Apple Regulated Substances Specification

069-0135-M

Revision	ECO #	Approver	Date	Revision Description
M	0040069980	Adrian Liga Gondawijaya	March 21, 2023	See Section 13 for full revision history.

1. Scope

It's Apple's mission to make sure that anyone who assembles, uses, or recycles an Apple product can do so safely. We have led the industry in removing many harmful substances from our product designs, and we go to great lengths to make sure that they stay that way. We are constantly designing our products to be better for the environment, and for people.

This Regulated Substances Specification describes Apple's global requirements and restrictions on the use of certain chemical substances or materials in Apple products, accessories, manufacturing processes, and packaging used for shipping products to Apple's end-customers. Restrictions are derived from international laws or directives, regulatory agencies, eco-label requirements, environmental standards, and Apple policies. Apple's restrictions may go beyond regulatory requirements in order to protect human health and the environment.

This specification is not an exhaustive list of all chemicals of concern. Apple suppliers should take action to understand the human health and environmental impacts of all chemicals used in the manufacturing process and present in parts and materials supplied to Apple. Suppliers should take action to reduce or eliminate the use of chemicals of concern listed in this specification as a first step, as well as comply with all applicable regulations. Suppliers must demonstrate compliance with this specification and provide required documentation (including required test data, Full Material Disclosure (FMD), and disclosure of reportable substances). Suppliers must notify Apple of any changes in formulation of materials or parts.

We hold our suppliers accountable by conducting factory audits and testing materials and components at certified laboratories for substances of high concern. Apple may verify supplier data and compliance to this specification utilizing our in-house laboratory or external third-party certified laboratories.

Effecti e ate. This specification takes effect on May 15, 2023. Prior to this date, revision L of the Regulated Substances Specification is in effect.

uestio s. Questions regarding the Apple Regulated Substances Specification should be directed to Apple at environment@apple.com.

2. Definitions

Allo. A metallic material, homogeneous on a macroscopic scale, consisting of two or more elements so combined that they cannot be readily separated by mechanical means.

Ap le olic. Apple restrictions that go beyond regulatory requirements, based on best industry practices or toxicological properties.

Brominated flame retardant: Brominated organic substance that has an inhibitory effect on the ignition of combustible organic materials.

CAS. Chemical Abstracts Service registry numbers that identify unique substances.

Chemical Safety Disclosure (CSD). Initiative that requires suppliers to provide information on the chemicals used in Apple manufacturing processes, to report practices in place to ensure compliance with occupational health and safety regulations and Apple requirements, and to support initiatives to advance the adoption of safer, environmentally preferable alternatives. See Section 12 for details.

Coating. Product in liquid, paste, or powder form that, when applied to a substrate, forms a layer possessing protective, decorative, and/or other specific properties. Metallic plating layers are exempted from coating requirements.

Elemental Chlorine Free (ECF). Process by which packaging material is produced with pulp that has been bleached using a chlorine derivative such as chlorine dioxide (ClO_2), but without the use of elemental chlorine (Cl).

Endocrine Disrupting Chemicals (EDCs). Chemicals that can interfere with the endocrine (hormone) system to cause possible adverse effects in humans and wildlife.

External Materials. Materials that are accessible to a customer under reasonable or foreseeable use.

Final assembly. Manufacturing process involving assembly of a product that is then directly sold to Apple customers, retail stores, or distribution channels.

Full Material Disclosure (FMD). Initiative that requires suppliers to provide the entire chemical composition of the parts and materials used in Apple products to ensure compliance to regulatory requirements, corporate initiatives, and to support assessment of the impact to human and environmental health. See Section 11 for details.

Homogeneous material. One material of uniform composition throughout or a material, consisting of a combination of materials, that cannot be disjointed, disaggregated, or separated into different materials by mechanical actions such as unscrewing, cutting, crushing, grinding, and abrasive processes. The definition is consistent with Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS 2). Per this document, the following examples illustrate what is and is not a homogeneous material:

- A plastic cover is a homogeneous material if it consists of one type of plastic that is not coated with other materials, or has other materials attached to it.
- A cable that consists of metal wires surrounded by nonmetallic insulation materials isn't a homogeneous material because mechanical processes could separate the different materials. In this case, restrictions apply to each of the separated materials individually.
- A semiconductor package contains many homogeneous materials that include the mold compound, die attach adhesive, die coatings, bonding wires, lead frame, and lead frame platings. Restrictions apply to each individual homogeneous material.
- Printed circuit board laminated materials consist of glass cloth, resins, and copper foil that are each a homogeneous material. Restrictions apply to each individual homogeneous material.

Incidental present: Present as an unavoidable impurity or unintentional trace contaminant.

Intentionally added. Substance deliberately used in the formulation of a material or component, where the presence of the substance in the final product provides a specific characteristic, appearance, or quality.

ixture. Solutions composed of two or more substances in which they do not react.

Nanomaterials. A natural, incidental, or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate; and where, for 50 percent or more of the particles in the number size distribution, one or more external dimensions are in the 1 nm–100 nm size range. In addition, fullerenes, graphene flakes, and single-wall carbon nanotubes with one or more external dimensions below 1 nm should be considered as nanomaterials.

No i te tio al use. Substance must not be intentionally added. Proof of compliance requires either 1) the substance is not listed in "Section 3 Composition/information on ingredients" of submitted Safety Data Sheet (SDS), which meets Globally Harmonized System (GHS) cutoff value requirement or 2) chemical manufacturer provides self-declaration of no intentional use.

No -use. Substance must not be intentionally or unintentionally present. Apple requires test reports from certified labs as proof of compliance. For all Section 6 restrictions, the substance must be under the method detection level by using Apple specified analytical methods.

ac agi g. Packaging materials used to enclose or protect Apple products during shipment to the end-customer. Packaging shipped to suppliers or OEMs (e.g., tape and reel, trays), and inter- and intra-factory protective packaging that does not remain in final product are not covered by the RSS.

ai t. Coatings containing pigments that, when applied to a substrate, form a dry film with protective, decorative, or special functions.

er- a d ol fluoroal l Substa ces (S). Substances that contain one or more perfluoroalkyl moieties, $–C_nF_{2n+1}$.

erso al rotecti e equi me t (E). Equipment for protecting manufacturing employees from exposure to hazardous materials in the workplace specific to the job function.

b. Parts per billion by weight of a substance; equivalent to 0.001 mg/kg or 0.0000001 percent by weight.

m. Parts per million by weight of a substance; equivalent to 1 mg/kg or 0.0001 percent by weight.

rimer. Surface treatment chemical used to increase adhesion when used in conjunction with a coating or adhesive system.

rocess chemical. Chemicals, used on their own or in formulations, that are not intentionally incorporated (partly or fully) into the product. Examples of a process chemical: cleaning agent, degreaser, demolder solution, lubricant, metal working fluid, heat transfer fluid, etching solution. Examples of a non-process chemical: paint, coating, ink, adhesive, primer, resin, flux, solder paste.

rocessed Chlori e- ree (C-). Process by which material is produced with pulp from virgin and/or recycled content that has been bleached without any type of chlorine, or that has not been bleached at all. Recycled content may have originally been bleached with chlorine or chlorine derivatives.

Test Re ort a i g (TR)- orm. The form used to map test reports to declared materials. The TRM form is created in and exported from the FMD Portal. The TRM form and mapped test reports are collected by Apple manufacturing partners to document compliance of the parts and materials used in Apple products. The information required to create a TRM form for Apple's manufacturing partners is the foundation of an FMD declaration required by Apple. These processes have been harmonized to eliminate duplicative work and align requirements across the Apple supply chain.

Textile. A flexible material made by creating an interlocking network of yarns or threads, which are produced by spinning raw fibers (from either natural or synthetic sources) into long threads.

Totall Chlori e- ree (TC-). Process by which packaging material is produced with pulp from virgin content that has been bleached without any type of chlorine, or that has not been bleached at all.

Var ish. Transparent coating material.

Wearable roducts. Electronics or accessories that can be comfortably worn on the body, such as Apple Watch. These products will occlude the skin.

3. Restricted Substances in Products

Restrictions in Section 3 apply to all homogeneous materials used in Apple products, accessories, and packaging. Restrictions also apply to all homogeneous materials applied to or cured onto parts in Apple products, accessories, and packaging. This includes adhesives, inks, coatings, primers, and other wet formulations manufactured by the material manufacturer in addition to the cured materials in the finished good. In certain cases, the scope may be more limited, which is indicated in the table below. Otherwise, if "All materials" is indicated in the scope, the general restriction scope applies. Substances and their respective restrictions are listed in alphabetical order.

