAGING RESTRICTED SUBSTANCES LIST

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AFIRM Mission

AFIRM is the Apparel and Footwear International RSL Management (AFIRM) Working Group, established in 2004. AFIRM's mission is "to reduce the use and impact of harmful substances in the apparel and footwear supply chain." AFIRM's purpose is to provide a forum to advance the global management of restricted substances in apparel and footwear, communicate information about chemical management to the supply chain, discuss concerns, and exchange ideas for improving chemical management.

AFIRM Vision

AFIRM continues to be a recognized global center of excellence, providing resources to enable continuous advancement of chemical management best practices. We do this based on transparency, science, and collaboration with relevant industries and experts to build safer and more sustainable chemistry within the apparel and footwear supply chains. It is understood that in adopting this vision, AFIRM's mission, objectives, and projects will continue to be product-focused or RSL-related.

Legal Statement

The AFIRM Packaging RSL constitutes information from AFIRM only and does not represent any individual AFIRM member. Individual brand Packaging RSLs may differ in specific parameters.

The AFIRM Packaging RSL is not intended to and does not establish any industry standard of care. The AFIRM RSL may not always provide the most appropriate approach for any individual company's chemical management program. Many brands have implementation guidelines, and suppliers must follow those guidelines where required. The AFIRM Packaging RSL does not constitute legal advice and is not a substitute for legal advice. There is no warranty, express or implied, as to the completeness or utility of the information contained in this AFIRM Packaging RSL, including, without limitation, that the information is current and error-free. AFIRM disclaims liability of any kind whatsoever resulting from any use of or reliance on the AFIRM Packaging RSL.

For more information about AFIRM, visit www.afirm-group.com.

Policy Statement

AFIRM created this Packaging Restricted Substances List (AFIRM Packaging RSL) to assist and guide supply chain participants seeking to increase product quality and safety, or to reduce their environmental impact by limiting the use of certain substances in packaging of apparel, footwear, accessories and related products including sporting equipment.

Scope of the AFIRM Packaging RSL

The EU Packaging and Packaging Waste Directive defines packaging as:

All products made of any materials of any nature to be used for the containment, protection, handling, delivery, and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer.

AFIRM acknowledges that the definition of packaging may vary by jurisdiction. For this reason, it is important to note the scope of coverage for the AFIRM Packaging RSL, outlined in Table 1. There are packaging products, such as clothing hangers, which are excluded from the scope. Suppliers are advised to consult AFIRM member brands on specific requirements for these products.

Table 1. Scope of the AFIRM Packaging RSL

Paper & Wood	Plastic & Wrap	Finishing, Dyes, Inks & Coatings	Metal	Textiles	Other Items
<ul style="list-style-type: none"> • Boxes/cartons • Corrugated shipping boxes/cartons • Gift boxes • Hang tags • J board • Labels, adhesive • Stuffing • Tissue paper • UPC tags • Stickers • Tape • Thermal receipt paper 	<ul style="list-style-type: none"> • Boxes, single pack and multi-pack • Hang tags • Plastic cases • Poly bags • Poly bags, zippered • Price tags • Retail carry bags • Stickers • Tape 	<ul style="list-style-type: none"> • Cellulose laminates • Coatings containing heavy metals • Foil stamping • Hot-stamp printing • Lamination, matte or gloss • Soft-touch coatings • Spot UV • Uncoated • UV coatings • Varnish coatings • Water-based (aqueous) lacquer coatings 	<ul style="list-style-type: none"> • Magnets • Bead chain • Eyelets/grommets • Pins • Zippers 	<ul style="list-style-type: none"> • Synthetic textiles • Plant-based textiles • Natural fibers (i.e. silk, wool) 	<ul style="list-style-type: none"> • Silica gel/desiccant sachets • Antimicrobial stickers • Stuffing materials, expanded foam materials

Uses of the AFIRM Packaging RSL

AFIRM member brands may differ on individual parameters; suppliers are advised to check with the customer regarding brand-specific requirements. The AFIRM RSL should leverage AFIRM's mission — “to reduce the use and impact of harmful substances in the apparel and footwear supply chain” — by providing a single set of information for maximum and in-depth implementation within the supply chain. Some examples of uses for the AFIRM Packaging RSL, depending on the objectives of the user, include:

- Providing a tool for vendors to establish chemical management knowledge and processes.
- Building base compliance with AFIRM member chemical restrictions.
- Providing a common base for testing packaging, which may be accepted by multiple AFIRM brands.

