2011

AFIRM Supplier Toolkit

04 November 2011 Version | Updated 17 March 2017

Special thanks to AFIRM toolkit task force members:

Arun Upadhyay, Andy Chen, Frank Kempe, Frank Opdenacker, Kitty Man, Mary Grim, Nathaniel Sponsler, and Ylva Holmquist; Phylmar staff members: Elizabeth Treanor, Eric Rozance, and Paige Stump; and outside contributors: Ben Mead, Dieter Sedlak, and Jane Murphy.

Table of Contents

This page intentionally blank.

1. Introduction

In response to feedback received from members of its global supply chain, The Apparel and Footwear International RSL Management (AFIRM) Working Group has developed this revised and updated Supplier RSL Toolkit as part of its continuing mission "to reduce the use and impact of harmful substances in the apparel and footwear supply chain." The Toolkit is specifically geared toward the needs of the apparel and footwear supply chain, including raw material & chemical suppliers, mills, dye houses, trim & packaging suppliers, screen-printers, factories, and any other entity involved in the manufacturing of apparel and footwear finished goods. Notable additions to the toolkit are several appendices, including an extensive "Detailed Chemical Guidance Document" (Appendix F) and "RSL Corrective Action Examples" (Appendix E). Both references provide specific technical information to help eliminate or reduce restricted substances in finished goods to meet brand RSL requirements. While this toolkit is primarily focused on the elimination of restricted substances from finished products, extensive information about chemical discharge into wastewater, air emissions, and solid waste is available in the Chemical Guidance Document.

Definition of "Restricted Substances"

Restricted Substances are chemicals and other materials whose use and/or presence has been banned or otherwise restricted by a brand. Typically, a restricted substance must be absent from a finished product or present in limited concentrations. Restricted substances may be restricted across many industries, across one industry, or in certain products or inputs. Please see Appendix A for a glossary of other terms that may be of interest.

Why Substances Are Restricted

Substances are restricted for many reasons. Some substances are restricted due to concern for the environment, while others are restricted due to health and safety concerns for workers or consumers. Some restricted substances are also restricted by legislation.

Substances are restricted in different ways. As noted above, some substances are banned from use during the manufacturing process or banned from finished products entirely. Others might be banned if they are present above certain concentration limits or if they leach a certain amount from a finished product under predefined conditions. In each case, a substance restriction is usually accompanied by a test method that companies can use to verify if a chemical is present and, if so, ensure the chemical is below the restricted level.

Purpose of a Restricted Substances List (RSL) & Why It Is Important to Suppliers

The purpose of a Restricted Substances List (RSL) is to reduce the use of hazardous substances in the textile and apparel supply chain. The AFIRM RSL and/or a specific brand RSL clearly sets forth for suppliers those chemicals that are restricted. Companies publish RSLs to ensure that suppliers and vendors—as well as internal corporate employees—are aware of and can follow corporate restricted substance requirements.

AFIRM companies require that all suppliers comply with their RSL. Apparel and footwear that do not comply with a brand's RSL are not accepted. It is recommended that suppliers understand the purpose of the RSL and develop their own programs to assure that they comply with RSL requirements.

2. Restricted Substances List (RSL)

A brand RSL is typically based on environmental and health & safety risk assessments, current and anticipated legal requirements of markets where products are distributed or sold, and industry best practices. Individual brand lists vary, so it is very important to check with your customer to ensure that you are using the correct list. If the brand has an RSL, it is essential that their RSL be followed. If your customers do not have an RSL, a good place to start is with the AFIRM RSL, which lists substances currently subject to legislated limits around the world, as well as limits based on best practices in the apparel and footwear industries. This RSL is available at http://afirm-group.com/afirm-rsl/.

3. Where Are the Risks?

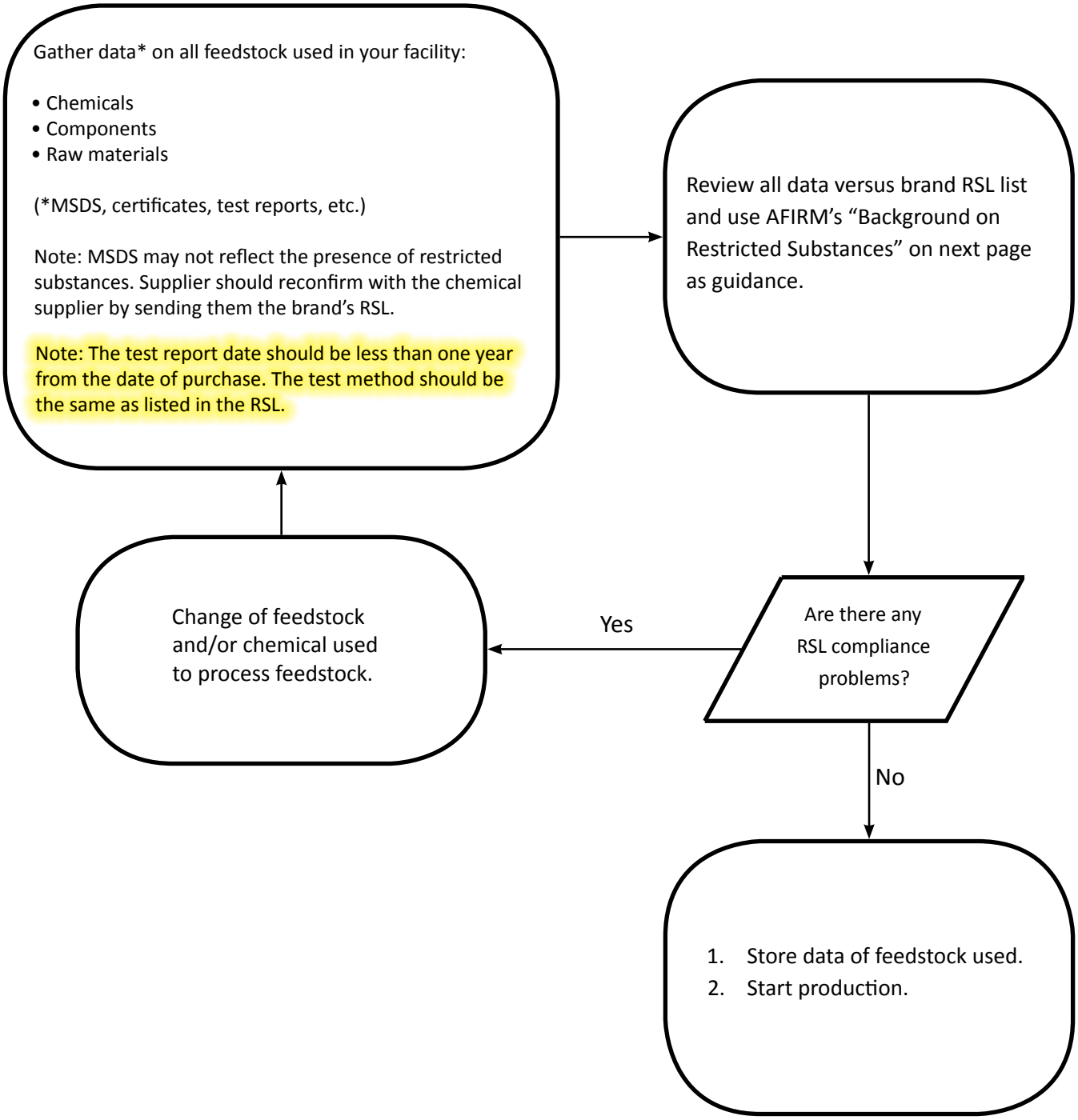
In the apparel and footwear supply chain, there are certain types of fibers and materials that are more likely to contain restricted substances. Many brands require testing of products prior to shipment to assure that the shipment does not contain articles not in compliance with their RSL (see Section 5 of this Toolkit for more information on testing, and see Appendix C for a model testing program if your customer does not have its own testing program).

AFIRM has developed a Risk Matrix that highlights the restricted substance risks associated with different fibers and materials. This Risk Matrix can be found as part of the AFIRM RSL, available at http://afirm-group.com/afirm-rsl/.

Understanding Chemical Risks

The flowchart in Figure 1 is intended to help suppliers understand how to review their production and make sure that the brand RSL is fulfilled.

Figure 1. Understanding Chemical Risks Flowchart



Background on Restricted Substances

Table 2 provides basic background information on some of the substances (or categories of substances) typically included on restricted substances lists. A brief description of the substance and where it may be found in apparel and footwear products is included. We are providing this information for general background purposes. It is advisable to consult your own internal materials experts or seek outside expertise to learn more about these specific substances and their potential occurrence in your product lines.

Table 2. Background on Restricted Substances

Restricted Substances	Description & Where they may be found
Alkyphenol Ethoxylates (APEOs) / Alkylphenols (AP) *Nonylphenol Ethoxylates (NPEO)* *Octylphenol Ethoxylates (OPEO)* *Nonylphenol (NP)* *Octylphenol (OP)*	APEOS are non-ionic surfactants including NPEOs, OPEOs, NP, and OP. NPEOs and OPEOs degrade into NP and OP, respectively. APEOs can be used as or found in: • Detergents • Scouring agents • Wetting agents • Softeners • Emulsifier/dispersing agents for dyes and prints • Impregnating agents • Degreasing agents for leather • Leather Finishing • De-gumming for silk production • Dyes and pigment preparations • Polyester padding • Down/feather fillings
Bisphenol-A (BPA)	Bisphenol-A (A=acetone) (BPA) occurs in its pure form as white flakes with a faint phenol-like smell. It is used in the production of epoxy resins and polycarbonate plastics. It can be used in production of flame retardants and in PVC production and processing.
Cationic Surfactants *DSDMAC* *DTDMAC* *DHTDMAC*	Distearyldimethyl ammouniumchloride (DSDMAC), Ditallowdimethylammonium (DTDMAC) and Di(hydrogenated tallow) dimethylammonium chloride (DHTDMAC) belong to the group of "quaternary ammonium salts" and are used as cationic surfactants. DSDMAC, DTDMAC, DHTDMAC are used as or found in: • Leveling agents (retarders) for basic (cationic) dyes that are mostly used for acrylic fibers • Fixation of direct dyes that are mostly used for cotton, rayon (viscose), linen, silk and polyamide • Surfactants • Emulsifier • Antistatic agents • Softeners • Water repellent agents

Restricted Substances	Description & Where they may be found
Chlorinated Bleaching Agents	Chlorinated Bleaching Agents are used for bleaching textiles and paper, etc. Textiles Chlorine dioxide (ClO_2), sodium hypochlorite (NaClO) and calcium hypochlorite ($Ca(ClO)_2$). Paper Chlorine gas (Cl_2) and chlorine dioxide (ClO_2)
Chlorinated Aromatic Hydrocarbons *Hexachlorobenzene* *Monochlorobenzene* *Pentachlorobenzene* *Pentachlorotoluene* *Isomers of di-, tri-, and tetra-chlorobenzene* *Isomers of mono-, di-, tri-, and tetra-chlorotoluene*	Chlorinated aromatic hydrocarbons are used as carriers in the dyeing process of polyester or wool/polyester fibers. They can also be used as solvents.
Chloroparaffins Short chained (SCCPs)	Chloroparaffins are hydrocarbons with a straight carbon chain. They can be used as: • Flame retardants • Leather greasing agent • Fat Liquoring of leather
Chloroparaffins Medium chained (MCCPs)	
Chromium VI (Cr^{6+})	Chromium is a naturally occurring metal that can exist in three main forms (Chromium (0), Chromium (III), and Chromium (VI). In nature, Cr (III) is the predominate form. Cr (0) and Cr (VI) do not occur in nature or are rare. Chromium is used in leather tanning and can be oxidised into Cr^{6+}.
Dimethylformamide (DMF)	DMF is a solvent used in plastics, rubber, and polyurethane (PU) coating. It has a strong smell in the finished product. Water-based PU does not contain DMF and is therefore preferable.
Dimethylfumarate (DMFu)	Dimethylfumarate is an anti mould agent used in sachets in packaging to prevent the build of mold, especially during shipping.
Dyes — AZO Dyes and Pigments	Azo dyes and pigments are colorants that incorporate one or several azo groups (-N=N-) bound with aromatic compounds. Thousands of azo dyes exist, but only those which degrade to form listed amines are restricted. Azo dyes are used in dyed fabric or leather.

Restricted Substances	Description & Where they may be found
Dyes — Disperse Dyes	Disperse dyes are a class of water-soluble dyes that penetrate the fiber system of synthetic or manufactured fibers and are held in place by physical forces without forming chemical bonds. Restricted disperse dyes are suspected of causing allergic reactions. Disperse Dyes are used in synthetic fiber (e.g., polyester, acetate, polyamide).
Flame Retardants	Flame retardants are chemical compounds that can be incorporated into textiles or applied by sprays to decrease the flammability of the product. Flame retardant chemicals are often used in children's clothing and tent fabrics (PU coatings) to meet safety standards.
Fluorinated Greenhouse Gases	Fluorocarbons are mainly used as substitutes for CFCs (Chlorofluorocarbons) and HCFCs (Hydrofluorocarbons), both of which are ozone depleting substances that the 1987 Montreal Protocol has progressively phased out of production. Flourocarbons are mostly used as refrigerants in refrigerators and air-conditioners and as propellants in industrial aerosols. Other applications include foam-blowing, solvent cleaning and textile coating. Textiles coated with fluorocarbons provide good resistance to weathering, UV light aging, chemical and soil resistance. Treated textiles also give good water-proof and anti-pilling effect. They are most likey to be found in coated textiles.
Formaldehyde	Formaldehyde is a volatile compound used widely in apparel and textile manufacturing as an anti-creasing and an anti-shrinking agent. In addition, formaldehyde is often used in polymeric resins (e.g., phenol-formaldehyde and urea-formaldehyde). Because of its volatility it can easily spread by cross contamination from one garment to another. Formaldehyde/ formaldehyde releasing compounds are applied for: • Permanent press and artificially stiffen fabric • Dimensional stability control (i.e., pre-shrinkage) • Easy-care • Crinkle treatment • Fixation or preservation of dyes and prints • Adhesives for flock prints • Binders for pigment prints • Fluorescent dyes and pigments
Isocyanates	Isocyanates are used in the production of polyurethane plastics and foams. When testing PU for Isocyanates it is important to follow the standard method, since certain conditions result in false positives.