Chemical or Chemical Group	Substance Identifier or CAS No.	Threshold Limit	Scope	Examples	References
Adhesive monomers Group I	See Appendix O	No intentional use; 1000 ppm for incidentally present	Adhesives in wearable products	UV-cured adhesives	Apple Policy
Adhesive monomers Group II	See Appendix P	Must pass toxicological review for approval	Adhesives in wearable products	UV-cured adhesives in earphones and headphones	Apple Policy
Antimony Antimony compounds	1309-64-4 Several	1000 ppm	All materials	Flame retardant	Apple Policy
Arsenic Arsenic compounds	7440-38-2 Several	No intentional use 2 ppm for incidentally present	Wood products	Pallets	REACH 1907/2006 and amendments
		No intentional use 50 ppm for incidentally present	All other materials except semiconductors (substrates and dopants) and metal alloys	LCD display glass, camera lens, trackpad glass, display cover glass, antifouling agent	Apple Policy
		No intentional use 1000 ppm for incidentally present	Metals	Copper alloys	
		Exempt	Semiconductor substrates and dopants	GaAs semiconductors	
Asbestos and compounds	1332-21-4 12001-28-4 12001-29-5 12172-73-5 77536-66-4 77536-67-5 77536-68-6 132207-32-0	Non-use	All materials	Insulator, filler	REACH 1907/2006 and amendments
Azo dyes, Arylamines, Anilines	Appendix A	30 ppm total content	All materials	Dye or colorant for plastics, textiles, leather	REACH 1907/2006 and amendments Bedarfsgegenstande Verordnung GB 18401-2010, China GB 20400-2006, China
Benzene	71-43-2	1000 ppm	All materials	Paints, coatings, inks, adhesives, and primers manufactured by the material manufacturer and in the finished good	Apple Policy
Beryllium Beryllium compounds	7440-41-7 Several	No intentional use 1000 ppm total content for incidentally present	All materials	Metals, alloys, solder, and ceramic materials in connectors, stiffeners, AC inlets, springs, EMI finger/spring, transceivers, brackets, housing, buttons, and speaker wire.	Apple Policy IEEE 1680.1-2018 criterion 4.1.4.1
		Exempt	Products shipped before September 2014		

Chemical or Chemical Group	Substance Identifier or CAS No.	Threshold Limit	Scope	Examples	References
Bisphenol A (BPA)	80-05-7	Non-use in thermal paper	Thermal paper	Thermal paper	Apple Policy
		Report detectable levels of unpolymerized BPA	All materials	Adhesives, plastics, epoxy resin	California Proposition 65 Apple Policy
		1000 ppm	All other materials, unless preapproved by Apple	Adhesives, plastics, epoxy resin	REACH 1907/2006 and amendments
Bromine Brominated compounds	7726-95-6 Several	900 ppm total content	All materials	Flame retardant, flux, solder paste	Apple Policy UL 110, criterion 9.2.3
		1500 ppm (Cl + Br) total content			
Brominated Flame Retardants	See definition	No intentional use	All materials	Plastics, electronic components	Apple Policy
Cadmium Cadmium compounds	7440-43-9 Several	20 ppm	Battery cells and packs	Nickel cadmium battery	2013/56/EU IEEE 1680.1-2018 criterion 4.1.2.1
		50 ppm in all other materials	All other materials	Pigment stabilizer, copper alloys	2011/65/EU GB/T 26572 Taiwan BSMI RoHS
Chlorinated Organic Solvents	Appendix G	1000 ppm total content and Cl < 900 ppm	All materials	Paints, coatings, inks, adhesives, and primers manufactured by the material manufacturer and in the finished good	Apple Policy
Chlorinated Paraffins, Short and Medium Chain (SCCP and MCCP)	Appendix B	1000 ppm total content and Cl < 900 ppm	All materials	Paint, coating, sealant, flame retardant, textiles, lubricants	REACH 1907/2006 and its amendments EPA, SNUR 2070-AJ73, Dec. 2014 IEEE 1680 Apple Policy
Chlorine Chlorinated compounds	7782-50-5 Several	Non-use; Must be Elemental Chlorine Free (ECF), Totally Chlorine Free (TCF) or Process Chlorine Free (PCF)	Fiber-based packaging	Fiber-based packaging	IEEE 1680.1-2018 criteria 4.1.5.1 & 4.1.5.2 UL 110, criteria 9.2.3 & 12.7.1 Apple Policy
		900 ppm total content in all materials	All materials	Flame retardant, flux, solder paste	Apple Policy
		1500 ppm (Cl + Br) total content in all materials			
Dimethylfumarate (DMFu)	624-49-7	0.1 ppm	All materials	Biocide, desiccant pack	2010/153/EC
Formaldehyde	50-00-0	300 ppm	All materials	Wood, adhesives, plastics, coatings	ChemVerbotsV GB 18401-2003/2005, China GB 20400-2006, China
Halogenated Diphenyl Methanes	76253-60-6 81161-70-8 99688-47-8	1000 ppm and Br / Cl < 900 ppm	All materials	Capacitor, transformer	REACH 1907/2006 and amendments Apple Policy
Heavy Metals (Cd + Cr (VI) + Hg + Pb)	7440-43-9 18540-29-9 7439-97-6 7439-92-1	100 ppm combined total	Packaging	Packaging materials	94/62/EC

Chemical or Chemical Group	Substance Identifier or CAS No.	Threshold Limit	Scope	Examples	References
Hexabromocyclododecane (HBCDD)	25637-99-4 3194-55-6 134237-50-6 134237-51-7 134237-52-8	Non-use or 100 ppm total	All materials	Flame retardant	2019/1021/EU
Hexavalent Chromium (Cr (VI), Cr^{6+}) Hexavalent Chromium compounds	18540-29-9 Several	1 ppm	All wearable products and accessories	Watch band materials including leather and textiles	REACH 1907/2006 Entry 72
		3 ppm	Leather in all other applications	Leather	REACH 1907/2006 Entry 47 Taiwan BSMI RoHS
		500 ppm	All other materials	Metal coating, pigment	2011/65/EU, GB/T 26572 Taiwan BSMI RoHS
Lacey Act and EU Timber Regulation	Not Applicable	Non-use	All materials		US Lacey Act (16 U.S.C. §§ 3371–3378) EU Timber Regulation
Lead Lead compounds	7439-92-1 Several	No intentional use 40 ppm for incidentally present	Battery cells and packs	Lead-acid, Zn-Mn, alkaline batteries	2013/56/EU
		No intentional use 50 ppm for incidentally present	Plastics, inks, surface coatings, displays (including housing, wiring, and printed circuit board)	Paints, cable jacketing and insulation	IEEE 1680.1-2018 CPSIA, 2008
		No intentional use 1000 ppm for incidentally present	All other materials except all exemptions in 2011/65/EU and its amendments	Solder, glass, steel, copper alloys, aluminum alloys	2011/65/EU GB/T 26572 Taiwan BSMI RoHS
Mercury Mercury compounds	7439-97-6 Several	No intentional use 5 ppm for incidentally present	Battery cells and packs	Mercury oxide, zinc-manganese, alkaline manganese batteries	2013/56/EU
		No intentional use 100 ppm for incidentally present	All other materials	CCFL lamps, switches, dyes	2011/65/EU, IEEE 1680-1 criterion 4.1.3.1, GB/T 26572, Taiwan BSMI RoHS
Methyl-phenol compounds	95-48-7 106-44-5 108-39-4 1319-77-3	10 ppm total content	All materials	Cleaning compound, adhesives, resin, coatings at all tiers of the supply chain	Canadian Environmental Protection Act, 1999
Natural rubber, latex	Latex proteins	Non-use	All wearable materials		ASTM D6499 for screening antigens. If positive, use Western Blot / SDS PAGE for confirmation
n-Hexane	110-54-3	1000 ppm	All materials	Paints, coatings, inks, adhesives, and primers manufactured by the material manufacturer and in the finished good	Apple Policy
Nickel and its compounds	7440-02-0 Several	0.28 µg/cm^2/week leach rate	Parts with direct and prolonged skin contact	Metal alloys with nickel, plating material, anti-corrosive alloy	REACH 1907/2006 and amendments
Organotin compounds	Appendix C	1000 ppm total content	All materials	Glass coatings, antifouling coatings, silicones, polyurethanes, paints, adhesives	REACH 1907/2006 and amendments Apple Policy
Perchlorates	7601-89-0 7778-74-7 7790-98-9 7791-03-9 10034-81-8	0.1 ppm total content	All materials	Lithium perchlorate coin cell batteries	CA DTSC Perchlorate Contamination Prevention Act