AFIRM member companies determine and communicate to their vendors their testing requirements and acceptance of test reports.

Links and References

Be proactive! These links provide additional important information regarding chemical management and should be visited on a regular basis.

AFIRM Chemistry Toolkit

www.afirm-group.com/toolkit

- Available in English, Chinese, Vietnamese, and Spanish

AFIRM Chemical Information Sheets

www.afirm-group.com/chemical-information-sheets

- Available in English, Chinese, Vietnamese, and Spanish

Sustainable Packaging Coalition (SPC)

www.sustainablepackaging.org

EU Packaging and Packaging Waste Directive

http://ec.europa.eu/environment/waste/packaging/index_en.htm

Additional Substances and Parameters to Consider

EU REACH Substances of Very High Concern

Based on scientific evidence indicating potential hazards to human health or the environment, the European Commission (EC) and European Union (EU) member states propose substances of very high concern (SVHCs) for placement on the European Chemicals Agency (ECHA) “Candidate List of Substances of Very High Concern for Authorisation.” Placing a substance on the Candidate List triggers specific obligations for importers, producers, and suppliers of any article that contains one or more of these substances above 0.1 percent by weight per component. The obligations include providing sufficient information to allow safe use of the article to brand and retail customers or, upon request, to a consumer within 45 days of receipt of the request.

In addition, ECHA must be notified if the substance(s) are present in article components above 0.1 percent in quantities totaling over one ton per producer or importer per year. Notification is not required if the substance has already been registered for that use or when the producer or importer of an article can exclude exposure of humans and the environment during the use and disposal of the article. In such cases, the producer or importer must supply appropriate instructions to the recipient of the article.

ECHA periodically updates the Candidate List; find the most current version at <https://www.echa.europa.eu/candidate-list-table>.

AFIRM member brands may differ on how they address SVHCs as well as the legal obligations. AFIRM advises suppliers to consult with their customers regarding brand-specific requirements for SVHCs.

California Proposition 65 Substances

Each year, California publishes a list of chemicals known to the state to cause cancer or reproductive toxicity. Businesses that expose individuals to one or more of these chemicals must provide a clear and reasonable warning before the exposure occurs. For consumer products, this is typically through warning labels on the products or retail signage. Note that this warning is not the same as a regulatory requirement indicating that the product is “unsafe” if a specific concentration is exceeded. Enforcement is carried out through civil lawsuits brought by the California attorney general, district attorneys, or private parties acting in the public interest.

Additional information can be found at <https://oehha.ca.gov/proposition-65>.

AFIRM member brands may differ on how they address warning-label requirements. AFIRM advises suppliers to consult with their customers regarding brand-specific requirements for Proposition 65 substances.

Oxo-degradable Additives

The EU Commission on Waste and the Ellen MacArthur Foundation consider oxo-degradable plastics to be problematic in current recycling/circular systems. Manufacturers and or users of these plastics should be aware that the EU may restrict them in the future. Concurrently, several countries, including Saudi Arabia and the UAE, have legislation that requires plastics of certain grades to be oxo-degradable. These substances are subject to conflicting policies or legislation globally, and manufacturers should be aware and prepare accordingly. AFIRM will address these substances in a future release. For more information, please visit http://europa.eu/rapid/press-release_IP-18-5_en.htm and <http://ec.europa.eu/environment/circular-economy/pdf/oxo-plastics.pdf>.

Materials in Which Restricted Substances Are Likely to Be Found

In the supply chain for apparel, footwear, and sporting equipment packaging, certain types of materials are more likely to contain restricted substances. Brands may require packaging product or material testing prior to shipment to ensure that packaging articles comply with their Packaging RSLs; this information is included in brand-specific requirements.^A

AFIRM Group brands agree on the chemicals included in the AFIRM Packaging RSL, the allowable limits, and the test methods. The responsibility for managing testing programs—which specific restricted chemicals should be tested in which specific materials and the frequency of such tests—remains with individual brands.

The risk matrix shown in Table 2, on the next page, highlights the restricted substance risks associated with different fibers and materials, and is presented as a guidance tool. It is based on our many years of experience in manufacturing and in managing restricted substances across a wide range of materials. The aim is to provide information on those substances that have historically been deliberately used or found as reagent/contaminants in different materials.^B It uses the following color code:

-  Red indicates that a chemical has been in widespread use and/or frequently detected in a particular material.
-  Orange indicates that a chemical has been deliberately used and/or detected in a particular material occasionally.
-  Yellow indicates there is a very low but theoretical chance that a chemical could be used and/or detected.
-  White indicates that we believe there is an almost negligible risk of a chemical being used and/or detected.