Restricted Substances	Description & Where they may be found
Metals	
Arsenic (As)	Arsenic is a half-metal element. It can be present as a pure metal, as non-metal or as Arsenic compounds (e.g., salts). Arsenic and its compounds can be used in some preservatives, pesticides and defoliants for cotton. It is also associated with synthetic fibers, accessories for textiles and clothing, paints, inks, trims, plastics, and metal components.
Antimony (Sb)	Antimony is a half-metal element. It can be present as a pure metal, as non-metal or as Antimony compounds (e.g., salts). Antimony is found in or used as: • Catalyst in polymerisation of polyester • Flame retardants • Fixing agents • Pigments • Alloys
Cadmium (Cd)	Cadmium is a naturally occurring and abundant metal that does not easily corrode (rust). It can be present as a pure metal or as cadmium compounds (e.g., salts). Cadmium compounds are found in or used as: • Pigments (particularly red, orange, yellow, and green) • Stabilizer for PVC plastic • Fertilizers • Biocides • Alloys for plating of other metals. • Paints (e.g., surface paints on zippers and buttons)
Chromium (Cr)	Chromium is a metal element that can be present as a pure metal or as Chromium compounds (e.g., salts). (See also Chromium VI). Chromium compounds can be used as: • Dyeing additives • Dye-fixing agents • After-treatments to improve color fastness • Dyes for wool, silk and polyamide (especially dark shades) • Tanning of leather Most Cr containing dyes can be put in one of the following categories: **Metal complex dyes** • 1:1 metal complex • 2:1 metal complex **Mordant dyes** • Metachrome • After-chrome **Textile (except polyamide, polyamide blends & worsted wool)** • Never use dyes based on, or containing Cr. Never use Cr-fixation of dyes (Mordant dyes).

(continues on next page)

Restricted Substances	Description & Where they may be found
Chromium (Cr)	**Polyamide, polyamide blends and worsted wool** • Most important for dark shades • Consult your dye stuff supplier to make sure the dye is bound strongly enough and that you're not using more Cr than needed There are reactive dyes and acid dyes suitable for the critical fibers. Preferred dyes depend on the color and the fiber.
Cobalt (Co)	Cobalt is a naturally occurring metal element that can be present as a pure metal or as Cobalt compounds (e.g., salts). • Cobalt metal can be used in alloys. • Cobalt compounds can be used as pigments and in dyestuff. • Cobalt salt is used as initiator in curing of unsaturated polyester in the production of plastic buttons.
Lead (Pb)	Lead is a naturally occurring metal element that can be present as a pure metal or as Lead compounds (e.g., salts). It is important to the production of batteries, fuels, paints, plastics (as a heat stabilizer), ceramics, caulking and solders. In apparel and footwear, lead may be associated with plastics, paints, inks, pigments, surface coatings and metal components.
Mercury (Hg)	Mercury is a naturally occurring metal element that can be present as a pure metal or as Mercury compounds (e.g., salts). It can exist as metallic mercury (liquid), a gas (when heated), or as solids (inorganic and organic compounds). Mercury compounds can be present in pesticides and can be found as contamination in caustic soda (NaOH). Mercury compounds can be used in paints, (e.g., surface paints on zippers and buttons).
Nickel (Ni)	Nickel is an abundant metal element that can be present as a pure metal or as Nickel compounds (e.g., salts). It is often combined with other metals to create alloys with increased hardness and resistance to corrosion. Nickel metal is mainly used for plating of alloys, improving the corrosion resistance in alloys, improving the hardness of alloys and is a key element in the production of stainless steel. Certain dyestuffs contain complex-bound Nickel. Both Nickel metal and Nickel compounds can occur as an impurities in pigments and alloys.
Other Metals	Metals like Selenium (Se) and Barium (Ba) may be associated with synthetic fibers, accessories for textiles and clothing, paints, inks, trims, plastics, and metal components.

Restricted Substances	Description & Where they may be found
Octamethylcyclotetrasiloxane	Octamethylcyclotetrasiloxane can be used in textile softeners.
Organotin Compounds	Organotins are a 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 productions, and heat stabilizers in plastics/rubber. In textiles and apparel, organotins may be associated with textiles plastics/rubber, inks, paints, metallic glitter, and heat transfer material.
Phenols *Pentachlorphenol (PCP)* *Tetrachlorphenol (TeCP)* *O-phenylphenol (OPP)*	Phenols are compounds used as preservatives or pesticides. Pentachlorphenol (PCP) and Tetrachlorphenol (TeCP) are polychlorinated compounds sometimes used to prevent mould and kill insects when growing cotton and when storing/transporting fabrics. PCP/TeCP can also be used as a preservative in print pastes. *O*-phenylphenol (OPP) can be used for its preservative properties in leather or as a carrier in dyeing processes.
Phthalates	Esters of orth-phthalic acid or "phthalates" are a class of organic compounds commonly added to plastics to increase flexibility. They are sometimes used to facilitate molding of plastic by decreasing its melting temperature. Phthalates can be found in: • Flexible Plastic components (e.g., PVC) • Print pastes • Adhesives • Plastic buttons • Plastic sleevings • Coatings
Polyvinyl chloride (PVC)	PVC (also known as vinyl) is a chlorinated polymer used extensively. Vinyl products include credit cards, furniture, toys, flooring, cable/wire insulation, garden hoses, and coats. PVC can be found in plastic items and trim in apparel and footwear. PVC is typically used in: • Badges • Sequins • Zipper pulls • Stickers • Coating on textiles for rainwear • Prints • Synthetic leathers • Flip Flops / footwear

Restricted Substances	Description & Where they may be found
Perfluoro Compounds *PFOS* *PFOA*	Perfluorooctanesulfonic acid is an organofluorine compound. Salts of this compound are often used as surfactants. Like other fluorocarbons the C8F17 subunit in this compound repels water, and PFOS is the main ingredient in many stain repellent finishes. PFOS is used as a binder in non-woven fabrics to enhance dyeing, wetting agents to improve coverage and penetration of substances, achieve finish-on-yarn uniformity, and water resistance, oil resistant coatings on textiles, leather, and other materials. Perfluorooctanoic Acid is used in the production of fluoropolymers which are used as impregnating agents on textiles (e.g., water repellents on jackets).
Polychlorinated Biphenyles (PCBs) Polychlorinated Triphenyles (PCTs)	PCBs and PCTs are large molecules containing many chlorine atoms. PCBs/ PCTs are mainly used as pesticides but also as softeners, carriers, and flame retardants.
Polycyclic Aromatic Hydrocarbons (PAHs)	Polycyclic Aromatic Hydrocarbons (PAHs) are natural components of crude oil and they are a common residue from oil refining. PAHs have a characteristic smell similar to the smell of car tires or asphalt. Oil residues containing PAHs are added in rubber and plastics as a softener or extender. Therefore, PAHs are risky in rubber, plastics, lacquers and coatings. PAHs are often found in the outsoles of footwear and in printing pastes of screen prints. PAHs can be present as impurities in Carbon Black. Clean mineral oils should be used in the rubber to avoid PAHs.
Solvents	Organic solvents are widely used in chemical preparations. They are also used in many processes such as dry cleaning. Some organic solvents are highly volatile. In apparel and footwear, solvents are used as finishing/cleaning and printing agents, for dissolving and diluting fats, oils and adhesives (e.g., in degreasing or cleaning operations).
Triclosan	Triclosan can be used as disinfectant and as an antibacterial agent in textiles.

Although we do not anticipate that the following substances will be found in finished apparel and footwear, it is important to note that they are restricted:

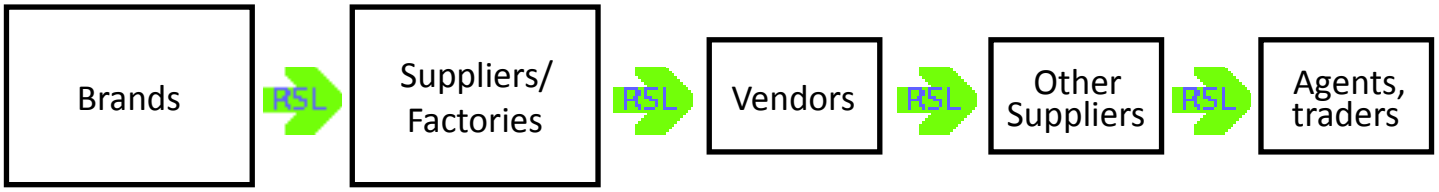
Restricted Substances	Description & Where they may be found
Asbestos	Asbestos is a naturally occurring group of fibrous silicate minerals. These thin, long, and flexible fibers can be woven into textiles. Asbestos fibers are strong, durable and fire-resistant. Unlikely to be found in current textiles except for fire-fighting clothing.

Restricted Substances	Description & Where they may be found
Dioxins and Furans	Dioxins are made up of 75 polychlorinated compounds called chlorinated dibenzo-p-dioxins. Each dioxin has a different level of toxicity based on its structure and tissue absorption qualities. Furans are also polychlorinated compounds (135 different furans exist). Dioxins and furans are structurally and toxically similar. Dioxins/furans are common by-products of incomplete combustion (burning) of organics in a chlorine rich environment and are often associated with the production of pesticides, PVC, and other similar chlorinated chemicals. It is unlikely that dioxin and furan legislation will apply to apparel and footwear.
Pesticides	Pesticides compounds are used for preventing growth of insects or fungi on plants, animals or materials. In the textile industry they are mainly used in production and transportation of natural fibers (e.g., cotton, wool). Dieldrin and DTTB are pesticides that may be found in natural fibers during growth and processing. In apparel and footwear, these pesticides may be found in natural fibers, primarily cotton.

4. Educate the Supply Chain

As outlined in Figure 2, brands are responsible for educating their contracted suppliers about their RSL requirements and procedures. You, the supplier, are then responsible for educating your vendors on brand RSL requirements as well.

Figure 2. Educating the Supply Chain



We suggest the following as a process for educating your own supply chain:

a. Make sure all of your subcontractors, accessory suppliers, dye mills, print mills, tanneries, chemical suppliers, et cetera are aware of the brand's specific RSL restrictions and have the latest updated version available. Only do business with RSL compliant companies.

b. Use and encourage the use of dyestuffs, pigments and textile auxiliaries from reputable manufacturers only. More information about dye manufacturers is available from the Ecological Toxicological Association of Dyestuffs (ETAD), Basel, Switzerland. www.etad.com

c. When choosing chemicals for the dyeing process consider your customer's quality requirements. When choosing a reputable chemical supplier you can often get necessary technical support and dye recipes for free in order to comply with both chemical and quality requirements. High quality dyes are often less expensive when considering total cost (energy, water, time, total chemical usage, quality tests, etc.) and the need to meet customer color and quality standards.

d. Insist that the chemical supplier provides material safety data sheets (MSDS) for the dyes and textile auxiliaries supplied. Study of these safety data sheets can help to reveal whether the materials used are free from restricted substances such as arylamines, disperse dyes, heavy metals such as lead. See Appendix G for examples and explanation of MSDS.

e. Work to understand the chemistry and where substances may be found in the apparel and footwear supply chain—see flowchart and tables above as well as Appendix F, a detailed Chemical Guidance Document, for more specific technical information about where various restricted substances are introduced during the manufacturing process. Appendix E gives numerous examples of restricted substance failures and corrective actions taken to eliminate them.

5. Laboratory RSL Testing

Many brands have specific testing requirements. If your customer does not have testing requirements, we recommend developing a testing program of your own. Appendix C is representative of a retailer's testing program, which is from the brand's point of view and may be helpful in understanding testing issues. If your customer does not have testing requirements, suppliers are encouraged to trust, but verify, that vendors are RSL compliant through a testing program.

Laboratories

Typically, each brand has its own list of approved laboratories, and samples must be sent only to laboratories approved by the brand. If your customer does not have a list of approved laboratories, some considerations to keep in mind when choosing a laboratory for your own testing are as follows:

- Does the lab hold certifications or accreditations? From whom? (Accreditation is required by the new US law, Consumer Product Safety Improvement Act, enacted 14 August 2008.)
- Does the lab follow GLP (Good Laboratory Practices) or ISO 17025 guidelines?
- Does the lab have a Quality Policy Statement or other document staing general quality procedures?
- What was the date and result of a recent external audit? Is a report available?
- Does the lab belong to any private quality assurance organization?
- Does the lab regularly participate in any round-robin or blind sample testing?
- Is the lab open to a site visit or audit?
- Are in-house protocols written and in manuals? Are they available?
- Has the lab ever been denied or lost certification?
- Is a list of key scientists, including degrees, certifications, etc., available?
- Is a list of major, on-site analytical equipment available?
- Is a list of reference methods the lab routinely performs available?
- Is a list of sample handling and preparation capabilities available?
- Approximately how many analyses are conducted per month or year?
- What percentage of the lab's analyses are subcontracted to a third party?
- In what languages are reports available?
- Are data processed by hand or computer?
- Does the lab have an automated laboratory information management system (LIMS)?