Chemical or Chemical Group	Substance Identifier or CAS No.	Threshold Limit	Scope	Examples	References
PFBS and related substances	Compounds with the formula $C_4F_9SO_3H$, their salts and any combinations thereof. This includes any substance having a perfluoroalkyl group (linear or branched) C_4F_9- directly attached to a sulfur atom. **Including but not limited to the list of compounds on pages 14, 15, 24, and 25 in the reference list.**	1000 ppm total content	All materials	Flame retardant additive for plastic resins	www.miljodirektoratet.no/globalassets/publikasjoner/M759/M759.pdf
PFCAs (C9-C14), their salts and related substances	Compounds that are perfluoroalkyl carboxylic acids (branched and/or linear) with the formula: CF_3-(CF_2)n-, n=8-13 as a structural element, including their salts. In addition, any related substance (including their salts and polymers) with the above defined linear and/or branched perfluoroalkyl structural elements that can degrade to C9-C14 PFCA. **Including but not limited to compounds listed on pages 21, 56, and 198-205 in the reference list.**	25 ppb for the sum of C9-C14 PFCAs and their salts 260 ppb for the sum of C9-C14 PFCA-related substances	All materials		2021/1297/EU echa.europa.eu/documents/10162/2ec5dfdd-0e63-0b49-d756-4dc1bae7ec61
PFHxA, its salts and related substances	See Apple Engineering Requirements Specification: Poly- and Perfluoroalkyl substances (PFAS) and Perfluorohexanoic acid (PFHxA) Definitions and Substance Lists, 099-39076	25 ppb for the sum of PFHxA and its salts 1000 ppb for the sum of PFHxA-related substances	All materials	Protective and oleophobic coatings	See Apple Engineering Requirements Specification: PFAS & PFHxA Definition and Reporting, 099-39076
PFHxS, its salts and related substances	Compounds with the formula $C_6F_{13}SO_3H$, their salts and any combinations thereof. This includes any substance having a perfluoroalkyl group (linear or branched) C_6F_{13}- directly attached to a sulfur atom. **Including but not limited to compounds listed on pages 178-192 in the reference list.**	25 ppb for the sum of PFHxS and its salts 1000 ppb for the sum of PFHxS related substances	All materials		echa.europa.eu/documents/10162/a22da803-0749-81d8-bc6d-ef551fc24e19
PFOA, its salts and PFOA-related compounds	PFOA and its salts and compounds that degrade to PFOA, including any substances (including salts and polymers) having a linear or branched perfluoroheptyl group with the moiety $(C_7F_{15})C$ as one of the structural elements. **Including but not limited to compounds on pages 79-81 in the reference list.**	< 1 µg/m² coated area	Textiles and other coated materials	Surfactant, impregnation agent in textiles	Norway FOR-2004-06-01-922 2019/1021/EU oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=env/jm/mono(2006)15
		25 ppb for sum of PFOA and its salts 1000 ppb for individual PFOA-related substances	All other materials		
PFOS and its derivatives	Compounds with the formula $C_8F_{17}SO_3H$, their salts and any combinations thereof. This includes any substance having a perfluoroalkyl group (linear or branched) C_8F_{17}- directly attached to a sulfur atom. **Including but not limited to compounds on pages 24-44 in reference list.**	≤ 1 µg/m² coated area	Textiles and other coated materials	Surfactant, impregnation agent in textiles	2019/1021/EU www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=env/jm/mono(2006)15
		10 ppm	Preparations		
		1000 ppm total content	All other materials		
Phenyl, Isopropylated Phosphate (3:1) or PIP 3:1	68937-41-7	No intentional use	All materials	Plasticizer, flame retardant, or anti-wear additive in plastics, adhesives, lubricants	TSCA Section 6(h)
Phthalates	Appendix E	1000 ppm total content	All materials	Plasticizer	California Proposition 65 REACH 1907/2006 and amendments 2011/65/EU

Chemical or Chemical Group	Substance Identifier or CAS No.	Threshold Limit	Scope	Examples	References
Polybrominated Biphenyls (PBBs)	59536-65-1 Several	1000 ppm and Br < 900 ppm	All materials	Flame retardants	2011/65/EU GB/T 26572 Apple Policy
Polybrominated Diphenyl Ethers (PBDEs)	Appendix N	10 ppm individually and 500 ppm for sum of total PBDEs	All materials	Flame retardants	2011/65/EU GB/T 26572 Apple Policy
Polychlorinated Biphenyl (PCB)	1336-36-3 Several	Non-detect (< 0.1 ppm)	All materials	Capacitor, transformer, heat transfer fluids, lubricants	2019/1021/EU 85/467/EEC CRS 001/1983, Brazil
Polychlorinated Naphthalene (PCN)	70776-03-3	5 ppm	All materials	Lubricant, paint, cable insulation, wood preservatives, lubricants, electroplating masking compounds, feedstock for dye production, dye carriers, capacitor fluids, flame proofing, preservatives, moisture proofing sealant, temporary binders for ceramic component manufacturing, casting material for alloys	Apple Policy
Polychlorinated Terphenyl (PCT)	61788-33-8	5 ppm	All materials	Capacitor, transformer, heat transfer fluids, lubricants	85/467/EEC REACH 1907/2006 Apple Policy
Polycyclic Aromatic Hydrocarbons (PAHs)	Appendix F	0.5 ppm individually and 10 ppm for sum of total PAHs	Inks Otherwise, external materials only	Carbon black, plastics, dyes, combustion by-products	EC/1272/2013 Apple Policy
Polyvinyl Chloride (PVC)	9002-86-2	No intentional use 900 ppm Cl for incidentally present	All materials	Electrical insulator, wire, tape, tubing, cable enclosure, vibration dampener, films	Apple Policy
		No intentional use 1500 ppm (Cl + Br) for incidentally present			
Radioactive substances	Several	Detectable levels of ionized radiation in parts, components, materials, and products above regional background levels. Restrictions under international regulations will apply, if appropriate. Any exceedance above the background levels must be reviewed and preapproved by Apple.	All materials	Electrical sensor, phosphorescent ink	Japanese Laws for the Regulation of Nuclear Source Material, Nuclear Fuel Material, and Reactors, 1986
REACH Annex XVII	Check the ECHA website for the individual restrictions at echa.europa.eu/substances-restricted-under-reach	As applicable	All materials	REACH, Annex XVII	REACH 1907/2006 and amendments
REACH Candidate List of SVHCs	Check the ECHA website for the updated list at http://echa.europa.eu/candidate-list-table	1000 ppm in all materials unless allowed per Apple SVHC disclosures. **Must also report to Apple all uses when > 1000 ppm in materials**	All materials	REACH, Candidate List	REACH 1907/2006 and amendments Apple Policy
Tetrabromobisphenyl A (TBBA, TBBPA)	79-94-7	900 ppm Br	All materials	Flame retardant for electrical insulator, wire, tape, tubing, cable enclosure, vibration dampener	Apple Policy
		1500 ppm (Cl + Br)			
Toluene	108-88-3	1000 ppm	All materials	Paints, coatings, inks, adhesives, and primers manufactured by the material manufacturer and in the finished good	Apple policy

4. Reportable Substances and Future Restrictions in Products

Suppliers are required to report the use of all substances listed in Section 4, regardless of the future restriction timeline, in any homogeneous materials used in Apple products, accessories, and packaging as well as in any homogeneous materials applied to or cured onto parts in Apple products, accessories, and packaging. This includes the wet formulations of adhesives, inks, coatings, primers, and other wet formulations manufactured by the material manufacturer in addition to the cured materials in the finished good. In some cases, reporting is required only if the substances exceed a defined permissible limit. Apple is prioritizing the chemicals it intends to restrict in the future in order to work effectively with its supply chain. Suppliers are required to report via FMD Portal and/or the Test Report Mapping (TRM) form for evaluation and approval for use prior to use in Apple products. Where indicated, Apple expects future restrictions based on regulation or Apple Policy. Some substances will require immediate phase-out; suppliers must start reformulating existing or qualifying new materials that do not intentionally use the substance(s). In some cases, use will be allowed under a specific threshold limit.

Chemical or Chemical Group	Substance Identifier or CAS No.	Reporting Threshold	Examples	Phase-Out & Future Restrictions	References
Per- and Polyfluoroalkyl Substances (PFAS)	See Apple Engineering Requirements Specification: Poly- and Perfluoroalkyl substances (PFAS) and Perfluorohexanoic acid (PFHxA) Definitions and Substance Lists, 099-39076	25 ppb for non-polymeric PFAS 50 ppm for polymeric PFAS	Lubricants, corrosion resistance coatings, top coats, water repellency coatings, plastics	Begin phase-out immediately. Restriction by October 2025 for all but EU-approved essential use exemptions.	See Apple Engineering Requirements Specification: PFAS & PFHxA Definitions and Substance Lists, 099-39076; Annex XV Restriction Report
Perfluorohexanoic Acid (PFHxA)	See Apple Engineering Requirements Specification: Poly- and Perfluoroalkyl substances (PFAS) and Perfluorohexanoic acid (PFHxA) Definitions and Substance Lists,099-39076	25 ppb for the sum of PFHxA and its salts 1000 ppb for the sum of PFHxA-related substances	Protective coatings, color filter resist coatings	Restricted (See Section 3)	See Apple Engineering Requirements Specification: PFAS & PFHxA Definitions and Substance List, 099-39076
REACH Candidate List of SVHCs	Check the ECHA website for the updated list at http://echa.europa.eu/candidate-list-table	1000 ppm at the material level		Begin phase-out immediately. Expect future restrictions	REACH Candidate List of SVHCs
Bisphenol Chemicals	See Appendix L	100 ppm	Adhesives, plastics, epoxy resin	Begin phase-out immediately. Expect future restrictions	Apple Policy
Brominated Organic Solvents	See Appendix M	100 ppm		Begin phase-out immediately. Expect future restrictions	Apple Policy
Formaldehyde-releasing substances	**Including but not limited to the compounds in the reference link.**	Formaldehyde released from substance exceeds a concentration of 0.124 mg/m3 in the air of a test chamber used under the conditions prescribed in EN 717-1.		Begin phase-out immediately. Expect future restrictions	echa.europa.eu/documents/10162/13641/rest_formaldehyde_axvreport_en.pdf/
Parts/Components utilizing RoHS exemptions	http://ec.europa.eu/environment/waste/rohs_eee/index_en.htm	Individual substance thresholds as per the RoHS directive		Begin phase-out immediately. Expect future restrictions	2011/65/EU
Phenyl, Isopropylated Phosphate (3:1) or PIP 3:1	68937-41-7	Any intentional use	Plasticizer, flame retardant, or anti-wear additive in plastics, adhesives, lubricants	Restricted (See Section 3)	TSCA Section 6(h)
Skin sensitizing substances	**Including but not limited to the compounds in the reference link.**	Various	Only applicable to leather, textile, hide, and fur articles. Natural leather is exempt.	Begin phase-out immediately. Expect future restrictions	echa.europa.eu/de/registry-of-restriction-intentions/-/dislist/details/0b0236e182446136
Volatile Organic Compounds (VOCs)	See latest revision of 099-22549 as applicable	See latest revision of 099-22549 as applicable	See latest revision of 099-22549 as applicable. Report detectable levels. Vendors must meet all applicable VOC regulations in the areas in which they are operating.	Begin phase-out immediately. Expect future restrictions. Includes VOC content and substance restrictions for paints, coatings, inks, adhesives, primers, and cleaners	Apple Specification 099-22549