In the absence of a brand Packaging RSL and testing program, the matrix outlined in Table 2 is a good starting point until you gain a true understanding of the risks within your specific supply chain. Use of this matrix should be accompanied by due diligence across all chemistries of concern.

The unified approach of the AFIRM Packaging RSL enables member brands to share test data more easily. We anticipate that the risk matrix will evolve to reflect realistic risks at any given time, which can then translate to testing options.

Individual brand testing programs, to the extent they are different, supersede this guidance tool.

A. See Section 5 of the AFIRM Supplier Toolkit for more information on testing and Appendix C of the AFIRM Supplier Toolkit for a model testing program if your customer does not have one of its own.

B. If a substance is a component of a combined material (for example, a laminated component like polymer material + cardboard), we recommend testing according to different material types.

Materials in Which Restricted Substances Are Likely to Be Found

Table 2. Risk Matrix

Substance	Wood & Paper	Plastic & Wraps	Finishing, Dyes, Inks & Coatings	Metal	Textiles	Other Items
Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs), including all isomers	1	1	1		1	1 Foams only
Bisphenols	1 Thermal receipt paper	2 Tapes, polycarbonate, and recycled plastic cases				
Butylhydroxytoluene (BHT)		2 Poly bags				
Dimethylfumarate (DMFu)						2 Silica gel packets, foam packaging
Formaldehyde	1		1		2	
Heavy Metals, Chromium VI	2	3 Colored bags	3	3		
Heavy Metals, Cadmium Total	2 Materials with high recycled content	3	2	2		
Heavy Metals, Lead Total	2 Materials with high recycled content	3	2	2		
Heavy Metals, Mercury Total		3	3			
Organotin Compounds		3	3		3	
Perfluorinated and Polyfluorinated Chemicals (PFCs)	2 Only with waterproofing finishes		2 Only with waterproofing finishes		2 Only with waterproofing finishes	
Phthalates		1	1 Plastisol prints		2 PVC	

Change Log for the 2019 AFIRM Packaging RSL

CAS No.	Substance	Modification	Page
80-09-1	Bisphenols	Added for recommended reporting of results when a Bisphenol A (BPA) test is performed: Bisphenol S (BPS), Bisphenol F (BPF), and Bisphenol AF (BPAF)	12
620-92-8			
1478-61-1			
71888-89-6	Phthalates	<p>Added with a 500 ppm limit each, 1000 ppm total of all Phthalates (EU CMR Regulation-2018/1513): 1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich, Bis(2-methoxyethyl) phthalate, and Diisopentyl phthalate (DIPP)</p> <p>Added with 500 ppm limit each, 1000 ppm total of all Phthalates: Dipropyl phthalate (DPRP); Diisooctyl phthalate (DIOP); Diisohexyl phthalate (DIHP); 1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP); and 1,2-benzenedicarboxylic acid Dipentyl ester, branched and linear</p>	16
117-82-8			
605-50-5			
131-16-8			
27554-26-3			
68515-50-4			
68515-42-4			
84777-06-0			

AFIRM Packaging RSL

CAS No.	Substance	Limits Component Materials	Potential Uses Processing for Packaging Materials	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits Above Which Test Results Should Be Reported
Alkylphenols (APs) + Alkylphenol Ethoxylates (APEOs) + including all isomers					
Various	Nonylphenol (NP), mixed isomers	Total: 100 ppm	<p>APEOs are used as surfactants in the production of plastics, elastomers, paper, and textiles. These chemicals can be found in many processes involving foaming, emulsification, solubilization, or dispersion. APEOs can be used in paper pulping, lubrication oils, and plastic polymer stabilization.</p> <p>APs are used as intermediaries in the manufacture of APEOs and antioxidants used to protect or stabilize polymers. Biodegradation of APEOs into APs is the main source of APs in the environment.</p>	<p>Textiles: Extraction: 1 g sample/20 mL THF, sonication for 60 minutes at 70 degrees C Measurement: EN ISO 18857-2:2011 (with derivatization)</p> <p>Polymers: 1 g sample/20 mL THF, sonication for 60 minutes at 70 degrees C, analysis with LC/MS or LC/MS/MS</p> <p>All other materials: 1 g sample/20 mL THF, sonication for 60 minutes at 70 degrees C, analysis with GC/MS</p>	Sum of NP & OP: 10 ppm
Various	Octylphenol (OP), mixed isomers				
Various	Nonylphenol ethoxylates (NPEOs)	Total: 100 ppm	<p>APEOs and formulations containing APEOs are prohibited from use throughout supply chain and manufacturing processes. We acknowledge that residual or trace concentrations of APEOs may still be found at levels exceeding 100 ppm and that more time is necessary for the supply chain to phase them out completely. This limit aligns with forthcoming EU legislation applicable to textiles and was set to provide suppliers direction for continuous improvement.</p>	<p>All materials: EN ISO 18254-1:2016 with determination of APEO using LC/MS or LC/MS/MS</p>	Sum of NPEO & OPEO: 20 ppm
Various	Octylphenol ethoxylates (OPEOs)				