6. RSL Implementation

Model Implementation steps for establishing your own RSL program are as follows:

Figure 3. Model for Establishing a Restricted Substances List Program

STEP 1: Internal Communication

- Develop and publish a company policy, including steps for implementation. (See Appendix B.)
- Gain the commitment of internal stake holders.
- Delegate responsibility to a department or staff member.
- Develop and disseminate a schedule for implementation. (See Appendix B.)
- Train internal staff. (See Appendices B, D, F, and I for more information, and www.afirm-group.com for presentation slides).

➢ **Best Practice:** Track emerging legislation and voluntary standards.

STEP 2: Communicate to Facilities/Suppliers

- Send a letter or checklist to company suppliers informing them of your requirements (use the information in Appendix B to develop this or use your customer's checklist).
- Provide basic chemical and legislation information to suppliers. See the AFIRM RSL (http://afirm-group.com/afirm-rsl) for legislated substances.
- Predict and answer frequently asked questions from suppliers (see Appendix J, AFIRM Frequently Asked Questions).

➢ **Best Practice:** Develop a procedure for gathering, tracking, and following up on response or lack of response from suppliers.

STEP 3: Testing and Reporting Results

- Identify and communicate your needs to the testing laboratories identified by your customers.
- Determine how often the company will test for restricted substances in finished products (use the requirements of your customer, or see Appendix C for a brand's model testing program to develop your own).
- Identify which chemicals will be tested for based on your customer's requirements (use customer requirements or see Appendix C).
- Create/use a procedure and forms to send and receive testing data (see Appendix C).

➢ **Best Practice:** Develop a system for storing testing data.

STEP 4: Continuous Improvment Best Practices

- Track updates and trends in legislation related to restricted substances in apparel manufacturing.
- Develop own process for managing restricted substances in your supply chain (see Appendix B and Appendix D).
- Identify most stringent requirements and adopt them as your own.

7. Appendices

Appendix A—Glossary of Terms

Allergen: A substance that induces an allergy. Common allergens include pollen, grasses, dust, and some medications.

Antifoulant: A substance that prevents the accumulation of growths such as barnacles and algae on underwater surfaces.

Antifungal: Any agent that destroys or prevents the growth of fungi.

Bioaccumulate: Substances that cannot be eliminated by living organisms and tend to bioaccumulate, which means they become more concentrated throughout the food chain. Concentrations of these substances can reach levels that are harmful to human health or the environment.

Carcinogenic: A relationship has been established between exposure to the substance and human cancer.

Endocrine disrupter: A substance believed to alter hormones or glands in humans or animals. Endocrine disrupters may influence biological processes such as the control of blood sugar, growth and function of reproductive systems, regulation of metabolism, brain and nervous system development, and the development of an organism from conception through adulthood and old age.

Environmentally persistent: Substances that resist natural breakdown processes for an extended timeframe.

Feedstock: Raw material for processing or manufacturing.

Material Safety Data Sheet or "MSDS": A form containing data regarding the properties of a particular substance. It is an important component of product stewardship and workplace safety, intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner, and includes information such as physical data, toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill handling procedures. The exact format of an MSDS can vary from source to source within a country depending on how specific the national requirement is. See Appendix G for examples and explanation of MSDS.

Preservative: A chemical substance used to preserve organic materials from decomposition or fermentation.

Restricted Substances List: Defines those chemicals that are restricted or banned from finished products.

Suspected carcinogen: A relationship has been established between exposure to the substance and cancer in animals or if there is limited evidence of cancer in human and animals from exposure to the substance.

Toxic: A substance is toxic if inhalation, absorption through the skin, or ingestion causes damage to living tissue, damage to the central nervous system, or death.

Volatile: A substance is considered volatile if it has a low boiling point at normal atmospheric pressure. Volatile chemicals (e.g., formaldehyde) can cross contaminate products because they can more easily vaporize and travel.

Usage Ban: Defined as a prohibition of intentional use of the substance during any and all stages of product manufacturing. However, the RSL may expressly allow a trace amount of the substance to be present as an unavoidable contaminant. The allowable trace amount is shown as TR in the RSL Limit Value column (see below).

Appendix B—Factory Management Plan

1. **Factory management**

    1.1. Factory name: _____

    1.2. Location: _____

    1.3. Factory RSL contact name: _____

    1.4. Factory RSL Project Team (person(s) responsible for RSL compliance):

    _____

2. **RSL strategy for Components and Suppliers**

    2.1. **List vendors for components and suppliers**

    2.2. List type of materials, components and source from each vendor listed above.

3. Describe your overall management strategy to minimize RSL risk (e.g., focus on high-risk materials: leather, TPU, metal, injection, ink/paint; and focus on high-risk colors: bright and fluorescent colors.)

    Example:

    3.1. **Short term Goals**

        3.1.1. Identify RSL risk by materials on the basis of classified RSL risk.

        3.1.2. Set up the RSL risk control strategy.

        3.1.3. Develop tracking report/system for strengthening RSL risk management.

        3.1.4. All the RSL test results are to be reported to management on a seasonal basis.

    3.2. **Long term Goals**

        3.2.1. Create an evaluation system to track factories' and vendor's compliance. A score card could be established and implemented.

        3.2.2. Use the result of evaluation for the future sourcing decision.

        3.2.3. Share the RSL database with vendors.

4. **Vendor Management**

    4.1. Risk from vendors can vary greatly. Globally recognized vendors will tend to be of lower risk because they are aware of and usually prepared to meet global standards for chemicals content. Local vendors are usually not as aware of the need to comply with global standards.

    4.2. **Describe your management strategy to minimize risk from vendors.**

        4.2.1. Do you classify vendors by RSL risk?

        4.2.2. How do you define a low risk vendor?

        4.2.3. How do you define a high-risk vendor?

        4.2.4. How do you ensure that new vendors understand and meet the RSL?

5. Chemical Testing

5.1. The best way to manage the RSL is to be knowledgeable about product chemistry. Learning the processes and chemicals used by vendors is the best way to understand product chemistry. Chemical testing is another tool to better understand product chemistry. If required, chemical testing of components and products is preferable to testing of upstream materials. Any testing should prioritize components that pose the highest risk (see accompanying information). A thorough knowledge of the chemistry of the manufacturing process is also necessary to identify additional RSL risks that might be introduced during manufacture.

5.2. Describe the methods you use to understand chemical content of your product.

5.3. How do you build knowledge of chemical content of your components and manufacturing process?

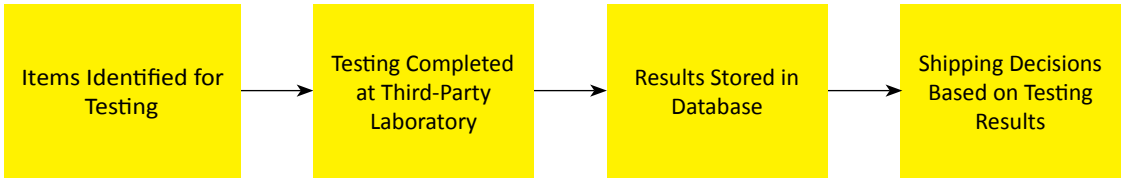
5.3.1. Understanding of the process and chemicals involved in the manufacture of the components, such as checking the MSDS. See Appendix G for examples and explanation of MSDS.

5.3.2. Use of RSL risk identification database.

5.3.3. Testing of components prior to confirmation.

5.3.4. Other, please explain.

Figure 4. Approach to Testing (use accompanying information)



6. Corrective Action

6.1. Though we would like all risk to be eliminated, we recognize that there will be some component failures. The cause(s) of individual failures can be many and varied. Root cause analysis should be performed to determine how to best reduce risk of RSL violation. See Appendix H for a Failure Resolution Form useful for recording and retaining this information for future reference and to provide to brand customers.

6.2. Describe, if available, your management plan to address corrective action for vendors, materials, and/or color RSL violations.

Example:

6.3. Follow up action for non-compliance.

6.4. Non-compliance during development process:

6.4.1. Report it to Engineering team.

6.4.2. Suggest solution before production stage.

- Material change
- Color change

6.5. Vendor should submit the improvement plan within 1 week with corrective action.

6.6. Non-compliance under production

6.6.1. Stop production

6.6.2. Replace with alternative materials.

6.6.3. Destroy non-compliant materials.

6.6.4. Vendor to reimburse on all loss.

7. **Data Management**

7.1. Access to RSL data throughout the supply chain is a key component in management strategy for the RSL. Strategic testing of materials is critical for streamlining RSL management.

7.2. Describe how you manage data you collect from sample analysis/testing and how you share that information with your partners

- Do you have a database for all testing data?
- Do you send this data for management review on a regular basis?
- Do you identify suppliers with repeated failures and put them on notice?

8. **Tracking Time Table**

8.1. Set up a time table (see Table 3) which identifies your RSL Plan of each year. Some items must be included, such as: Four deadlines of reviewing of your RSL Data trend; One training/meeting on RSL to your vendors; Summary of your RSL tracking from Purchasing at the end of the year.

Table 3. Example of Testing Time Table

Progress	**Target Date**	**Finish Date**
Complete RSL Plan and present to factory management	1/20/13	
Discuss RSL Plan with vendors	2/20/13	
Set up the RSL Action Plan Schedule	4/20/13	
Prepare material for RSL testing	5/20/13	
Finish RSL testing	6/20/13	
Review RSL data trend with vendors	7/20/13	
Review and revise RSL plan for continuous improvement	8/20/13	

Appendix C—Model Brand Program Protocol for Testing Clothing

This appendix provides an example of what a brand's testing program might look like. It is included to help suppliers understand the kind of testing requirements they can expect from their customer and how to design their own internal testing protocols to meet them. Please note that no two brands have the same protocols and you should always check with your customer to make sure you fully understand their requirements.

1. **AIM**

   To ensure compliance with the Rules for Due Diligence—Analytical Testing.

2. **OBJECTIVE**

   All brand products must be tested or checked to an agreed program to ensure that they are safe and legal.

3. **SCOPE**

   This protocol applies to all brand products technically managed by the clothing category, including clothing, accessories, jewelry, footwear, etc.

   The protocol also covers products not branded but for which we have the legal responsibility.

   Reference to internal Legal and Technical Document.

4. **INTRODUCTION**

   As part of due diligence it is important that the company performs a degree of analytical testing to monitor and prove product and supplier performance. Auditing suppliers and setting specifications alone is insufficient to ensure our products are legal and safe.

   Analytical testing is not designed as a tool to manage quality, although the information gathered from this testing may be used to monitor this indirectly.

   - This product data will be used to defend our standards when challenged by the trading standards or the courts.
   - The product data will be used when challenged by the media and other non-enforcement agencies such as consumer groups or NGOs.
   - The product data will be used to form part of our formal due diligence defense.
   - Test results will be used internally to demonstrate that all management processes are in-place and operating correctly.

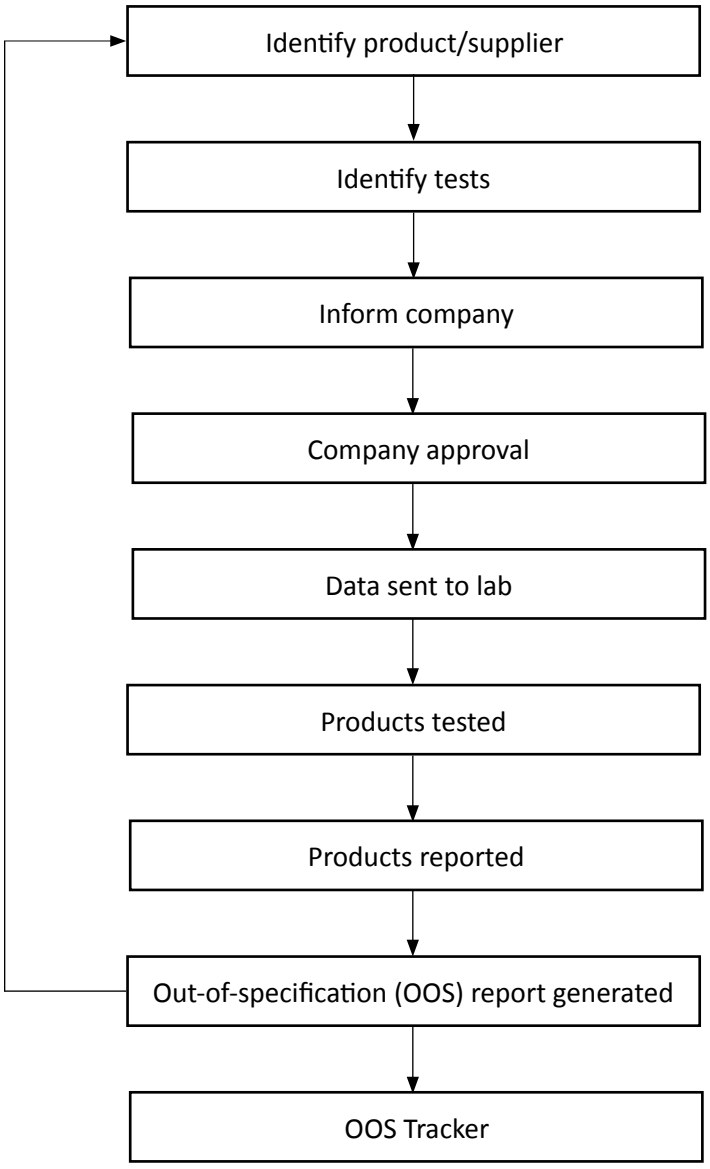
   As part of due diligence it is important that the company performs a degree of analytical testing to monitor and prove supplier performance. This analysis includes chemical testing, setting specifications alone in insufficient to ensure our products are legal and safe.

continues on next page

5. PROCEDURE

Figure 5 outlines a procedure for clothing surveillance.