Chemical or Chemical Group	Substance Identifier or CAS No.	Reporting Threshold	Examples	Phase-Out & Future Restrictions	References
Additive Phosphorous Flame Retardants	Examples include substances in Appendix K	1000 ppm	Plastics, printed circuit boards	Expect future restrictions	Sweden Chemical Tax (2016:1067)
Biocides	Several echa.europa.eu/regulations/biocidal-products-regulation/understanding-bpr	Detectable levels. Treated articles must use biocides that are approved or under review	Additive in polymers, leather, other coated materials	Expect future restrictions	EU No 528/2012 (BPR)
Cobalt Cobalt Compounds	7440-48-4 Several	1000 ppm	Moisture indicator, additive in rubber, cobalt alloys	Expect future restrictions	REACH 1907/2006 and amendments Apple Policy
Endocrine Disrupting Chemicals (EDCs)	Examples include substances in Appendix J	Detectable levels	All materials	Expect future restrictions	Apple Policy
IEC 62474 Substances	std.iec.ch/iec62474	Various, as required by standard	All materials	Expect future restrictions	Apple Policy
Indium Phosphide	22398-80-7	Detectable levels in electronic components	Electronic components	Expect future restrictions	Apple Policy
Melamine	108-78-1	1000 ppm	Plastics	Expect future restrictions	Apple Policy
Nanomaterials	Several	Detectable levels	Silver nanoparticles, carbon nanotubes and graphene, nano-scale cerium dioxide, nano titanium dioxide, nano-scale iron, nanometer-sized copper particles	Expect future restrictions	France Decree No. 2012-232, Environmental Code Article L. 523-4— Annual declaration of substances in nanoparticle 2011/696/EU
N-Ethyl-2-pyrrolidone	2687-91-4	1000 ppm	Paints, coatings, inks, adhesives, primers manufactured by the material supplier and in the finished good	Expect future restrictions	Apple Policy
Proposition 65 list of chemicals	All chemicals listed in the following link: http://oehha.ca.gov/prop65/prop65_list/Newlist.html	Detectable levels	All materials	Expect future restrictions	California Proposition 65
Washington State's List of Chemicals of High Concern to Children (CHCC)	All chemicals listed in the following link: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-334-130	Practical quantification limit (PQL) if added intentionally 100 ppm if present as a contaminant	All materials	Expect future restrictions	Children's Safe Products Act

5. Notifying Apple of Chemical Phase Out and Reformulation from Suppliers

Suppliers are required to communicate promptly any change in chemical manufacturing processes, manufacturing site, or any other change that will affect any attribute of the material either in its chemical composition (intentional or residual) or its lead time. For example, if for environmental or other purposes the supplier wishes to modify the goods or the processes, production lines, or site(s) used to manufacture the parts or finished goods, the supplier must provide Apple with the reason (e.g., an internal initiative to a phase out or to reformulate any material/part due to a chemical or any other concern), by contacting the supplier's Apple Global Supply Manager(s) **and** the Apple Environmental Team at environment@apple.com prior to any such modification. Apple will review the submission and decide whether, or to what extent, a modification is permitted. For any such modification, the supplier must, at a minimum, provide test reports to meet the requirements of Section 9 and test reports for other substances may also be requested. Subject to the above, suppliers must agree to not modify the goods or the processes used to manufacture the goods in any way after qualification without Apple's prior written consent.

6. Restrictions in Manufacturing Processes

Restrictions in Section 6 apply to manufacturing process chemicals used to create components or materials for Apple products and the assembly of Apple products including: direct use during production or indirect use for manufacturing equipment, machines, or tools during maintenance. Restrictions do not apply to laboratory, housekeeping, wastewater treatment plant, or other non-manufacturing processes. Suppliers must comply with threshold limits for the chemicals listed in this section. Test reports are required to demonstrate compliance of non-use. "Non-use" and "no intentional use" are defined in Section 2. Per the Apple Supplier Code of Conduct, suppliers shall identify, evaluate, and manage occupational health and safety hazards through a prioritized process of hazard elimination, engineering controls, and/or administrative controls. Suppliers shall provide their employees with suitable job-related, appropriately maintained personal protective equipment and instruction on its proper use.

Chemical or Chemical Group	Substance Identifier or CAS No.	Threshold & Scope	References
Benzene	71-43-2	Non-use for cleaning agents, degreasers, and demolder solutions No intentional use for all other manufacturing process chemicals	Apple Policy
Brominated Organic Solvents	All Brominated Organic Solvents. See Appendix M for examples	Non-use for cleaning agents, degreasers, and demolder solutions No intentional use for all other manufacturing process chemicals	Apple Policy
Chlorinated Organic Solvents	All Chlorinated Organic Solvents. See Appendix G for examples	Non-use for cleaning agents, degreasers, and demolder solutions No intentional use for all other manufacturing process chemicals	Apple Policy
Methanol	67-56-1	No intentional use for cleaning agents, degreasers, and demolder solutions	Apple Policy
n-Hexane	110-54-3	Non-use for cleaning agents, degreasers, and demolder solutions No intentional use for all other manufacturing process chemicals	Apple Policy
N-Methylpyrrolidone (NMP)	872-50-4	Non-use for cleaning agents, degreasers, demolder solutions	Apple Policy
Ozone Depleting Chemicals (ODC)	Appendix H and Appendix I	No intentional use for all manufacturing process chemicals	Montreal Protocol EC No. 2037/2000
Toluene	108-88-3	Non-use for cleaning agents, degreasers, demolder solutions	Apple Policy

7. Reportable Substances and Future Restrictions in Manufacturing Processes

Suppliers are required to report the use of substances listed in Section 7 in any manufacturing process used to create components or materials for Apple products regardless of phase out priority. Apple is prioritizing the chemicals it intends to phase out of Apple manufacturing processes in order to work effectively with its supply chain. Suppliers are required to report use through the Chemical Safety Disclosure Portal. Apple may require disclosure of the use of manufacturing process chemicals and their chemical composition as deemed necessary.

Chemical or Chemical Group	Substance Identifier or CAS No.	Reporting Threshold	Scope	Phase Out & Future Restrictions	References
Ethylbenzene	100-41-4	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy
Formaldehyde	50-00-0	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy
Hydrogen Fluoride (HF)	7664-39-3	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy
Methanol	67-56-1	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy
N-Methylpyrrolidone (NMP)	872-50-4	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy
Toluene	108-88-3	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy
Xylene	1330-20-7	Detectable levels (Content)	All manufacturing processes	Expect future restrictions	Apple Policy

8. Supplementary Specifications

All Apple products must comply with the restrictions listed in this Regulated Substances Specification. In cases when new restrictions are introduced over a transition period, Apple may release supplementary specifications referencing those specific restrictions. Drawings, fabrication notes, and product specifications will reference the supplementary specification as applicable. The supplementary specifications are available to qualified suppliers upon request by contacting Apple at environment@apple.com.

8.1 Apple Environmental Quality Specification, 069-8496

The Apple Environmental Quality Specification sets forth Apple's requirements for final assembly facilities, module suppliers, and component suppliers to maintain an environmental quality control program to ensure the environmental compliance of Apple products. The environmental quality control program for supplier facilities must include a material declaration process, in-process controls, and audits of raw materials and finished goods. All final assembly and module suppliers are required to adhere to these requirements and provide information to Apple in a timely manner.

8.2 Apple Regulated Substances Specification for Prolonged Skin Contact Materials, 099-3470

The Apple Regulated Substances Specification for Prolonged Skin Contact Materials applies to materials with direct or indirect prolonged skin contact in both wearable and non-wearable products. Materials with no or incidental skin contact will not need to comply with this specification. All materials, regardless of whether they are in prolonged skin contact, must also comply with the Apple Regulated Substances Specification (069-0135).

8.3 Conflict Minerals Restrictions, 069-5202

All suppliers of materials, parts, sub-components, components, or products (Component Goods) that are to be incorporated into an Apple product and containing tantalum, tungsten, tin, gold, or cobalt must comply with the specification on Conflict Minerals Restrictions, 069-5202. Suppliers may only use tin, tantalum, tungsten, gold, or cobalt in Component Goods if the supplier demonstrates that it has exercised due diligence in the sourcing of such materials and reports to Apple on the source and chain of custody of such metals in accordance with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas. This will enable a determination as to whether those metals are from the Democratic Republic of the Congo (DRC) or any adjoining country and, if so, whether those metals directly or indirectly financed or benefited armed groups that are perpetrators of serious human rights abuses in the DRC or an adjoining country. Suppliers may only source tin, tantalum, tungsten, gold, or cobalt through smelters and refiners participating in a verification of their sourcing practices by an independent third-party organization or program recognized by Apple.