CAS No.	Substance	Limits Component Materials	Potential Uses Processing for Packaging Materials	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits Above Which Test Results Should Be Reported
Butylated Hydroxytoluene (BHT)					
128-37-0	Dibutylhydroxytoluene (BHT)	25 ppm	Used as an additive in plastics as an antioxidant to prevent aging. Can cause phenolic yellowing of textiles.	ASTM D4275	5 ppm
Bisphenols +					
80-05-7	Bisphenol-A (BPA)	1 ppm	Used in the production of epoxy resins, polycarbonate plastics, flame retardants, and PVC. It is often used as a coating in thermal receipt paper as a developer.	All materials: Extraction: 1 g sample/20 ml THF, sonication for 60 minutes at 60 degrees C, analysis with LC/MS	1 ppm
80-09-1	Bisphenol-S (BPS)	For informational purposes only. AFIRM recommends testing polycarbonate materials to assess content levels.	BPA alternatives with known or suspected similar hazards are used in the production of epoxy resins, polycarbonate plastics, flame retardants, and PVC.		1 ppm each
620-92-8	Bisphenol-F (BPF)				
1478-61-1	Bisphenol-AF (BPAF)				
Dimethylfumarate +					
624-49-7	Dimethylfumarate (DMFu)	0.1 ppm	DMFu is an anti-mold agent used in sachets in packaging to prevent the buildup of mold, especially during shipping.	All materials: CEN ISO/TS 16186:2012	0.05 ppm

CAS No.	Substance	Limits Component Materials	Potential Uses Processing for Packaging Materials	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits Above Which Test Results Should Be Reported
Formaldehyde †					
50-00-0	Formaldehyde	150 ppm	<p>Formaldehyde can be found in polymeric resins, binders, and fixing agents for dyes and pigments, including those with fluorescent effects. It is also used as a catalyst in certain printing, adhesives, and heat transfers. Formaldehyde can be used in antimicrobial applications for odor control.</p> <p>Formaldehyde found in packaging can off-gas directly onto product.</p> <p>Composite wood materials (e.g., particle board and plywood) must comply with existing California and forthcoming U.S. formaldehyde emission requirements (40 CFR 770). Though formaldehyde legislation does not specifically apply to packaging, suppliers are advised to refer to brand-specific requirements for these materials.</p>	<p>All materials except plastics: JIS L 1041-1983 A (Japan Law 112) or EN ISO 14184-1:2011</p> <p>Plastics: EN ISO 14184-2</p>	16 ppm