Figure 5. Procedure for Clothing Surveillance



a. Review

- Technical managers (TMs) to perform a quarterly review of their product range. Deadline dates to be agreed.
- Information to be presented in an agreed upon format.

continues on next page

b. Risk Assessment

Technical Managers must perform a risk assessment for each product:

- Decide if a product needs testing (see Figure 6, Clothing Risk Assessment Decision Tree for SUPPLIERS).
- Decide what testing is required (see Figure 7, Clothing Risk Assessment Decision Tree for PRODUCT).
- Identify any physical testing required (see Figure 8, Clothing Risk Assessment Decision Tree for TESTING).
- Identify any chemical testing required (see Figure 8, Clothing Risk Assessment Decision Tree for TESTING).

Hints & Tips When Deciding What to Test

- All new suppliers are deemed high risk and will be subject to a high test frequency in their first season until a level of confidence is established.
- All suppliers who have historically performed well (fewer than two surveillance testing fails in the past 12 months) are deemed low risk for the purpose of this program and will only be subject to random ad-hoc testing.
- All products classified as toys (items designed for use in play for 14 years old or under) should be tested (e.g., dressing up out-fits/disguise costumes, soft toys).
- Products that are not specifically sold as toys but have an obvious play value should be tested as a toy.
- All continuity products should be tested once a year.
- All products with a promotional claim should be tested, for example:

    1. Nightwear flammability
    2. Stain resistant
    3. Waterproof / water resistant
    4. Non-iron (formaldehyde content)
    5. Easy care (formaldehyde content)

- All infant, babies, and children's products are considered high risk and frequency of testing should reflect this as well as children's specific chemical limits, restrictions or bans.
- All nickel components in intimate prolonged contact with the skin should be tested.
- Leather should be checked for chromium VI.
- TMs should submit their testing recommendations quarterly to management for review and approval.
- This information will then be submitted to the nominated testing laboratories who will arrange to collect the samples from stores, test, and report back.
- Will be informed of all failures immediately.
- Every period, the nominated test lab will visit a company store and select 10 samples for chemical testing.
- As shown in Table 4, on the next page, chemical testing will be performed on a project basis, concentrating on one specific chemical per period. The schedule will be repeated twice per year to cover seasonal product offerings.
- Understanding the chemical risks in your supply chain, processes and product is critical in making good and appropriate decisions. (See Understanding Chemical Risks on page 3 of the toolkit.)

Table 4. Chemical Testing Schedule by Period/Season

Period/Season	Chemical
1 & 7	AZO Dyes
2 & 8	Phthalates
3 & 9	Heavy Metals (prints and trims)
4 & 10	Disperse Dyes
5 & 11	PCPs
6 & 12	Phthalates

Figure 6. Clothing Risk Assessment Decision Tree for SUPPLIERS

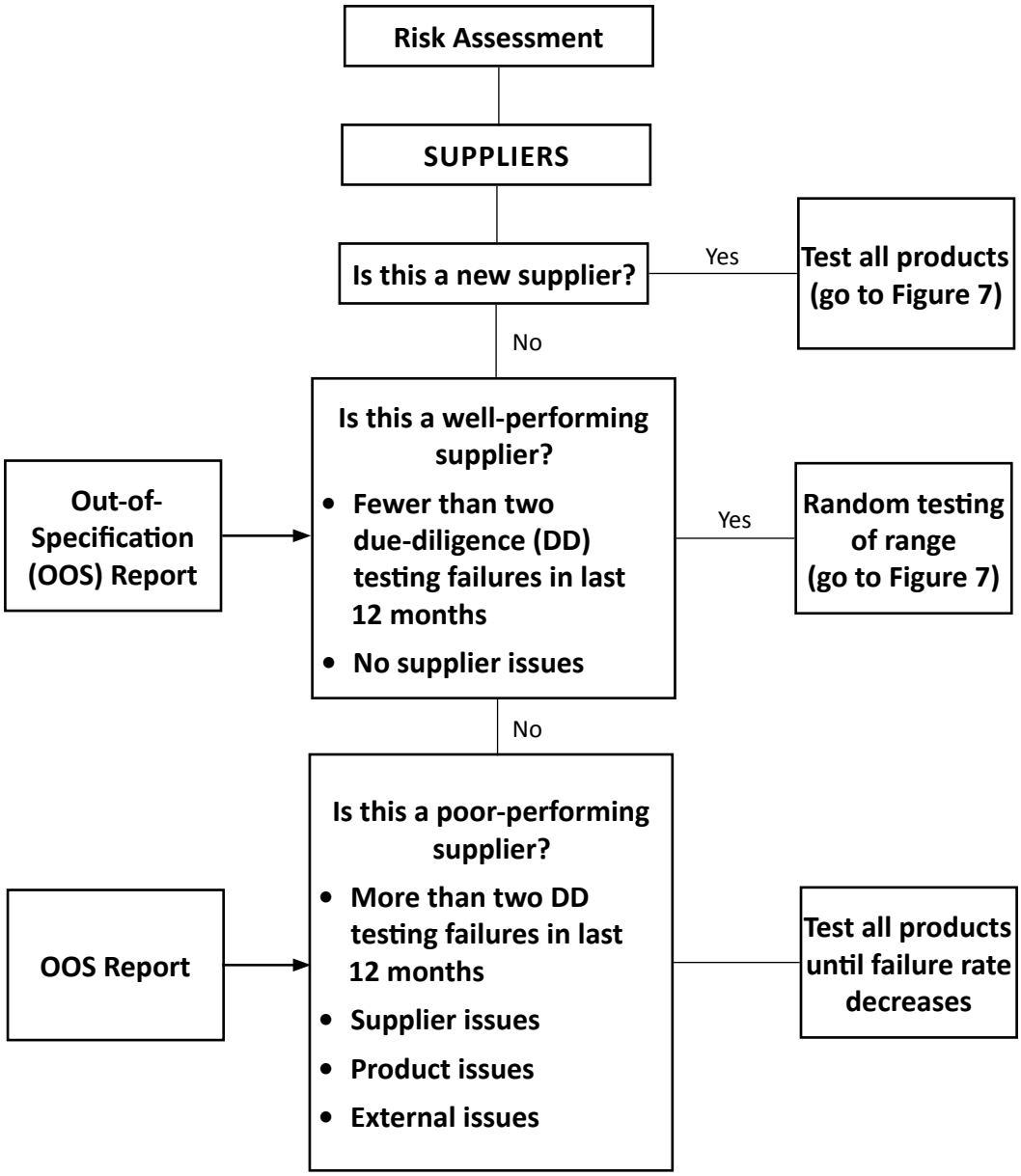
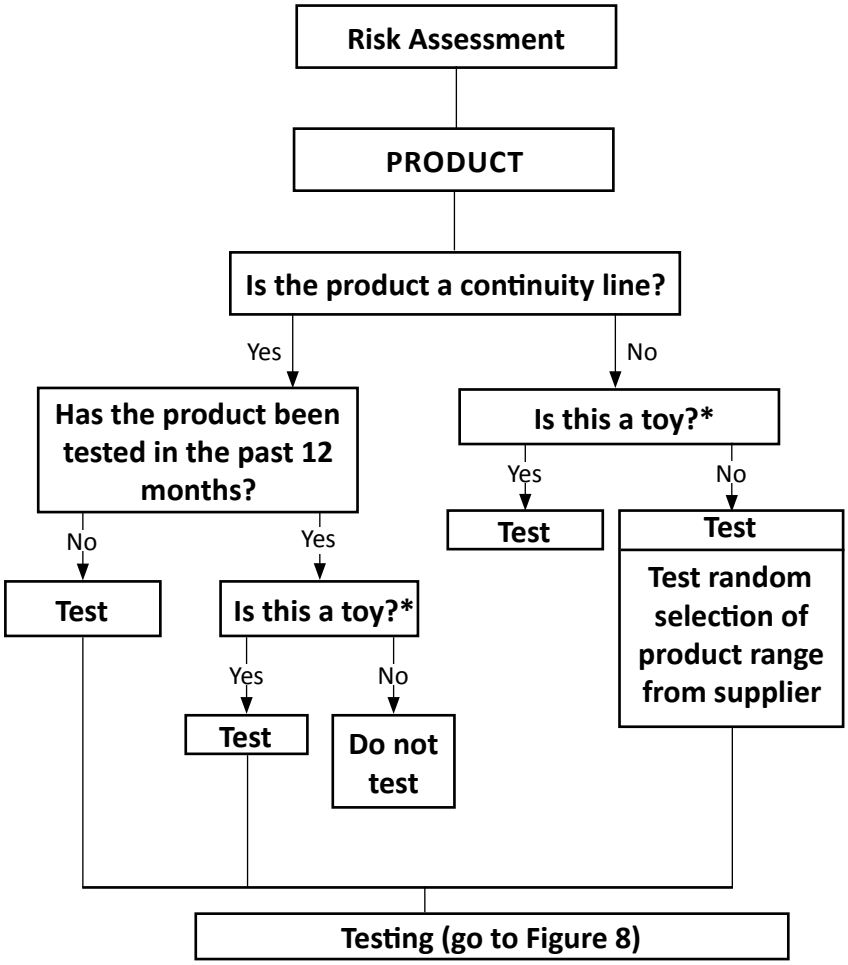
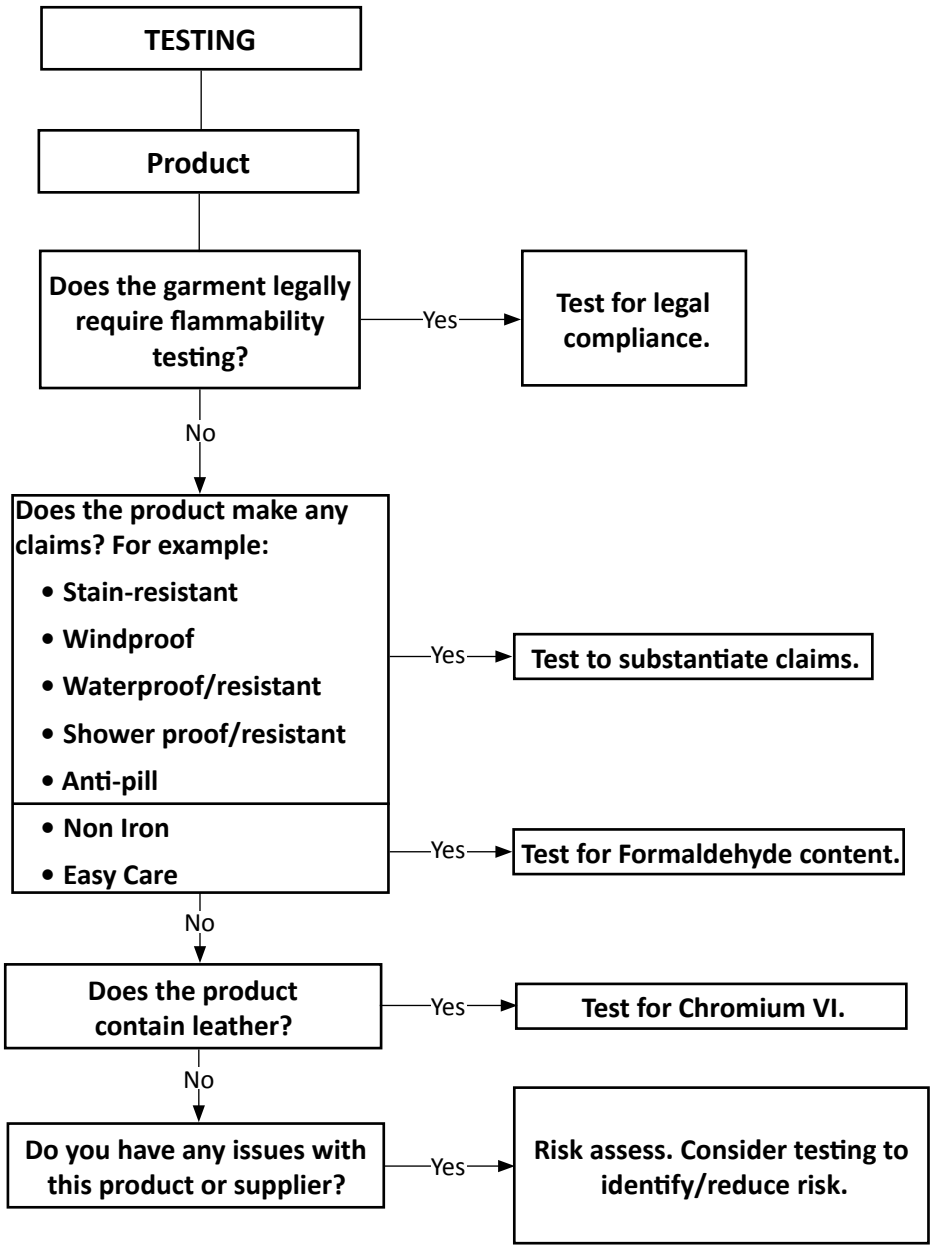


Figure 7. Clothing Risk Assessment Decision Tree for PRODUCT



* Toy is defined as any product designed for or likely to be used in play, by a child under 14 years of age, and includes disguise (dressing up) costumes.