Apple expects each supplier to provide complete and accurate reporting of its due diligence efforts for all tin, tantalum, tungsten, gold, or cobalt used in Apple Component Goods. Apple will audit suppliers' Conflict Minerals data submissions to ensure conformity with Apple requirements. If any supplier becomes aware that it has sourced tin, tantalum, tungsten, gold, or cobalt that is from the DRC or any adjoining country and that directly or indirectly financed or benefited armed groups, in any Component Goods incorporated into Apple products, the supplier must immediately notify Apple in writing at mineralsreporting@apple.com.

8.4 Apple Volatile Organic Compound (VOC) Specification, 099-22549

This specification sets forth Apple's requirements for compliance with all restrictions, regulations, and reporting requirements for VOC (Volatile Organic Compound)-containing materials applicable to Apple products and packaging, and related manufacturing processes. Compliance is applicable to the following stakeholders: all contract manufacturing partners, suppliers, and vendors, including all component, module, or system-level assembly facilities applying VOC-containing materials. Apple expects these stakeholders to ensure that materials under the scope of this specification used by their suppliers also comply with restrictions, regulations, and reporting requirements defined in this specification.

8.5 Engineering Requirements Specification: PFAS and PFHxA Definitions and Substances Lists, 099-39076

This document is the material specification defining chemicals that may be considered "Poly- or perfluoro alkyls substances" or PFAS and "Perfluorohexanoic acid and its related compounds", the most comprehensive (though non-exhaustive) list of PFAS and PFHxA chemicals, and information that helps material vendors provide information to Apple in order to satisfy Apple RSS reporting requirements for PFAS.

9. Demonstrating Compliance

In addition to requiring test reports for the substances below, Apple may request analytical test reports demonstrating compliance for **a[illegible] of the substa[illegible]ces listed i[illegible] this s[illegible]ecificatio[illegible]**, at the supplier's expense. Besides the prescribed test methods below, other test methods may be acceptable by Apple if preapproved.

Apple requires test reports from certified labs as proof of compliance for the following substances in homogeneous materials:

Chemical or Chemical Group	Test Results Required for:	Test Method
Arsenic (As)	Glass	Total acid digestion followed by ICP-MS, ICP-OES, ICP-AES
Beryllium	Metal alloys that contain copper and beryllia ceramics For metals and alloys that contain copper and solder, it is acceptable to submit a Certified Mill Test Report (also known as a Mill Test Certificate) in lieu of a test report as defined later in this section, if it provides full composition information	US EPA 3050B US EPA 3052 ICP-AES in addition to ICP-MS ICP-OES in addition to ICP-MS
Bis(2-ethylhexyl) phthalate (DEHP) Butyl benzyl phthalate (BBP) Cadmium (Cd) Dibutyl phthalate (DBP) Diisobutyl phthalate (DIBP) Hexavalent Chromium (Cr^{6+}) Lead (Pb) Mercury (Hg) Polybrominated biphenyl (PBB) Polybrominated diphenyl ether (PBDE)	All materials. Test reports are not required for PBB, PBDE, DEHP, BBP, DBP, and DiBP in metals, glass, or ceramic	Methods described or referenced in IEC 62321 ISO17075-2 for Hexavalent Chromium (Cr^{6+}) in leather EN 14372 followed by GC-MS for Phthalates
Bromine (Br) Chlorine (Cl) Fluorine (F)	All materials except metals and ceramics	EN 14582 US EPA SW-846 5050/9056 ASTM D 7359-14a, DIN 53474:2017-12, or IEC62321-3-2, followed by IC testing
PFOA PFOS	Inks, leather, coated textiles, lubricants, coatings (e.g., primers, varnishes, paints, CVDs, photoresist, solder resist; see Definitions section), fluoropolymer materials	DIN CEN/TS 15968 LC-MS-MS methods that can achieve an MDL of 25 ppb
Any other substance listed in this specification	Any material if requested by Apple	As required

Apple requires test reports from certified labs as proof of non-use for the following manufacturing process chemicals:

Chemical or Chemical Group	Test Results Required for:	Test Method
Benzene	Cleaning agents, degreasers, demolder solutions	Solvent extraction, analyzed by GC-MS or HPLC-MS 5 ppm Minimum Detection Limit
Brominated Organic Solvents	Cleaning agents, degreasers, demolder solutions	EN 14582 for total bromine or US EPA SW-846 5050/9056 50 ppm Minimum Detection Limit Others preapproved by Apple
Chlorinated Organic Solvents	Cleaning agents, degreasers, demolder solutions	EN 14582 for total chlorine or US EPA SW-846 5050/9056 50 ppm Minimum Detection Limit Others preapproved by Apple
n-Hexane	Cleaning agents, degreasers, demolder solutions	Solvent extraction, analyzed by GC-MS or HPLC-MS 5 ppm Minimum Detection Limit
N-Methylpyrrolidone (NMP)	Cleaning agents, degreasers, demolder solutions	Solvent extraction, analyzed by GC-MS or HPLC-MS 5 ppm Minimum Detection Limit
Toluene	Cleaning agents, degreasers, demolder solutions	Solvent extraction, analyzed by GC-MS or HPLC-MS 5 ppm Minimum Detection Limit

All test reports must meet the following requirements:

- Test reports must be no more than two years old from the date submitted to Apple or Apple's manufacturing partners. Material test reports are required for each use of that material in a new product design. Suppliers are obligated to maintain appropriate processes and systems to manage test reports so that the valid reports can be submitted to Apple in a timely manner. Materials tested must be homogeneous.
  Test reports that are not at a homogeneous material level are not acceptable (e.g., modules made up of several homogeneous materials tested after grinding the entire subassembly).
- Apple requires unaltered test reports of homogeneous materials from certified labs as proof of compliance for the substances listed in Section 9. Digital test reports must be in the form of original, unaltered PDF files containing text and images as provided by the certified lab(s). Scanned, photographed, modified, and/or image-only PDF files are prohibited without Apple's prior approval, and will be rejected at Apple's discretion.
- A nationally or internationally certified laboratory must issue the test report. Supplier-owned laboratories are acceptable if they are independently certified and evidence of certification is submitted to environment@apple.com for approval. One example of international certification is ISO 17025.
- Test reports based on X-ray Fluorescence Spectroscopy (XRF) are not acceptable forms of compliance documentation.
- Testing must be conducted on the material in the form present in the final Apple product, accessory, or retail packaging item (i.e., "dry" or "cured").
- When conducting test method (EN14582) for halogens (Br, Cl, F), supplier must ensure with test laboratory that the method is validated for different halogens using certified reference materials.
- Test reports submitted to Apple must be issued in English or include English if a multilingual report.
- It is the supplier's responsibility to provide test reports at the supplier's expense.
- Redacted test reports will not be accepted by Apple. They may, however, satisfy contract manufacturer requirements. Contact the Apple Environmental Quality Team for guidance as required. (Source: Current version of Apple Environmental Quality Specification [069-8496] on Section 4.1 General Requirement).

Apple or Apple's manufacturing partners may request test reports on a case-by-case basis, at the supplier's expense, if there are concerns regarding the validity of the test data or compliance of the parts.

All compliance documentation (e.g., test reports and declarations) must be retained by the supplier for a minimum of 10 years as part of the supplier's record-keeping process. Digital formats are acceptable unless otherwise noted. Suppliers are also expected to have compliance assurance processes and systems to control and maintain compliance. Refer to the Apple Environmental Quality Specification (069-8496) for additional information on supplier's internal environmental quality assurance requirements. Questions relating to test requirements may be directed to Apple Global Supply Managers (GSM), or emailed to Apple at environment@apple.com.

For substances that are restricted or regulated and have been replaced with an alternative substance, the supplier is required to ensure the alternative substance is an environmentally responsible substitution. Substitutions should be selected based on minimizing unintended consequences that might occur in phasing out a potentially hazardous substance. Suppliers shall conduct alternative assessments or obtain these assessments from their raw materials suppliers prior to making a replacement. Contact Apple at environment@apple.com for more information on conducting alternative assessments.

10. Waiver Process

Any instances of materials exceeding the thresholds in this specification must immediately be reported to Apple. Suppliers that are seeking a temporary waiver of restrictions in the Apple Regulated Substances Specification must make the request to Apple in writing. Apple will review the request and provide its decision via email to the requester. Contact Apple at environment@apple.com for more information on this process.

11. Full Material Disclosure (FMD)

Apple has implemented the Full Material Disclosure (FMD) initiative that requires suppliers to provide the entire chemical composition of the parts and materials used in Apple products. Implementation of FMD requires suppliers to disclose the complete, accurate, and precise identity of the parts and materials used in Apple products. Apple's Full Material Disclosure (FMD) requirements are documented in the FMD Data Requirements for Part Suppliers (080-00316) and the FMD Data Requirements for Material Suppliers (080-01462) specifications. The use of the FMD data collected from suppliers is governed by the Apple FMD Data Use Policy (080-00967), which restricts access to and use of the FMD data submitted to Apple.

Apple will audit supplier FMD data submissions to ensure conformity with the requirements. Apple will conduct analyses to ensure submissions accurately reflect the composition of the parts and materials provided. The analyses will include comparison of FMD data to supplier-provided test reports and may include comparison to Apple test reports. Please contact FMD_Support@apple.com for more information.

12. Chemical Safety Disclosure (CSD)

Suppliers must submit the required information in Apple SupplierCare System to enable Apple to evaluate conformity with the requirements in Section 6 and Section 7 of this specification. Please contact CSD@group.apple.com for more information.