CAS No.	Substance	Limits Component Materials	Potential Uses Processing for Packaging Materials	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits Above Which Test Results Should Be Reported
Heavy Metals (Total Content +/-)					
7440-43-9	Cadmium (Cd)	100 ppm (Sum)	Cadmium compounds are used as pigments (especially in red, orange, yellow and green) and in paints. It can also be used as a stabilizer for PVC.	Total heavy metals (Cd, Cr, Pb & Hg): EN ISO 16711-1 If total of four heavy metals exceeds 100 ppm and Cr is detected, test for CrVI.	1 ppm
7439-92-1	Lead (Pb)		May be associated with plastics, paints, inks, pigments, and surface coatings.		10 ppm
7439-97-6	Mercury (Hg)		Mercury compounds can be present in pesticides and as contaminants in caustic soda (NaOH). They may also be used in paints.		0.1 ppm
18540-29-9	Chromium VI +/-		Though typically associated with leather tanning, Chromium VI also may be used in pigments, chrome plating of metals, and wood preservatives.		All materials: EN ISO 17075-1:2017 if Total Cr is detected and EN ISO 17075-2:2017 for confirmation in case the extract causes interference. Alternatively, EN ISO 17075-2:2017 may be used on its own.
Organotin Compounds +/-					
Various	Dibutyltin (DBT)	1 ppm each	Class of chemicals combining tin and organics such as butyl and phenyl groups. Organotins are predominantly found in the environment as antifoulants in marine paints, but they can also be used as biocides (e.g., antibacterials), catalysts in plastic and glue production, and heat stabilizers in plastics/rubber. In textiles and apparel packaging, organotins are associated with plastics/rubber, inks, paints, metallic glitter, polyurethane products and heat transfer material.	All materials: CEN ISO/TS 16179:2012	0.1 ppm each
Various	Dioctyltin (DOT)				
Various	Monobutyltin (MBT)				
Various	Tricyclohexyltin (TCyHT)				
Various	Trimethyltin (TMT)				
Various	Trioctyltin (TOT)				
Various	Tripropyltin (TPT)				
Various	Tributyltin (TBT)	0.5 ppm each			
Various	Triphenyltin (TPHT)				

CAS No.	Substance	Limits Component Materials	Potential Uses Processing for Packaging Materials	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits Above Which Test Results Should Be Reported
Perfluorinated and Polyfluorinated Chemicals (PFCs) †					
Various	Perfluorooctane Sulfonate (PFOS) and related substances	1 µg/m ² each	PFOA and PFOS may be present as unintended byproducts in long-chain and short-chain commercial water-, oil-, and stain-repellent agents. PFOA may also be used in polymers like polytetrafluoroethylene (PTFE). The area-based limit for PFOA will be superseded by Commission Regulation (EU) 2017/1000 and removed in 2023.	All materials: prISO FDIS 23702-1: 2018	1 µg/m ² each
Various	Perfluorooctanoic Acid (PFOA) and its salts	1 µg/m ² 25 ppb total			
Various	PFOA-related substances	1000 ppb total			1000 ppb total

CAS No.	Substance	Limits Component Materials	Potential Uses Processing for Packaging Materials	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits Above Which Test Results Should Be Reported
Phthalates +					
28553-12-0	Di-Iso-nonylphthalate (DINP)	500 ppm each Total: 1000 ppm	<p>Esters of ortho-phthalic acid (Phthalates) are a class of organic compound commonly added to plastics to increase flexibility. They are sometimes used to facilitate the moulding of plastic by decreasing its melting temperature.</p> <p>Phthalates can be found in:</p> <ul style="list-style-type: none"> Flexible plastic packaging Components (e.g., PVC) Plastisol print pastes Adhesives Plastic sleeves Polymeric coatings <p>Find more information about additional Phthalates on the REACH substances of very high concern (SVHCs) candidate list, which is updated frequently.</p>	<p>Sample preparation for all materials: CPSC-CH-C1001-09.4</p> <p>Measurement: Textiles: GC-MS, EN ISO 14389:2014 (7.1 Calculation based on weight of print only; 7.2 Calculation based on weight of print and textile if print cannot be removed).</p> <p>Plastics: EN 14372</p> <p>Other Materials: GC-MS</p>	50 ppm each
117-84-0	Di-n-octylphthalate (DNOP)				
117-81-7	Di(2-ethylhexyl)-phthalate (DEHP)				
26761-40-0	Diisodecylphthalate (DIDP)				
85-68-7	Butylbenzylphthalate (BBP)				
84-74-2	Dibutylphthalate (DBP)				
84-69-5	Diisobutylphthalate (DIBP)				
84-75-3	Di-n-hexylphthalate (DnHP)				
84-66-2	Diethylphthalate (DEP)				
131-11-3	Dimethylphthalate (DMP)				
84-61-7	Dicyclohexyl phthalate (DCHP)				
71888-89-6	1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich				
117-82-8	Bis(2-methoxyethyl) phthalate				
605-50-5	Diisopentyl phthalate (DIPP)				
131-16-8	Dipropyl phthalate (DPRP)				
27554-26-3	Diisooctyl phthalate (DIOP)				
68515-50-4	Diisohexyl phthalate (DIHP)				
68515-42-4	1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUF)				
84777-06-0	1,2-Benzenedicarboxylic acid Dipentyl ester, branched and linear				



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