Figure 8. Clothing Risk Assessment Decision Tree for TESTING



Appendix D—Best Practices to Avoid RSL Issues

This appendix document is intended as a guide to help in identifying, preventing and resolving product compliance and quality issues related to a retailer's Restricted Substance Program. The information in Table 5 should be used to supplement the Finished Product Restricted Substance List, other training resources, and the advice of competent technical resources. This information may be shared with suppliers, but should not be considered an exhaustive list of all potential issues, sources, or prevention and remediation solutions.

Table 5. Best Practices to Avoid Restricted Substances List Issues

	Restricted Substance	Manufacturing Technology that Could Introduce the Substance	Steps to Avoid Restricted Substance in Finished Products
Natural Fibers (cotton, rayon, wool, hemp, etc.)	Formaldehyde	Resins to prevent shrinkage	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
		Resins to prevent wrinkling	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
		Resins to permanently include wrinkles	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
		Discharge Printing	Water based discharge printing systems rely on Zinc Formaldehyde Sulfonate (ZFS). Discharge prints must be used according to manufacturers instructions to meet adult formaldehyde requirements.
		Pigment print binder	Use formaldehyde free binders; Use low formaldehyde binders & fully cure to chemical supplier specifications to remove free formaldehyde.
	Heavy metals (mercury, lead, cadmium)	Dye stuff	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance.
		Pigment prints	Use pigments from internationally recognized dye stuff suppliers with commitments to chemical compliance.
	Azo amines	Dye stuff	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance.
		Pigment prints	Azo structures in pigments can cleave into one of the harmful amines. With low solubility the consumer risk is minimal, but GC/MS will detect amines. LC/MS can be used for proper confirmation. Check with ETAD www.etad.com for a list of pigments that pose this risk.
Synthetic Fibers (polyester, nylon, acetate, acrylic, etc.)	Formaldehyde	Resins to prevent shrinkage	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
		Resins to prevent wrinkling	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
		Resins to permanently include wrinkles	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
		Cross linking agent in coating processes	Use formaldehyde free resins; Use low formaldehyde resins & fully cure to chemical supplier specifications to remove free formaldehyde.
	Heavy metals (mercury, lead, cadmium)	Dye stuff	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance.
		Stabilizer	More likely in molded plastics than fibers, but cadmium should not be used as a stabilizer.
		Polymer extrusion contamination	Heavy metals such as lead, cadmium and mercury are not likely intentionally used in polymer extrusion, but could be present due to contamination.
	Disperse dyes	Dye stuff	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance. Orange 37/76 is the most common failure and is commonly found in dark colors which use Orange 37/76 in the recipe.
	Azo dyes	Dye stuff	Synthetic fibers with a PU or fluorinated coating may give a false positive for azo amines if tested using GC/MS. LC/MS can be used for confirmation. Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance.

	Restricted Substance	Manufacturing Technology that Could Introduce the Substance	Steps to Avoid Restricted Substance in Finished Products
Metal Trim	Heavy metals (mercury, lead, cadmium)	Alloying metal	These heavy metals have been used as low cost substitutes in place of more precious metals. They should not be used in metal trims.
		Paint or coating	Paints are one of the most common sources of heavy metals as pigments and stabilizers. Red, yellow, orange and colors made of these base colors are the most likely sources.
	Nickel	Alloying metal	Nickel can be alloyed with various metals. Commonly used to form varieties of brass, steel, cast iron. Nickel can be used in trim items but it must have a durable coating to reduce weekly exposure below 0.5 ug/cm^2.
	Iron (not on the RSL)	Alloying metal	Iron can be alloyed with various metals. Iron should be avoided so that materials can pass metal detection. Iron is not a part of the RSL.
Plastic trim / heat transfers / screen print ink / synthetic leather	Formaldehyde	Adhesive	Use formaldehyde free adhesives; Use low formaldehyde adhesives & fully cure to chemical supplier specifications to remove free formaldehyde.
		Discharge Printing	Water based discharge printing systems rely on Zinc Formaldehyde Sulfonate (ZFS). Discharge prints must be used according to manufacturers instructions to meet adult formaldehyde requirements.
		Pigment Binder	Fluorescent pigments and glass beads for reflective inks are larger than traditional pigments and the traditional binders are not strong enough. Binders containing formaldehyde must be used and therefore you are unlikely to meet the kids formaldehyde requirement (<20 ppm).
		Anti-microbial	Water based screen print inks often use a small concentration of an antimicrobial agent to preserve the useable life of the ink. Follow manufacturer instructions for dryer temperature and dwell time to remove free formaldehyde.
		Catalyst	Heat transfer adhesive such as those used in flocks require a catalyst. Use formaldehyde free catalyst based adhesives when available. If not technically available some flock applications will not meet the kids formaldehyde limits (<20 ppm).
	Heavy metals (mercury, lead, cadmium)	Pigments	Pigments are often used to color molded plastic trims. Red, yellow, orange and colors made of these base colors are the most likely sources. Use pigments from internationally recognized dye stuff suppliers with commitments to chemical compliance.
		Heat stabilizers	Some low temperature melting plastics use heavy metals as stabilizers to prevent the plastic from breaking down at high application temperatures. Cadmium is commonly used as a stabilizer is PVC, one of the many reasons to avoid PVC.
		Paints	Paints are one of the most common sources of heavy metals as pigments and stabilizers. Red, yellow, orange and colors made of these base colors are the most likely sources.
	Disperse Dyes	Solution dyed plastic trims (commonly buttons)	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance.
	Organotin Compounds	Heat stabilizers	Some low temperature melting plastics use organotins (TBT, DBT) as stabilizers to prevent the plastic from breaking down at high application temperatures. Organotins has been used as a stabilizer is PVC, one of the many reasons to avoid PVC.
	Phthalates	Plasticizers / Softener	Phthalates are most commonly used with to make PVC soft and flexible. Commonly found in plastisol screen print inks. Phthalate free and PVC free inks should be used for little kids screen prints and these inks should be segregated from traditional plastisol inks to prevent contamination.
		Adhesives	Use phthalate free adhesives.

↓ section continues on next page ↓

	Restricted Substance	Manufacturing Technology that Could Introduce the Substance	Steps to Avoid Restricted Substance in Finished Products
Plastic trim / heat transfers / screen print ink / synthetic leather	Polyvinyl chloride (PVC)	Flexible plastics	PVC is an inexpensive plastic that can be used in a variety of applications from films for apparel, to molded trims and screen print inks.
		Screen prints	Phthalate free and PVC free inks should be used for little kids screen prints and these inks should be segregated from traditional plastisol inks to prevent contamination.
		Synthetic Leather / Polyurethane Foam	PVC is sometimes used as an inexpensive filler in PU and Thermoplastic Polyurethane (TPU) applications.
Leather and Coated Leather	Azo amines	Dye stuff	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance.
		Pigment prints	A limited number of pigments will give a false positive for azo amines if tested using GC/MS. LC/MS can be used for confirmation.
	Chromium VI	Chrome tanning process	Chromium compounds are used to tan leather so you will expect to see a high level of total chromium. After tanning a complete reduction process is required to ensure any residual chromium ions are converted from $Chromium^{6+}$ (the carcinogenic form) to $Chromium^{3+}$ (inert form).
	Disperse Dyes	Dye stuff	Use dyestuff from internationally recognized dye stuff suppliers with commitments to chemical compliance. Orange 37/76 is the most common failure and is commonly found in dark colors which use Orange 37/76 in the recipe.
	Formaldehyde	Tanning process	There are tanning processes that rely heavily on formaldehyde for softening the leather. These process should be avoided or heavily controlled to prevent formaldehyde on finished materials.
	Organotin Compounds	Heat stabilizers (mainly for PU coated leather)	Some low temperature melting plastics use organotins (TBT, DBT) as stabilizers to prevent the plastic from breaking down at high application temperatures. Organotins has been used as a stabilizer in PVC, one of the many reasons to avoid PVC.
		Anti-microbial	Water based tanning processes often use a small concentration of an antimicrobial agent to prevent mold and bacteria growth during manufacturing. Avoid the use of organotin antimicrobial agents.
	Polyvinyl chloride (PVC)	Polyurethane coatings	PVC is sometimes used as an inexpensive filler in PU and Thermoplastic Polyurethane (TPU) applications. Use polyurethane alternatives.

This page intentionally blank.

Appendix E—RSL Failures & Corrective Action Examples

This appendix includes a link to a slide deck of actual RSL failures with corrective actions taken to resolve them. Recommendations for preventing the failures from happening again are included. A menu on the title slide and bottom left corner of each slide allows for easy navigation of the various restricted substance sections. The table of contents is shown in Table 6.

Restricted Substance Problem Solution Prevention Library.ppt

Table 6. Table of Contents for "Restricted Substance Problem Solution Prevention Library" Slide Deck

Restricted Substance	Issue	Slide #
Formaldehyde	Discharge Printing	2
Formaldehyde	Cap Stiffener	5
Formaldehyde	Wrinkle Effect	8
Formaldehyde	Pigment Print	11
Formaldehyde	Recipe Calculation	14
Formaldehyde	Leather Tanning	17
Aromatic Amines	Drawcord Dyestuff	21
Heavy Metals - Cadmium	PVC pigment	23
Heavy Metals - Lead	Paint pigment	26
Heavy Metals - Lead	Polyurethane coating	29
Heavy Metals - Lead	Heat transfer	32
Heavy Metals - Chromium	Metalized Dye	34
Heavy Metals - Mercury	Solvent cleaner	36
Phthalates - DEHP	Spray adhesive	38
Phthalates - alternative	Solvent plasticizer	41
APEO	Scouring agent	44
APEO	Fiber board emulsion	47
APEO	Leather degreasing	49
Organotins	Adhesive heat stabilizer	51
Miscellaneous - Phenol	Adhesive contamination	54
Miscellaneous - PAH	Rubber formula	57
Miscellaneous - PFOA	Non-wicking treatment	60
Miscellaneous - VOC	Solvent contamination	63
Miscellaneous - Phenol	Print paste thickener	65
Miscellaneous - VOC	Yarn lubricant	67
Disperse Dyes	Woven label	69

Appendix F—Detailed Chemical Guidance Document

This appendix is intended to provide readers with a detailed overview and background on the types of chemicals used in textile and leather goods manufacturing. It offers a large amount of information on many aspects of apparel manufacturing from raw materials to finishing and applications. It is best used as a reference for understanding particular aspects of manufacturing and what chemical risks are involved. The document is divided into sections with a table of contents and index of chemicals for easy reference and navigation. If viewed on a computer, it can be searched for specific terms by using the Find (Ctrl-F) function in the PDF viewer. This document is not intended to be read straight through.

Chemical Guidance Document

Appendix G—Material Safety Data Sheet (MSDS) Examples

This appendix provides links (see Table 7) to several examples of MSDSs, with comments, including a section-by-section explanation of the information a useful MSDS should contain. Although MSDSs can vary in format, AFIRM suppliers should require their chemical suppliers to provide MSDSs similar to the preferred examples here. Equipped with good MSDS information, restricted substances issues can be prevented.*

Table 7. Material Safety Data Sheet Examples

MSDS Section Explanations *A section-by-section breakdown of the information contained in MSDS.*	 MSDS Explanation
Preferred Examples of MSDS *In English and Chinese*	 Preferred MSDS English  Preferred MSDS Chinese
Non-Preferred Examples of MSDS *In English and Chinese*	 Non-Preferred MSDS English  Non-Preferred MSDS Chinese

*Note:

MSDS for a specific chemical product or chemical formulation does not contain information on all of its active components and/or additives.

Chemical formulations used for the processing of textile materials, components and/or finished products often contain multiple active components as well as formulation additives such as solvents, emulsifiers, preservation agents, salts, etc. The number of intentionally added chemicals in a formulation can be as high as 25.

Most active components or additives are of technical grade quality—especially in our textile business—and contain many impurities and/or by-products from their chemical synthesis.

MSDS for substances are primarily intended to focus on the hazards and risks for the people working with these chemicals in an occupational setting, and not intended for the end consumer. Nevertheless, it is very important to collect good MSDS information from your supply chain. MSDS information together with the information on your final product and the related processes (parameters, chemical consumptions, and air and water emission data) forms the basis of solid chemical product management.

Appendix H—RSL Failure Resolution Form

This Failure Resolution Form is a useful tool for collecting, organizing, and retaining information about RSL failures to submit to your brand customers or for your own records.