13. Revision History

Revision	Date	Revision Description
M	March 21, 2023	**Section 2:** Added definitions for Brominated flame retardant and intentionally added. **Section 3:** Updated Adhesive monomers Group I to include adhesives in wearable products within the scope. Updated Mercury, Lead, Arsenic, Brominated flame retardants, PVC, and Beryllium to indicate "No intentional use" under the threshold limit. Removed Benzenamine, N-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene (BNST). Added Brominated flame retardants restriction. Added PFHxA, its salts, and related substances restriction. Added Phenyl, Isopropylated Phosphate (3:1), or PIP 3:1 restriction. Added "1000 ppm in all materials unless allowed per Apple SVHC disclosures. Must also report to Apple all use when > 1000 ppm in materials" for REACH SVHC restriction. Added Toluene restriction. **Section 4:** Updated the threshold section of PFAS section to include 50 ppm for polymeric PFAS, 25 ppb for non-polymeric PFAS, and a link to pre-published draft Annex XV report. Added Perfluorohexanoic Acid (PFHxA). Added REACH Candidate List of SVHCs. Added Phenyl, Isopropylated Phosphate (3:1), or PIP 3:1. Removed Aminoethyl ethanolamine and Diphenylamines, Substituted (SDPA) (including Appendix H). Regulation references updated for POP, PFOA, and PFCAs. **Section 8:** Added Engineering Requirements Specification: PFAS and PFHxA Definitions and Substances (099-39076)**Section 9**: Added the following test methods for Beryllium "ICP-AES in addition to ICP-MS and ICP-OES in addition to ICP-MS". Added Fluorine. Added "LC-MS-MS methods that can achieve an MDL of 25 ppb" test method for PFOA and PFOS. Included language for conducting test method EN14582. **Section 14:** Updated POP regulation to 2019/1021/EC. **Section 15:** Updated substances in Appendix O and P.
L	March 15, 2021	**Multiple Sections**: Updated Section 3, Section 4, and Section 6 introductions to include a clarified scope. Added a larger list of Brominated Organic Solvents that expands on "n-Propyl bromide" in Section 4, Section 6, and Section 9. **Section 2:** Added definitions for Alloys, Chemical Safety Disclosure (CSD), Coating, Mixture, No intentional use, Paint, ppb, Primer, Process chemical, Textile, Varnish, and Wearable products. **Section 3:** Added restriction for Adhesive monomers Group I & II. Broadened restriction of Antimony to all Antimony compounds. Added restrictions for Benzene, Chlorinated Organic Solvents, and n-Hexane. Updated scope and restriction thresholds for Hexavalent Chromium and its compounds. Updated restriction scope of Lead compounds to include "No intentional use" in all other materials besides those exempted by the EU. Lowered restriction threshold for Mercury and its compounds. Added Natural rubber, latex restriction. Added restrictions for PFCAs (C9-C14), their salts and related substances, and PFHxS, its salts and related substances. Updated restriction thresholds for PFOA and updated restriction group to include "its salts, and PFOA-related compounds." Updated restriction for PFOS to include "and its derivatives." Updated list of restricted Polybrominated Diphenyl Ethers (PBDEs). Updated restriction threshold for Polycyclic Aromatic Hydrocarbons (PAHs). **Section 4:** Changed Section 4 column "Phase Out Priority" to "Phase-Out & Future Restrictions," and clarified what is meant by "phase-out." Changed all "Priority 1" substances to "Begin phase-out immediately. Expect future restrictions." Changed all "Reportable" substances to "Expect future restrictions." Added Adhesive monomers Group I, Per- and Polyfluoroalkyl Substance (PFAS), PFBS and related substances, PFHxA, its salts, and related substances, and Toluene to Section 4 with explicit timelines for phase-out. Expanded the list of reportable Bisphenol Chemicals. Added Formaldehyde-releasing substances. Changed the phase-out and future restriction for Parts/Components utilizing RoHS exemptions from just reportable to "Begin phase-out immediately. Expect future restrictions." Added Skin sensitizing substances. Added reference to the Apple VOC Specification for Volatile Organic Compounds (VOCs). Added Melamine and N-Ethyl-2-pyrrolidone to "Expect future restrictions." **Section 6**: Increased scope of Benzene, Brominated Organic Solvents, n-Hexane, and Chlorinated Organic Solvents to include "No intentional use for all other manufacturing process chemicals." Added Methanol restriction for "No intentional use for cleaning agents, degreasers, and demolder solutions." **Section 7:** Added Ethyl Benzene, Formaldehyde, Hydrogen Fluoride (HF), Methanol, and Xylene. Changed instances of "Reportable" to "Expect future restrictions." **Section 8**: Added Apple Volatile Organic Compound (VOC) Specification, 099-22549, and Safeguarding Substances Specification, 080-03584. Updated text for Apple Regulated Substances Specification for Prolonged Skin Contact Materials, 099-3470, and Conflict Minerals Restrictions, 069-5202. **Section 9**: Updated scope of materials in "Test results required for" for Beryllium and PFOS, PFOA. Added "Any other substance listed in this specification" in which test results are required for "Any material if requested by Apple." Updated test report requirements. **Other Sections**: Updated description of Waiver Process (Section 10), Full Material Disclosure (FMD; Section 11), and Chemical Safety Disclosure (CSD; Section 12). Modified Appendix D. Removed SF_6 from Appendix I. Created Appendices M, N, O, P, and Q.
K	March 30, 2018	Updated Scope to include supplier requirements. Updated restriction on BPA. Split PFOA and PFOS into separate listings and updated PFOA restriction. Added restriction on REACH Candidate List of SVHCs, HBCDD. Moved listing for Radioactive Substances from reportable to restricted. Updated restrictions for Cadmium, Chlorine, Bromine, Hexavalent Chromium, Lead, and Mercury to include "compounds." Created separate restriction listing for Heavy Metals in packaging. Updated scope for restriction on PAHs to External Materials. Updated threshold for reportable listings Benzene, Chlorinated Organic Solvents, and Toluene to reference wet formulation. Changed Parts/Components utilizing RoHS exemptions from priority phase-out 3 to 2. Added reportable listings, priority 2 phase-out listings Bisphenol F/Bisphenol S and VOCs. Added reportable listings for EDCs, Additive Phosphorous Flame Retardants, IEC 62474 substances, Indium Phosphide, PFAS, and Biocides. Changed the priority phase out for several listings to "Reportable." Added Section "Notifying Apple of Chemical Phase Out and Reformulation from Suppliers." Added restriction on nPB in manufacturing process. Created new section "Reportable Substances and Future Restrictions in Manufacturing Processes." Changed Beryllium test results required for Metals and Ceramics. Added requirement for test results for DEHP, BBP, DBP, and DIBP. Added test report requirement for PFOA/PFOS for leather, textiles, and coatings. Added manufacturing chemical test report requirements for nPB. Removed test reports being valid for the life of the component. Added additional requirements for test reports. Updated Appendices D, E, F, and I with additional substances. Created Appendices K, L, and M.
J	March 21, 2016	Folded the following specifications into 069-0135-J: Apple RoHS Compliance Specification (069-1111), Apple Specification on Restriction of Beryllium (099-3471), and Apple Specification on the Restriction of Bromine and Chlorine (069-1857). Added additional asbestos compounds. Updated Azo dyes, Arylamines, and Anilines into Appendix A. Updated formaldehyde content restrictions. Updated restrictions for lead. Additional CAS numbers added for Perchlorates. Added Appendix B for Chlorinated Paraffins. Added Appendix C for Organotin compounds, Appendix D for Perfluorinated compounds, Appendix E for Phthalates. Lowered the thresholds for PAHs. Lowered the threshold for PCBs. Added reporting requirements for benzene, toluene, and chlorinated solvents, proposition 65 list, Washington State's List of Chemicals of High Concern, and substances allowed due to RoHS exemptions in Section 4. Phase out priorities added to all the items in reportable Section 4. Added Manufacturing Process restrictions for NMP and Toluene in Section 5. Updated content restriction values for Benzene, Chlorinated Organic Solvents, n-Hexane, and Toluene in Section 5. Updated Supplementary Specifications. Updated Section 7, Demonstrating Compliance. Added testing requirements for manufacturing process chemicals. Added Section 9 relating to Full Material Disclosure (FMD).
H	June 20, 2014	Updated definition of Homogeneous Material, Separated Reportable Substances into new section; updated requirements for azo dyes, beryllium, BPA, cadmium, halogenated biphenyl methanes, Lacey Act, lead, organic tin, PFOS, PFOA, phthalates, PVC, REACH SVHCs, TBBPA, benzene, n-Hexane, chlorinated solvents, nPB in ODC, conflict minerals; removed Halogens; addition of Soft Goods Regulated Substances and Beryllium Restriction Specifications in Section 6 for Supplementary Specifications; addition of alternative assessment verbiage and testing requirements for cleaning agents and degreasers in Section 7 for Demonstrating Compliance.
G	April 11, 2013	Updated REACH SVHCs, arsenic, asbestos, beryllium requirements, new nickel standard. Added REACH 1907/2006 and amendments, reference to RoHS Recast (RoHS 2), CEPA substances, perchlorate, new phthalates, lead in surface coating, PFOA, BPA reporting, benzotriazole, new PAHs, Lacey Act, and EU Timber Regulation, additional ODCs, benzene and n-Hexane restrictions in manufacturing. Removed polystyrene, gallium. Added reference to 069-8496 for supplier QA. Updated Conflict Minerals reference. Added PFOA/PFOS testing requirement for ink and paints.
F	January 6, 2010	Added restrictions on DMF, PAH, PFOS, organic tin compounds, formaldehyde in textiles, and certain phthalates. Added notification requirements and restrictions for substances regulated by REACH. Adjusted arsenic limit and added test report requirement for arsenic in glass. Added reference to Conflict Minerals Restriction specification.
E	October 9, 2007	Updated format; introduced restrictions on Br, Cl, TBBA, red phosphorus, gallium; updated limits on As, Pb, Cd, Hg, Cr(VI), asbestos, chlorinated paraffins, formaldehyde, diphenyl methanes, nickel, organic Sn, PCB, PCN, PCT, PVC, radioactive substances; added Be to watch list; limited scope restrictions on Chlorinated Organic Solvents.
D	October 26, 2004	Updated plastics Pb limit; merged plastics and cables section; added appendix for guidance on Pb restrictions; added appendix with summary table of permissible limits.
C	August 18, 2004	Changed format, new substances added, included permissible limits.
B	February 12, 2003	Initial release
A	December 10, 2002	Initial release

14. Referenced Documents

069-0152. Conflict Minerals Restriction, Apple Inc.