RSL Failure Resolution Form (FRF)

Fields marked with * are required

BRAND SAMPLE TESTED FOR:	PRODUCT TYPE:	RSL SUBMISSION ID (of failed report)

LAB WHERE SAMPLE WAS TESTED

VENDOR INFORMATION					
Liaison Office	Season	Vendor Name*	Vendor Code	Factory Name*	Factory Code
Sample Submitter Company*		Sample Submitter Contact Name*		Sample Submitter Contact Info (phone/fax/email)*	

SAMPLE DESCRIPTION					
Product or Style Number (SKU)	Material Name	Material Type*	Material or Item Number*	Date Material Made	Date Sample Submitted
Color Name 1*	Color Code 1*	Color Name 2	Color Code 2	GCW# (graphic colorway number)	GCW & Color Description
Sample Type*			Retest		
◯ Production Quality Material ◯ R&D Material ◯ Finished Product			◯ Yes ◯ No	RSL Submission ID:	

TESTING INFORMATION	
What chemical failed?	
Lab Tested Result (attach test report)	
What is the trade name and CAS# of the chemical causing the failure?	
Why is this chemical used in the manufacturing process (conduct PDCA to identify root cause)?	
Provide an action plan with a time table to show when and how the corrective action will be completed. • Existing failed product: immediate action • Future products: develop a prevention plan	

I WILL ENSURE THE COMPANY I REPRESENT IMPLEMENTS THE RESOLUTION LISTED ABOVE SO THAT ALL FUTURE PRODUCTION OF THIS DESCRIBED MATERIAL WILL MEET THE REQUIREMENTS OF THE RESTRICTED SUBSTANCES LIST.	
Signature: _____	Date: _____

Appendix I—Screen Printing & Applications/Finishing Best Practices

For restricted substances not subject to usage bans, brand RSLs restrict them to certain concentrations in components of finished products. These substances may be used, but appropriate steps must be taken to ensure that residual amounts or contaminants do not exceed limits. Solvents, for example, may be used with careful attention to drying/curing times to greatly reduce or eliminate them altogether. This appendix provides general guidance on drying/curing best practices as well as examples of good and bad practices for maintaining screen print production areas.

Drying /Curing Best Practices

Many applications and finishes require curing, such as resin finishing for a 3D-effect, easy-care, or screen printing. “Curing” is not limited to drying materials or garments but actually involves chemical reactions that begin at specific temperatures and take time to complete. It is important to understand and control the curing temperature and duration to fully react ingredient chemicals.

Information about appropriate curing conditions can be obtained from chemical suppliers. Improper/ incomplete curing may lead to both chemical product safety (RSL) and performance issues (e.g., losing the 3D/ easy care effect after a few home launderings).

Suppliers working with resins, screen prints, or other applications that require curing should:

1. Request Technical Data Sheets (TDS) from their chemical suppliers and follow the listed curing condition instructions.
2. Document the finishing/screen-print formulation and curing conditions.
3. Calibrate the oven regularly and keep the calibration record. (The digital display attached to the oven may not represent the actual temperature in the oven.)
4. If a conveyor belt oven is used in factories located in colder climates, understand the temperature gradient at different parts of the oven, as this may result in inconsistent quality or concentrations of residual chemicals in the finished garments.
5. Start the curing time requirement when the garment surface temperature reaches the required curing temperature, *not simply when the garment is placed in the oven!*

Temperature checking stickers are available, but these only record the highest temperature on the garment surface. There are also digital devices which can check the garment surface temperature at regular time intervals. These devices can give a more detailed profile of the garment surface temperature differences, which allow for better control of the curing process.

Screen Print Facility Best & Worst Practices

This document provides examples and pictures of best and worst practices at screen print facilities:

Screen Print Facility Best & Worst Practices.pptx

Appendix J—AFIRM Frequently Asked Questions (FAQ)

AFIRM

1. **Q: Can other brands join AFIRM?**

   A: Other brands are welcome to apply for membership to AFIRM.

RESTRICTED SUBSTANCES—GENERAL

2. **Q: Can you give more details on restricted substances?**

   A: Since different brands have different restricted substances lists, it would be difficult to list all restricted substances. Listed below are those that are commonly found in RSLs:

   a. Carcinogenic aromatic amines (related to azo dyes, 24 banned amines depends on the brand's preference)
   b. Allergenic disperse dyes
   c. Heavy metals (e.g., cadmium, chromium, lead, mercury, nickel, etc.)
   d. Organotins (e.g., MBT, TBT, TPhT, etc…)
   e. Chlorinated aromatics (chlorinated organic carriers, such as chlorinated benzenes and chlorinated toluenes)
   f. Flame retardants (e.g., PBBs, pentaBDE, OctaBDE, etc.)
   g. Formaldehyde
   h. Phthalates (e.g., DEHP, DINP, etc.)
   i. Auxiliary chemicals such as PFOS, etc.

   NOTE: The list above only includes some of the restricted substances that could be found in a RSL. It is recommended that suppliers check individual brand RSLs for the details or see the AFIRM RSL at http://afirm-group.com/afirm-rsl/.

3. **Q: What sort of substance restrictions imposed by major brands in the US and Europe are especially for children's apparel?**

   A: Children are at greater risk of harm due to their developing organs, lower body weight, and the accumulative nature of some chemicals.

   1. Thus all RSL chemicals are important for children's wear, and some limits are lower for children (e.g., formaldehyde).
   2. Of particular concern:
      a. in EU: phthalates (plasticizer in PVC)
      b. in US: lead (metal trim, surface coatings, pigments) and phthalates

4. **Q: Brand lists of restricted substances are constantly changing due to factors such as increased understanding of chemicals and their effect on human health and the environment. With such a huge number chemicals in existence, especially organic compounds that can be reacted to create new compounds, how do responsible governing bodies decide which chemicals to study for long term impacts on health and the environment?**

   A: To the best of our knowledge, governing bodies take into account information from health professionals, reputable scientific organizations and reputable pressure groups. We recommend that this question be directed to governing bodies themselves.

5. **Q: Can you provide specific information about the intimate apparel field?**

   A: Regardless of the type of apparel item, each product must comply with brand RSL restrictions. We appreciate this question and will endeavor to provide information regarding specific product classes during future RSL seminars and toolkit updates.

6. **Q: Some brands do not permit the use of substances like Toluene, Cyclohexanone, DMF, Methalrylic Acid, MEK, Phenol. Why?**

   A: Some AFIRM members' RSLs relate solely to chemicals found in finished products. However many global brands have wider policies regarding the use of chemicals in manufacturing and the health and safety of workers.

7. **Q: Does the RSL include any performance testing?**

   A: Generally The RSL does not have any performance testing requirements. You will need to satisfy a brand's quality and performance expectations in addition to RSL requirements.

8. **Q: If a supplier complies with RSL requirements, is it guaranteed his product will be accepted by the particular brand?**

   A: It's highly likely—but there are some items that do not appear on an RSL (e.g., radioactive substances, explosives). Please remember that many companies require vendors to sign agreements that make vendors responsible for any applicable legal or safety requirements that may not have been specifically listed in the companies' manuals.

9. **Q: Do different brands have different RSL requirements for sewing threads?**

   A: Each company's RSL also applies to sewing thread.

10. **Q: Has AFIRM conducted research on the possibility of formation of a RSL substance via a production process apart from intentional use of the chemical?**

    A: AFIRM companies are aware that a few restricted chemicals may not be intentionally added along the supply chain but are present as a by-product, through reaction between other chemicals, or as a contaminant. No systematic survey has been done but it is generally known which chemicals have a high risk of occurring as reaction products, (e.g., formaldehyde, PFOA) and how to control them. If contamination is the cause (lead in coatings is sometimes traceable to contamination), usually the sources can be controlled with care by the factory. This is why a supplier's own baseline testing, followed by root cause analysis if the unexpected is found, is a "best practice."

11. **Q: How do you keep the packaging (boxes and plastic bags) from contaminating the final product during shipment?**

    A: Packaging materials should comply with both brand RSLs and also global regulation as applicable. This should minimize any contamination of the final product by contact with packaging materials.

12. **Q: When you add a new restricted substance to the RSL, do you first consult or discuss with the dyestuff and auxiliary suppliers before implementation? According to chemical suppliers, when a new RSL has been launched, products may not satisfy the new RSL. Therefore, it takes time to reformulate products or it may be impossible to change the product in a short period of time.**

    A: This depends on the nature of the change. Most RSL lists are generated based on a best practice approach. If a new requirement/change is based on a new legal regulation, (e.g., US Consumer Product Safety Improvement Act of 2008) immediate action may be necessary to meet the legal timeline, since brands are naturally expected to deliver legally compliant products. Suppliers are also expected to pro-actively secure legal compliance of their products on their own. With good cooperation, other requirements based on consumer protection can be worked out and communicated together with strategic suppliers, so implementation timelines should not be a problem.

    As an example, some AFIRM companies consult chemical companies before introducing lower limits or new substances to the RSL. AFIRM companies may also send out a new RSL a couple of months before it becomes effective.

CHEMICAL LEGISLATION (REACH, etc.)

13. **Q: What are the differences between the USA-CPSIA, Europe-Reach and China Regulations, and how does the RSL relate to them?**

    A: Each country or region has their own specific regulations. Most Brand RSLs try to capture the most stringent regulation globally and apply restrictions or limits that are relevant to their brand and product lines. RSL testing can be of production quality material components before they are made into finished products, on current production or post production product. CPSIA, the EU and China regulations are written such that they apply to finished product testing.

14. **Q: Can you define "intended to be released" under REACH?**

    A: There is much discussion and disagreement about the definition of "intended release" under REACH. The Guidance Document on Requirements for Substances in Articles says that "a release of substances from articles is intended if it fulfills an accessory function which is deliberately planned and would not be achieved if the substance were not released. In the case of scented articles, for example, the fragrance substances need to be released in order for the article to be smelled."

    Substances that are released because of ageing of articles, because of wear and tear or as an unavoidable side-effect of the functioning of the article, are generally not intended releases, as the

release as such does not provide a function in itself. Also, a release is not intended if it is the result of abuse or an accident. A release of chemicals formed during chemical reactions is also not considered "intended," for example if the product catches fire.

(See Section 3.1, Guidance on Requirements for Substances in Articles.)

15. **Q: How does AFIRM define "skin contact"?**

A: Generally any material or component that comes into direct contact with skin. Shoe upper and lining materials are considered to come in direct skin contact even though many times socks are worn with shoes. All apparel items including accessories like handbags and belts are considered to have components/materials that come in direct skin contact.

Certain regulations restrict substances in components that come into direct and "prolonged" skin contact (REACH restrictions of azo amines and nickel for example). There is a distinction between direct skin contact and prolonged skin contact, since some materials/components may briefly contact the skin (internal bag components) while others may contact the skin for the entire duration of use (pants, shirts for example). If you have any questions about a material, component, or product, you should consult directly with your partner brand.

OEKO-TEX

16. **Q: Can we use material that are Oeko-Tex 100 approved?**

A: All materials used must fulfill the brands RSL regardless of its Oeko-Tex 100 approval.

17. **Q: How do AFIRM members integrate Oeko-Tex into their RSL programs?**

A: The Oeko-Tex 100 standard is highly comparable with RSLs of the AFIRM group members. Over 80% of Oeko-Tex content mirrors these RSLs, but there are some specific differences. Hence the Oeko-Tex standard is not a substitute for a company's RSL, which is what each brand specifically requires.

TESTING

18. **Q: There is increasing awareness of RSL requirements throughout the supply-chain, but annual laboratory testing is expensive for "small suppliers." Can we do anything to reduce these lab fees?**

A: Different laboratories offer different testing prices for different tests. Contact them directly for details. AFIRM has no discussions about or influence over laboratory testing costs.

19. **Q: Do AFIRM companies allow material suppliers to test a material and use those results to demonstrate compliance to different brands' RSLs such as Nike, Levi's and H&M?**

A: If the material to be provided to different buyers is the same, and if the restricted substance requirements, test methods and limits are the same (same RSL), then the results of the testing may be relied upon by different brands.

20. **Q: Do AFIRM brands typically accept the same test report from a single lab?**

A: No. While many of the AFIRM companies use the same contract labs, there is no standard report format that is accepted by all member companies. Brands require their own unique identifying information on their reports and have individualized format preferences. In addition, any product testing requested by a brand must be performed on that brand's finished product.

21. **Q: If materials are tested and pass RSL testing, should the final product be tested again?**

    A: This depends on the brand's policy. Materials used in production may be exposed to different chemical treatments or manufacturing processes. Some brands may ask for finished product testing.

22. **Q: Can suppliers rely on RSL test results of raw chemicals from accredited labs?**

    A: RSLs cover chemical substances found in/on products, not in the raw chemicals themselves. However, chemical companies should verify to their customers the presence or absence of substances in their chemicals for informational purposes. One way is to test chemical products and share the results with their customers.

23. **Q: Normally, what is the most reasonable/practical sampling percentage in general or that you recommend for RSL testing?**

    A: Sampling products for testing is not an easy decision. Some AFIRM members specify exactly how many samples should be tested per order. Other AFIRM members let their suppliers make this decision. However, the objective is for the product manufacturer and the buyer to have confidence that residual chemicals on products comply with all chemical restrictions. Testing when you are not confident is necessary.

24. **Q: If a supplier has test equipment capable of matching the RSL requirements for their product range, can they use it in place of sending samples to an approved lab?**

    A: AFIRM brands typically publish their own lists of approved 3rd party laboratories for testing to their specific program requirements. AFIRM brands with approved 3rd party laboratories only accept test results from these labs. Suppliers are encouraged to perform their own self-reference testing on the premises or at any laboratory of their choice, but these test results will not be accepted in place of reports from approved 3rd party labs.