069-0849. Apple Environmental Quality Specification, Apple Inc.

080-0016. Apple FMD Data Requirements for Part Suppliers, Apple Inc.

080-0097. Apple FMD Data Use Policy, Apple Inc.

080-0142. Apple FMD Data Requirements for Material Suppliers, Apple Inc.

0099-0047. Apple Regulated Substances Specification; Prolonged Skin Contact Materials

0099-0079. Engineering Requirements Specification: PFAS and PFHxA Definitions and Substances

94/62 EC. Directive of the European Parliament and of the Council on Packaging and Packaging waste, 94/62/EC, December 1994.

2019 1021 EU. European Parliament and the Council of the European Union recasted a Regulation on persistent organic pollutants (2019/1021/EC) amended the regulation (2004/850/EC) in July 2019

2009 425 EC. Commission Decision 2009/425/EC of 28 May 2009 amending Council Directive 76/769/EEC: As regards restrictions on the marketing and use of organostannic compounds for the purpose of adapting its Annex I to technical progress.

2011 0015 EU. Prolonging the validity of Decision 2009/251/EC requiring Member States to ensure that products containing the biocide dimethylfumarate are not placed or made available on the market.

2011/65 EU. The restriction of the use of certain hazardous substances in electrical and electronic equipment ("RoHS Recast"). This directive replaces the directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

2011/696 EU. Commission recommendation of 18 October 2011 on the definition of nanomaterial.

2013/56 EU. 2013/56/EU Directive amended 2006/66/EC Directive of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators, and repealing Directive 91/157/EEC.

ACGIH. American Conference of Governmental Industrial Hygienist (ACGIH), Guide to Occupational Exposure Values, 2013.

IH TW. The AIHA Guideline Foundation Workplace Environmental Exposure Levels® (WEELs®) provide guidance for protecting most workers from adverse health effects related to occupational chemical exposures expressed as time-weighted average (TWA).

le Su lier Code of Co duct a d Su lier Res o sibilit Sta dards. See supplier requirements at www.apple.com/supplier-responsibility.

ASTM D6499: Standard Test Method for Immunological Measurement of Antigenic Protein in Hevea Natural Rubber (HNR) and its Products.

ASTM D7359 - 14a: Standard Test Method for Total Fluorine, Chlorine and Sulfur in Aromatic Hydrocarbons and Their Mixtures by Oxidative Pyrohydrolytic Combustion followed by Ion Chromatography Detection (Combustion Ion Chromatography-CIC).

edarfsgege sta de Verord u g. German National Law (consumer article regulation).

TSC. California Department of Toxic Substances Control; Perchlorate Contamination Prevention Act of 2003, AB 826.

Cal OSH. California Department of Public Health, Occupational Health Branch,
PELs, Title 8, section 5155/AC-1.

Califor ia ro 65. The Safe Drinking Water and Toxic Enforcement Act of 1986, California Health and Safety Code, Division 20, Chapter 6.5, sections 25249.5 through 25249.13.

Ca adia E iro me tal rotectio ct, 1999 (CE 1999). Chemicals Management Plan, Section 71.

ChemVerbotsV. Chemical Prohibition Ordinance, Germany.

Childre 's Safe roducts ct (CS). Washington State's Children's Safe Products Act reporting List of Chemicals of High Concern to Children (CHCC), US.

Chi a RoHS. Administration methods for use of hazardous substance in electrical
and electronic products, Ministry of Industry and Information Technology of People's Republic of China, Order#32, January 21, 2016.

CL Regulatio (EC) No. 1272 2 8. Classification, Labeling and Packaging complements Dangerous Substances Directive (67/548/EEC) and the Dangerous Preparations Directive (1999/45/EC) replaced by EU REACH Directive.

C S , 2 8. Consumer Product Safety Improvement Act of 2008–Public Law 110-314; US.

CRS 1 198 Executive Directive CRS 001/1983 Regulates Procedures for the Handling, Storage, and Transport of PCB-Contaminated Equipment in Brazil.

IN 5 474:2 17-12. Testing of plastics, rubber and elastomers - Determination of the chlorine content.

IN CEN TS 159 8. Determination of extractable perfluorooctane sulfonates (PFOS) in coated and impregnated solid articles, liquids, and fire fighting foams.

IN EN ISO 17 75. Leather–Chemical Tests–Determination of chromium(VI) content

EC No. 2 7 2. Regulation (EC) No. 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.

EC 757 2 1. Commission Regulation (EU) No. 757/2010 amending Regulation (EC) No. 850/2004 of the European Parliament and of the Council on persistent organic pollutants (perfluorooctane sulfonates) as regards Annexes IV and V.

ECH N 15 29. SEAC (Committee for Socio Economic Analysis) concludes on Bisphenol A, DecaBDE, and PFOA restrictions and finalizes two opinions for authorization, September 2015.

EN 14 72:2 4. Child use and care articles. Cutlery and feeding utensils. Safety requirements and tests.

EN 1811:2011+A1:2015. Reference test method for release of nickel from all post assemblies that are articles intended to come into direct and prolonged contact with the skin. Replaces BS EN 1811:2011

EN 14582:2016. Characterization of waste. Halogen and sulfur content. Oxygen combustion in closed systems and determination methods. British Standards Institute, 2016.

EPA SW-846 5050 9056. Bomb preparation method for solid waste; Method 9056: Determination of inorganic anions by ion chromatography. EPA,1994.

EU 1272/2013. Commission Regulation (EU) No. 1272/2013 to amend Entry 50 of Annex XVII to REACH Regulation (EC) No. 1907/2006 on the restrictions of polycyclic aromatic hydrocarbons (PAH).

EU 2017/1000. Commission Regulation (EU) 2017/1000 of 13 June 2017 amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards perfluorooctanoic acid (PFOA), its salts and PFOA-related substances.

EU No. 528 2 12 (R). Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.

EU Timber Regulatio. Regulation laying down the obligations of operators who place timber and timber products on the market: (EU) No. 995/2010.

ra ce ecree No. 2 12-2 2, E iro me tal Code rticle L. 52 -4. Annual declaration of nanoparticles in substances.

184 1. Chinese National General Safety Technical Code for Textile Products: GB 18401–2010.

2 4 . Limit of Harmful Matters in Leather and Fur, 2006 (Chinese mandatory standard).

T 26572. Chinese Standards on the Requirements of Concentration Limits for Certain Restricted Substances in Electrical and Electronic Products, 2011.

Z 2.1-2 7. Occupational exposure limits for hazardous agents in the workplace in China, 1 November 2007.

IEC62 21. Determination of certain substances in electrotechnical products. IEC, 2008. Updates in 2013 and 2015.

IEC62474. Material Declaration for Products of and for the Electrotechnical Industry.

IEEE 1680 .1-2 18. IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays, IEEE, 2018.

ISO17 75-2:2 17. Leather — Chemical determination of chromium(VI) content in leather — Part 2: Chromatographic method, 2017.

a a Chemical Substa ces Co trol La (CSCL). Japanese Chemical Substances Control Law (CSCL) and amendments, 2011.

a a ese La s. Japanese Laws for the Regulation of Nuclear Source Material, Nuclear Fuel Material, and Reactors, 1986.

Lace ct (16 U.S.C. §§ 71– 78). Amended in the Food, Conservation, and Energy Act of 2008 (Pub. L. 110-234, H.R. 2419, 122 Stat. 923, enacted May 22, 2008), expanded its protection to a broader range of plants and plant products (Section 8204. Prevention of Illegal Logging Practices).

o treal rotocol Montreal Protocol on Substances that Deplete the Ozone Layer, September 1987.

NIOSH National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, Center for Disease Control and Prevention (CDC), 2014.

Nor a OR-2 4- 1-922 Regulations relating to restrictions on the use of health-hazardous chemicals and other products (Product Regulations).

RE CH Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

RE CH 19 7 2 a d ame dme ts Annex XVII of Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). This Annex replaces the following directives:

- **7 7 9 EEC** (Azocolorants, Arsenic)
- **85 47 EEC** (PCB/PCT)
- **91 59 EEC** (Asbestos)
- **94 27 EC** (Nickel)
- **2 2 45 EEC** (Short-Chained Chlorinated Paraffins)
- **2 261 EC** (Azocolorants)
- **2 EC** (Blue Azocolorants)
- **2 9 425 EC** (Organotin Compounds)

REACH, Article 59 (10). Candidate List of substances of very high concern for Authorisation under REACH regulation.