25. **Q: Clearly all elements of the supply chain have a responsibility to control restricted substances, but who tests? If a sample is tested upstream in the supply chain, does it mean that further down the chain there is no need to test? Where does due diligence stop?**

    A: The timing of testing depends on brand requirements and the product type. Any point in the supply chain has a possibility to cause a product to fail. In many cases the largest chemical impact is at the raw material (i.e. fabric, trims) stage. Testing at this stage can provide information about compliance prior to assembling the finished product and allow for the testing of a material only once if it is used on several finished products. However, in order to guarantee compliance of a garment-treated or embellished product, it may be necessary to test at the finished product stage. Any chemical treatment to a consumer product could introduce restricted substances, so it is important for suppliers to purchase and use only chemicals which are known to be free of substances restricted by a brand's RSL.

26. **Q: Do we test each of the component inks or test a blended ink? Our concern is that each separate component ink may be RSL compliant, but when blended together to make an ink for screen printing it might exceed the RSL limit.**

    A: When various inks that all comply with the RSL limits individually are combined into a design on textiles, the relative amount of any restricted analyte in the ink will remain the same based on the volume or weight of ink applied. There should not be any concern that an ink that passes RSL on its own will then fail the RSL when combined with other compliant inks in a graphic design. This is provided that the screen print facility has process control measures in place to prevent any

contamination of the inks or screen prints in the production process.

There are rare circumstances where a mixture of two or more dyes may cause an RSL failure due to chemical reactions between the ingredients. Chemical suppliers can assist in preparing dye formulations to avoid this from happening.

27. **Q: When should heat transfer materials be tested?**

A: Heat transfers should ordinarily be tested by the vendor / supplier before application. Testing of the completed heat transfer should be conducted if restricted substances are showing up in the completed heat transfer that were not contained in the original materials. It is possible that the transfer process can create restricted substances from chemical reactions between the transfer materials.

28. **Q: Why is there a difference between test results from wet (or liquid) paints/inks/adhesives and dry (as applied) paint/inks/adhesives?**

A: Chemical changes may occur during drying or curing of the material. A good example is formaldehyde: in some coatings free formaldehyde is removed during the curing stage, so no free formaldehyde is found in the dry material.

29. **Q: If one fabric has two versions, one using normal polyester, the other version using recycled PET yarn, should the supplier submit these two fabrics separately for RSL testing? Or, if one version of the fabric passes RSL testing, can the report apply to another version?**

A: If the base material is different (normal poly versus recycled PET) then these are unique materials and there should be two separate tests. The reasoning is that they are produced separately and could have their own unique restricted substances issues. Recycled plastics in particular can be a source of restricted substance issues due to problems with the starting materials.

30. **Q: For the sample shown below, is a separate RSL test required for each different color, or could a composite test be performed by combining all colors?**

A: Composite testing is allowed by some AFIRM brands and not others. Brands that do allow compositing have different limits for the number of samples that may be included in a composite. This number may vary depending on the materials tested and the restricted substance tested for.

If composite testing is allowed, and if, for example, three is the maximum number of materials allowed for composite testing, a composite of equal amounts of the three materials can be tested. Brand policy as well as nominated laboratories will direct suppliers on composite requirements or restrictions.

31. **Q: For an embroidered badge, can RSL testing be performed using a composite test for all colors and all different layers?**

A: For those AFIRM brands that allow compositing, RSL testing should be performed by compositing the colors. A separate test of the adhesive layer should be performed if it is possible to separate that adhesive layer.

32. **Q: For painted metal parts, can we test metal & paint separately to show painted parts are RSL compliant?**

    A: For brand customers that require RSL testing of the finished product, separately testing the metal and paint is not possible since the final product will be submitted to the testing lab for analysis. For those companies that allow testing of raw materials the answer is yes. For example, the RSL compliance of a painted metal zipper may be demonstrated by testing the paint and the unpainted zipper separately. However, these materials must then be used together—if the paint is substituted or changed, then the new paint must also be tested to show it meets the RSL. Check with your brand customer for their specific policy.

33. **Q: Are differing warp/weave constructions for textiles identified as unique materials? We don't think the warp/weave construction affects the material's chemical properties.**

    A: Some AFIRM companies treat differing warp/weave constructions as one material. For those companies that treat them as unique materials requiring separate tests, the reason is that there may be differences in the mix of yarns used to produce each knit type and this in turn may cause different uptake of dyes and finishes.

34. **Q: Can we ship materials before we have a passing RSL test?**

    A: AFIRM brand program requirements vary, but typically tested materials should not be shipped or used in final production until the RSL result is received as PASS. Some brands perform RSL testing on bulk production units as part of an audit program. In this case final production begins before RSL testing, but products should not be shipped without a passing result.

35. **Q: We use yarns of different thicknesses but they are all produced the same way. Does each yarn need a separate RSL test?**

    A: Some AFIRM companies treat these yarns as the same material while others consider them to be unique materials requiring their own RSL tests.

36. **Q: How can we know the style is infant/toddler/kids/adults?**

    A: Suppliers are responsible for knowing if an item that they are producing will be used in an infant/toddler/kids style. Suppliers can request this information from the entity who is ordering the item when the order is received.

MATERIAL SAFETY DATA SHEETS (MSDS)

37. **Q: If a brand's supplier buys material from a nominated supplier (subcontractor) who cannot provide or does not have a proper MSDS, should the supplier (manufacturer of finished product) continue to buy from them?**

    A: Nominated or not, suppliers should always make sure their subcontractors use raw materials for which they can provide MSDS and/or RSL compliance declarations. Suppliers should push them until they do, or find different subcontractors.

38. **Q: Can suppliers really rely on chemical companies even though they supply MSDS and certifications—are they reliable at all?**

A: Material Safety Data Sheets do not typically provide the type of information needed to know if the end product will meet specific chemical restrictions. However, MSDS's may provide some clues. A first step is for brand suppliers to have a good relationship with their chemical suppliers. This relationship should include suppliers providing the brand's RSL to their chemical suppliers for them to provide information regarding the potential presence of a restricted substance. If a restricted substance is part of the chemical formulation, then a garment manufacturer (e.g., mill, laundry, etc.) must either use the chemical in a way wherein they are confident any restricted substance will not exceed the limitation of a brand RSL, or test the product.

Good dye and chemical companies will tell their clients if their formulations comply with a specific brand RSL.

COMPLIANCE & ASSURANCE

39. **Q: How are AFIRM brands verifying supplier compliance with their RSL list?**

A: In a variety of ways - supplier education and training is a priority for many companies. Some companies focus on control and monitoring of finish formulas, including working closely with chemical suppliers and the factories. Testing at independent outside laboratories plays a role in most enforcement programs, but it can vary from requiring vendors to 1) test every style; 2) selectively test based on past performance; 3) randomly test; or 4) no testing on their own but product will be subject to auditing and testing by the brand.

Note that virtually all companies have contractual agreements with suppliers that require products to comply with all applicable laws and regulations.

40. **Q: Do AFIRM brands audit to ensure environmental regulatory compliance of their suppliers? In absence of adequate local laws, do AFIRM brands specify best management practices?**

A: Generally yes and most AFIRM companies have minimum requirements to address environmental issues where there are no local laws.

41. **Q: How do you certify compliance with California Prop 65?**

A: Where the CA Proposition 65 limit to avoid product warnings is established for a chemical, companies can monitor compliance in the same way they do with other legally-regulated chemicals (see question 5).

Prop 65 is unusual in that a chemical may be listed without a safe exposure limit being set. Even when an exposure limit is set, such as 0.5 micrograms per day for lead, how that relates to the chemical's total content in a product must be determined. This means it is the responsibility of the manufacturer to know the listed chemicals in their products, to determine whether consumers are exposed to them and at what levels, and to inform the retailer/distributor. Risk assessment modeling may be needed to help make these determinations.

Note that the manufacturer and retailer can both be sued in California for violating Prop 65, based merely on a showing that a chemical is present in the product. It will then be up to the manufacturer and retailer to prove that there is no exposure requiring a warning to consumers.

SUBSTITUTES

42. **Q: What are the best substitutes to remove stains in place of white petrol?**

    A: It highly depends on what kind of stain needs to be removed. All organic solvents are potentially harmful and ventilation and personal protective equipment are essential in all stain removing activities. Chlorinated and aromatic solvents are generally more harmful than other solvents. Best practice for suppliers is to avoid stains by keeping factories clean and tidy.

CHEMICAL WASTE DISPOSAL

43. **Q: How should suppliers dispose of chemical waste?**

    A: Suppliers must implement policies and procedures for waste management to minimize risk to human health and the environment. Specifically, the supplier is responsible for ensuring that waste is disposed of using responsible environmental practices utilizing best available treatment technology. To achieve this practice, the supplier must utilize licensed/permitted (subject to approval) waste transporters and disposal facilities.

INCREASED COST

44. **Q: If the factory reaches the goal of RSL compliance but the cost will be a little bit higher than the general product, will retailer, brand, or company share the cost of the increase? This is an important issue for the factory and manufacturer, because to have better quality they need to pay more for good raw materials from their suppliers. Also, a similar question: Are the brands prepared to pay a premium if the supplier has to use products from "eco-friendly" international chemical suppliers instead of local suppliers?**

    A: The shared aim of all AFIRM members is to achieve total compliance with their individual (but similar) chemical restrictions. Providing that the "local chemical suppliers" can achieve compliance, then generally speaking there should be no problem. A non-complying chemical cannot be compared with a chemical that meets the required standard - therefore it is not a question of "paying a premium" because non-compliance is simply not an option.

45. **Q: Is it true that failures may be due to cost savings?**

    A: Yes, trying to save cost can result in products with undesirable levels of restricted substances. This can happen when factories buy raw materials and chemicals from unreliable supply houses that do not know or will not reveal what is in them. It also happens when neither the supplier nor the buyer is willing to test raw materials and/or product.

    Taking short cuts in this manner to offer the lowest cost product carries a significant risk of much higher enforcement costs downstream. It is the responsibility of suppliers and brands alike to seek cost-effective means of assuring there is no exposure to toxic chemicals. Working together is part of the reason for an organization like AFIRM.

FAILURES

46. **Q: Even though a product might comply with AFIRM brand RSLs, consumers may use bad detergent or bleach, which may cause restricted substances issues. How does AFIRM handle this?**

    A: Products manufactured for or bought by AFIRM companies must arrive at retail in a state that complies with individual company RSL requirements. The goal of the AFIRM RSL and AFIRM brand RSLs is to ensure that the product does not contain restricted substances in excess of the specified RSL limits. A company or manufacturer cannot expect to control the type of detergent or other preparation consumers may use to care for their products.

AMINES

47. **Q: In general, certain black reactive dyes have minimum traces of amine (P-Chloroaniline). Do all dyes have to have zero detection of this amine?**

A: Azo dyes may be manufactured using amino starting materials. Amines may be found in the end product due to either (a) residual unreacted traces of the starting chemical, or (b) reductive cleavage of the azo dye itself. In either case, minimal traces of the amine would be acceptable provided the trace concentration is below that of the brand RSL (typically 20 or 30 ppm).

In some cases black dyestuff is a mixture of red, blue and yellow, rather than a single black dye structure. As such, any one dye component (e.g. red) could contain the azo structure that can cleave into an amine.

APEO & NPEO

48. **Q: What type of material or manufacturing process has a chance of containing or using APEO?**

A: APEOs are risky in below listed materials / processes:

- Detergents
- Scouring agents
- Wetting agents
- Softeners
- Emulsifier/dispersing agents for dyes and prints
- Impregnating agents
- Degreasing agents for leather
- Leather Finishing
- De-gumming for silk production
- Dyes and pigment preparations
- Polyester padding

Knowledge about possible APEO content is achievable via a careful and comprehensive database of MSDSs, chemical supplier declarations and test reports. In case of doubt, one should always check with the chemical supplier first.

All processes can contain APEO, so dye mills and processors must check all dyes and chemical auxiliaries with their chemical suppliers. Examples of high-risk materials are leather, silk and cotton.

49. **Q: Are there restrictions on deliveries of goods to Europe, which have been treated with APEO containing auxiliaries in greater China?**

A: There is legislation in Europe banning the use of formulations containing greater than 0.1% of NPEO. There is no legislation regarding the sale of textiles or leather containing greater than 1000 ppm of NPEO. It would be therefore legal to treat footwear and apparel products with APEOs in certain areas of the world and sell them in Europe. Nevertheless, individual processors must understand the laws that operate in the region where they produce and sell, and as APEOs are restricted by some AFIRM members' RSLs, failure to meet those requirements may result in product rejection.

BENZOTHIAZOLE (MBT)

50. **Q: What exactly is Benzothiazole, and is it restricted by any AFIRM brands?**

    A: Benzothiazole (e.g., mercaptobenzothiazole, MBT) is restricted by at least one AFIRM member. It is commonly used as an accelerator in the vulcanization process of rubber, and a too high concentration in rubber should be avoided. The same applies to carbamates and thiurams. The use of allergens and sensitizers should be minimized in manufacturing processes.

CHLORO ORGANIC CARRIERS

51. **Q: Even though carriers are not used in polyester dyeing, COCs (Chloro Organic Carriers) are detected in trace amounts. Why is this?**

    A: COCs could, due to their toxic characteristics, also be used as preservatives, insecticides and biocides. This means that raw materials such as dyes, chemicals and fibres could contain trace amounts of COCs, either from manufacturing, storage or transport. COCs are used in the manufacturing process of some dyes and could therefore remain as traces in the finished dyes. For good quality dyes from reputable sources, those traces should be low enough to meet requirements. A close communication between suppliers and chemical and raw material suppliers is essential.

CHROME VI

52. **Q: How often and at what level can Chrome-VI be found on finished products (leather shoes and garments), or is this only a problem if shoes are disposed as waste and/or burned in certain facilities?**

    A: Levels above 150 ppm have been found on finished products. Nowadays, Cr-III is used as a tanning agent but under certain circumstances it can be oxidized into Cr-VI on the product. To avoid this, the tannery must use certain reducing auxiliaries during production. It is also very important to have a low free Cr-III level in the finished product to reduce the risk of Cr-VI formation. Another option is to use Chromium free tanning.

53. **Q: Since we know leather will almost always fail the total Cr screening test, why do some brands require it? Why not just go straight to Chrome VI test?**

    A: When running the metals test, the Chromium result is usually included. The lab uses the Cr result to decide if they need to run Cr VI tests. There is no extra fee for the total Cr test, rather, you save money (if you do not need to test for Cr VI). Some brands do not require a metals test to screen for Cr and instead test for Cr VI specifically.

54. **Q: Cr (VI) was found in dyed leather. Could this be due to the dye process?**

    A: The chemical processes involved in leather tanning and dyeing are complex, so there is a possibility that, under certain conditions (usually heat and humidity), Cr (III) may be oxidized to Cr (VI) during sea shipment.

FORMALDEHYDE

55. **Q: How do we improve/remediate formaldehyde failures?**

    A: For textiles, you might be able to rinse out the fabric. However, for other materials such as adhesives, formaldehyde failures cannot be fixed without changing the ingredients. Consult with your brand customer before attempting to improve or remediate a formaldehyde failure since the cost of water/energy/environmental impact/time may not be worth the effort for only a small reduction in formaldehyde content.

FLAME RETARDANTS

56. **Q: Some AFIRM RSLs state that flame retardant (FR) chemicals are prohibited. Does this mean all flame retardants are prohibited from use in finishing under RSLs?**

A: Not all FR chemicals are banned by law in all countries. However, because this class of substances is composed of many which are highly toxic, global retailers may choose to take no chances and ban them entirely from their product lines. Or retailers may wish to carefully control their use by indicating that FR chemicals may not be used without specific authorization from them. Each AFIRM brand has its own policy regarding whether the prohibition is absolute or if there are any exceptions.

Appendix K—Benefits of Water-Based Polyurethane

This appendix briefly describes the development of water-based polyurethane dispersions for use in apparel and footwear products and the various benefits of transitioning to this technology.

Solvent-Based Polyurethane Drawbacks

Solvent-based polyurethane (PU) production involves the use of volatile organic solvents with links to reproductive toxicological issues. These solvents present work-place safety, consumer product, and environmental safety issues. The cost of these solvents is expected to go up dramatically in the future as petroleum sources become harder to come by and more expensive to extract. Solvent-based synthetic PU leather is an energy-intensive process, which adds hidden costs.

The harmful properties of these solvents make them the subject of regulatory action restricting their use and allowable concentrations in finished products. These substances are increasingly the target of various authorities.

Commonly used solvents in the production of PU, synthetic PU-leather, and PU coatings include N,N-dimethylformamide (DMF), Toluene, N-Methylpyrrolidone (NMP), and N,N-dimethylacetamide (DMAC). Most AFIRM companies restrict these substances in finished products and they are a regular cause of RSL failures due to improper drying/curing conditions during production. Improperly equipped and incorrectly configured factories regularly release these solvents into the ambient air, which harms factory workers directly and the environment generally. Residual amounts of these substances on finished products present consumer product safety issues for customers.

Polyurethane-Waterborne NMP free Dispersions

Water-based polyurethane (PU) is not a new technology, but it has typically not been used in the apparel and footwear industry. New technology, however, has enabled the development of high-quality, eco-friendly synthetic PU leather with minimal use of volatile organic solvents. This synthetic leather can be used in footwear, apparel, and accessories with minimal investments. A new foam generator is necessary, but traditional equipment such as a coating line and mixing units can usually be left unchanged. Although water-based PU uses a dry process, it can be used in plants that currently use the wet process.

There are multiple benefits associated with transitioning to water-based PU, including:

- Dramatic reduction of toxic solvent use (worker/consumer/environmental safety)
- Reduced energy use (cost savings)
- Reduced use of solvents (cost saving as prices for solvents is expected to go up)
- Reduced green house gas (GHG) emissions

To obtain more information about water-based Polyurethane, a search on the Internet for “Polyurethane-waterborne NMP free dispersions” will generate useful results.

Appendix L—Additional Online Resources

Chemical Restriction Information

Restricted Substance Lists (RSLs) and Resources

AFIRM Restricted Substances List
http://afirm-group.com/afirm-rsl/

This Restricted Substances List (RSL) was created by the Apparel & Footwear International RSL Management Group (AFIRM). This RSL lists substances currently subject to legislated limits around the world, as well as limits based on best practices in the apparel and footwear industries.

AAFA Restricted Substance List
https://www.wewear.org/industry-resources/restricted-substances-list/

This Restricted Substances List (RSL) was created by a special working group of the American Apparel & Footwear Association's (AAFA) Environmental Task Force. The RSL is intended to provide apparel and footwear companies with information related to regulations and laws that restrict or ban certain chemicals and substances in finished home textile, apparel, and footwear products around the world.

AFIRM Brand Links (available on AFIRM website)
http://afirm-group.com/members

Meeting Customers' Needs for Chemical Data: A Guidance Document for Suppliers

Green Chemistry and Commerce Council (GC3)

http://www.greenchemistryandcommerce.org/resources/gc3-publications

Business-to-business communication of chemical data, such as chemical identity and health and safety impacts, along supply chains is critically important to product manufacturers' efforts to make informed decisions on the health and environmental impacts of the products that they put on the market. Forward looking companies working to bring safer products to market need the active engagement of suppliers to provide relevant chemical information. This document provides tools and examples in support of improved supply chain communication between suppliers and their customers, and in the development of more sustainable products.

Global Regulation and Chemical Resources

European Chemicals Agency (ECHA)
http://echa.europa.eu/

The European Chemicals Agency (ECHA) is an agency of the European Union which manages the technical, scientific and administrative aspects of the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) system.

Information about the following can be found on ECHA website:

REACH Legislation Information: REACH is the Regulation for Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force on 1st June 2007 to streamline and improve the former legislative framework on chemicals of the European Union (EU).

Substances of Very High Concern (SVHC): Substances that are included in the Candidate List have been identified as Substances of Very High Concern. Substances on the Candidate List may subsequently become subject to authorisation by decision of the European Commission. Substances are added to the Candidate List by ECHA. The inclusion of a substance in the List may have legal obligations on companies.

Information on Registered Substances

https://echa.europa.eu/information-on-chemicals/registered-substances

Here you can search in the ECHA database for information on registered substances. The information in the database was provided by companies in their registration dossiers. You can find a variety of information on the substances which companies manufacture or import: their hazardous properties, their classification and labeling and how to use the substances safely, for example.

U.S. Environmental Protection Agency (EPA)

http://www.epa.gov/

The EPA is an agency of the federal government of the United States charged with protecting human health and the environment, by writing and enforcing regulations based on laws passed by Congress. This agency administers laws such as Clean Air Act (CAA), Clean Water Act (CWA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA).

EPA Integrated Risk Information System (IRIS)

http://www.epa.gov/iris/index.html

The Integrated Risk Information System (IRIS) is a human health assessment program that evaluates quantitative and qualitative risk information on effects that may result from exposure to environmental contaminants. IRIS was initially developed for EPA staff in response to a *growing demand for consistent information on substances for use in risk assessments, decision-making, and regulatory activities. The information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences.*

Consumer Product Safety Improvement Act (CPSIA)

http://www.cpsc.gov/en/Regulations-Laws--Standards/Statutes/The-Consumer-Product-Safety-Improvement-Act/

The Consumer Product Safety Improvement Act of 2008 is a United States law imposing testing and documentation requirements, and sets new acceptable levels of several substances. It imposes requirements on manufacturers of apparel, shoes, personal care products, accessories and jewelry, home furnishings, bedding, toys, electronics and video games, books, school supplies, educational materials and science kits.

California Proposition 65 (PROP 65)

http://oehha.ca.gov/prop65.html

Prop 65 is a California law is intended to eliminate exposures to those chemicals identified as harmful to the environment and citizens of the State of California. Proposition 65 regulates substances officially

listed by California as causing cancer or birth defects or other reproductive harm in two ways. The first regulatory arm of Proposition 65 prohibits businesses from knowingly discharging listed substances into drinking water sources, or onto land where the substances can pass into drinking water sources. The second regulatory arm of Proposition 65 prohibits businesses from knowingly exposing individuals to listed substances without providing a clear and reasonable warning.

California Green Chemistry Initiative

http://www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/index.cfm

California Department of Toxic Substance Control (DTSC)

California state government is developing an alternative analysis framework to stimulate the rapid acceleration of replacement of harmful chemicals and ingredients with safer alternatives in products sold in California. Work being done under this initiative will become regulation under California law.

DTSC has released of an outline of the Draft Regulations for Safer Products as a second step in identifying chemicals of concern and fostering the design of safer products sold in California.

The outline proposes guidelines for scientific and systematic prioritization of chemicals and products of concern, certification of alternatives assessment and development of DTSC's regulatory response. With this outline DTSC will continue its collaboration with all stakeholders, governmental agencies and the public to transform the outline into the Green Chemistry Regulations for Safer Products. The outline builds from the conceptual framework completed in March of 2010. The next step is creating draft regulations based on the outline and framework. The draft regulations will be released in the very near future.

Washington State Child Safe Product Act

http://www.ecy.wa.gov/programs/swfa/rules/ruleChildSafe.html

The Washington State Child Safe Product Act (CPSA) will require apparel companies to report concentrations of 66 substances down to the component level of children's apparel and footwear products beginning in August 2012.

Additional Chemical & Risk Assessment Resources

ESIS: European chemical Substances Information System

https://ec.europa.eu/jrc/en/scientific-tools

Publicly available IT system from the European Commission Institute for Health and Consumer Protection Joint Research Center. ESIS provides the following information on chemicals, related to:

- EINECS (European Inventory of Existing Commercial chemical Substances) O.J. C 146A, 15.6.1990,
- ELINCS (European List of Notified Chemical Substances) in support of Directive 92/32/EEC, the 7th amendment to Directive 67/548/EEC,
- NLP (No-Longer Polymers),
- BPD (Biocidal Products Directive) active substances listed in Annex I or IA of Directive 98/8/EC or listed in the so-called list of non-inclusions,
- PBT (Persistent, Bioaccumulative, and Toxic) or vPvB (very Persistent and very Bioaccumulative),

- CLP/GHS (Classification, Labelling and Packaging of substances and mixtures), CLP implements the Globally harmonised System (GHS), Regulation (EC) No 1272/2008,
- Export and Import of Dangerous Chemicals listed in Annex I of Regulation (EC) No 689/2008,
- HPVCs (High Production Volume Chemicals) and LPVCs (Low Production Volume Chemicals), including EU Producers/Importers lists,
- IUCLID Chemical Data Sheets, IUCLID Export Files, OECD-IUCLID Export Files, EUSES Export Files,
- Priority Lists, Risk Assessment process and tracking system in relation to Council Regulation (EEC)

ATSDR: Agency for Toxic Substances & Disease Registry

http://www.atsdr.cdc.gov/

The Agency for Toxic Substances and Disease Registry (ATSDR), based in Atlanta, Georgia U.S.A. is a federal public health agency of the U.S. Department of Health and Human Services. ATSDR serves the public by using the best science, taking responsive public health actions, and providing health information to prevent harmful exposures and diseases related to toxic substances.

OECD: Global Portal to Information on Chemical Substances

http://www.echemportal.org/echemportal/page.action?pageID=0

eChemPortal provides free public access to information on properties of chemicals:

- Physical Chemical Properties
- Ecotoxicity
- Environmental Fate and Behavior
- Toxicity

eChemPortal allows simultaneous searching of reports and datasets by chemical name and number and by chemical property. Direct links to collections of chemical hazard and risk information prepared for government chemical review programmes at national, regional and international levels are obtained. Classification results according to national/regional hazard classification schemes or to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) are provided when available. The eChemPortal is an effort of the Organisation for Economic Co-operation and Development (OECD) in collaboration with the European Commission (EC), the European Chemicals Agency (ECHA), the United States, Canada, Japan, the International Council of Chemical Associations (ICCA), the Business and Industry Advisory Committee (BIAC), the World Health Organization's (WHO) International Program on Chemical Safety (IPCS), the United Nations Environment Programme (UNEP) and environmental non-governmental organisations.

Laboratory Resources

ASTM International Directory of Testing Laboratories

http://www.astm.org/LABS/search.html

The ASTM International Directory of Testing Laboratories is an on-line full text search for services and locations of testing laboratories. The information on the types of tests performed, specific tests performed, materials analyzed, or other services offered has been provided by the laboratories. ASTM has not attempted to investigate, rate, endorse, approve or certify any laboratory. Each laboratory has paid ASTM a fee for their listing.