Swedish Chemical Tax (2016:1067). Tax enacted on July 1, 2017, levied on chemicals in certain electronics.

SAE J2754-2017. Technical Specification for Low Volatile Organic Compound Content Paint.

Taiwan BSMI RoHS. CNS 15663 is the technique standards of Taiwan BSMI RoHS.

UL 110. UL Standard 110, Edition 2, UL 110 Standard for Sustainability for Mobile Phones, UL, 2017.

US EPA 3050. EPA method describing acid digestion of sediments, sludges, and soils.

US EPA 3052. EPA method describing microwave assisted acid digestion of siliceous and organically based matrices.

US EPA 5021. Method to determine volatile organic compounds in soils and other solid matrices using equilibrium headspace analysis.

US EPA, SNUR 2707. EPA's significant new use rule for short-chain chlorinated paraffins, under TSCA Section 5(a)(2), December 2014.

15. Appendices

Appendix A: Azo Dyes, Arylamines, and Anilines

Azo Dyes, Arylamines, and Anilines [24 items]	CAS No.
4-Aminoazobenzene	60-09-3
o-Aminoazotoluene	97-56-3
2-Amino-4-nitrotoluene	99-55-8
o-Anisidine	90-04-0
Benzidine	92-87-5
2,2'-dichloro-4,4'-methylenedianiline (MOCA)	101-14-4
4-Biphenylamine	92-67-1
4-Chloroaniline	106-47-8
4-Chloro-2-toluidine	95-69-2
p-Cresidine	120-71-8
2,4-Diaminoanisole	615-05-4
4,4′-Diaminodiphenylmethane	101-77-9
2,4-Diaminotoluene	95-80-7
3,3′-Dichlorobenzidine	91-94-1
3,3′-Dimethoxybenzidine	119-90-4
3,3′-Dimethylbenzidine	119-93-7
3,3′-Dimethyl-4,4′-diaminodiphenylmethane	838-88-0
2-Naphthylamine	91-59-8
4,4′-Oxydianiline	101-80-4
4,4′-Thiodianiline	139-65-1
o-Toluidine	95-53-4
2,4,5-Trimethylaniline	137-17-7
2,4-Xylidine	95-68-1
2,6-Xylidine	87-62-7

Appendix B: Chlorinated Paraffins (SCCP and MCCP)

Chlorinated Paraffins (SCCP and MCCP)	CAS No.
Short-Chain Chlorinated Paraffins (SCCPs) $C_xH_{2x+2-y}Cl_y$ where x=10-13 and y=1-13 [4+ items]	Examples
Alkanes, C10-13, chloro	85535-84-8
Alkanes, C10-21, chloro	84082-38-2
Alkanes, C12-13, chloro	71011-12-6
Alkanes, C12-14, chloro	85536-22-7
Medium-Chain Chlorinated Paraffins (MCCPs) CxH2x+2-yCly, where x=14-17 and y=1-17 [1 item]	Example
Alkanes, C14-17, chloro	85535-85-9

Appendix C: Organotin Compounds

Organotin Compounds [9 items]	CAS No.
Dibutyltin (DBT) Compounds	Multiple
Dioctyltin (DOT) Compounds	Multiple
Monobutyltin (MBT) Compounds	Multiple
Monooctyltin (MOT) Compounds	Multiple
Tetrabutyltin (TeBT)	Multiple
Tetraoctyltin (TeOT)	Multiple
Tributyltin (TBT) Compounds	Multiple
Tricyclohexyltin (TCyT) Compounds	Multiple
Triphenyltin (TPhT) Compounds	Multiple

Appendix D: PFAS Compounds

PFAS Compounds [7 items]	Chemical Group Definition and CAS No.[s]
PFAS compounds	Compounds containing at least one perfluoroalkyl moiety, $-C_nF_{2n}-$. **Including but not limited to compounds on pages 45-78 in:** www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=env/jm/mono(2006)15
Perfluorooctanoic Acid (PFOA), its salts and PFOA-related compounds	PFOA and its salts and compounds that degrade to PFOA, including any substances (including salts and polymers) having a linear or branched perfluoroheptyl group with the moiety $(C_7F_{15})C$ as one of the structural elements. **Including but not limited to compounds on pages 79-81 in:** www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=env/jm/mono(2006)15
Perfluorooctane Sulfonate (PFOS) and its derivatives	Compounds with the formula $C_8F_{17}SO_3H$, their salts and any combinations thereof. This includes any substance having a perfluoroalkyl group (linear or branched) $C_8F_{17}-$ directly attached to a sulfur atom. **Including but not limited to compounds on pages 24-44 in:** http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=env/jm/mono(2006)15
Perfluorobutane Sulfonate (PFBS), its salts and related substances	Compounds with the formula $C_4F_9SO_3H$, their salts and any combinations thereof. This includes any substance having a perfluoroalkyl group (linear or branched) C_4F_9- directly attached to a sulfur atom. **Including but not limited to the list of compounds on pages 14, 15, 24, and 25 in:** www.miljodirektoratet.no/globalassets/publikasjoner/M759/M759.pdf
Perfluorocarboxylic Acids (PFCAs; C9-C14), their salts and related substances	Compounds that are perfluoroalkyl carboxylic acids (branched and/or linear) with the formula: $CF_3-(CF_2)n-$, n=8-13 as a structural element, including their salts. In addition, any related substance (including its salts and polymers) with the above defined linear and/or branched perfluoroalkyl structural elements that can degrade to C9-C14 PFCA. **Including but not limited to compounds listed on pages 31, 56, and 198-205 in:** echa.europa.eu/documents/10162/2ec5dfdd-0e63-0b49-d756-4dc1bae7ec61
Perfluorohexanoic Acid (PFHxA), its salts and related substances	Compounds (including salts and polymers) having a linear or branched perfluoropentyl group with the formula $C_5F_{11}-$ directly attached to another carbon atom. **Including but not limited to compounds listed in:** echa.europa.eu/documents/10162/7da473c1-7f27-df34-9e6a-46152ef10d4b
Perfluorohexane Sulfonate (PFHxS), its salts and related substances	Compounds with the formula $C_6F_{13}SO_3H$, their salts and any combinations thereof. This includes any substance having a perfluoroalkyl group (linear or branched) $C_6F_{13}-$ directly attached to a sulfur atom. **Including but not limited to compounds listed on pages 168-192 in:** echa.europa.eu/documents/10162/a22da803-0749-81d8-bc6d-ef551fc24e19

Appendix E: Phthalates

Phthalates [21 items]	CAS No.
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6
1,2-Benzenedicarboxylic acid, di-C6-10-alkyl esters; 1,2-Benzenedicar- boxylic acid, mixed decyl and hexyl and octyl diesters with ≥ 0.3% of dihexyl phthalate	68515-51-5 68648-93-1
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4
1,2-Benzenedicarboxylic acid, dipentylester, branched and linear (DPP)	84777-06-0
Bis-(2-methoxyethyl) phthalate (DMEP)	117-82-8
Butylbenzyl phthalate (BBP)	85-68-7
Dibutyl phthalate (DBP)	84-74-2
Diethyl phthalate (DEP)	84-66-2
Diethylhexyl phthalate (DEHP)	117-81-7
Diisobutyl phthalate (DIBP)	84-69-5
Di-isodecyl phthalate (DIDP)	26761-40-0 68515-49-1
Diisononyl phthalate (DINP)	28553-12-0 68515-48-0
Di-iso-pentyl phthalate (DIPP)	605-50-5
Dimethyl phthalate (DMP)	131-11-3
Di-n-hexyl phthalate (DnHP)	84-75-3
Di-n-Octyl phthalate (DNOP)	117-84-0
Di-n-pentyl phthalate (DnPP)	131-18-0
n-Pentyl-isopentyl phthalate (nPIPP)	776297-69-9
Diundecyl phthalate (DuDP)	3648-20-2
Dicyclohexyl phthalate (DCHP)	84-61-7
Diisohexyl phthalate (DiHP)	68515-50-4

Appendix F: Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) [27 items]	CAS No.
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3; 1718-53-2
Benzo(a)phenanthrene (chrysene)	218-01-9
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Benzo(e)pyrene	192-97-2
Benzo(g,h,i)perylene	191-24-2
Benzo(j)fluoranthene	205-82-3
Benzo(k)fluoranthene	207-08-9
Benzo(j,k)fluorene (Fluoranthene)	206-44-0; 93951-69-0
Benzo(r,s,t)pentaphene	189-55-9
Dibenz(a,h)acridine	226-36-8
Dibenz(a,j)acridine	224-42-0
Dibenzo(a,h)anthracene	53-70-3
Dibenzo(a,e)fluoranthene	5385-75-1
Dibenzo(a,e)pyrene	192-65-4
Dibenzo(a,h)pyrene	189-64-0
Dibenzo(a,l)pyrene	191-30-0
7H-Dibenzo(c,g)carbazole	194-59-2
Fluorene	86-73-7
Indeno(1,2,3-cd)pyrene	193-39-5
5-Methylchrysene	3697-24-3
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0; 1718-52-1

Appendix G: Chlorinated Organic Solvents

Chlorinated Organic Solvents	CAS No.
Chlorinated Methanes [6 items]	
Bromodichloromethane	75-27-4
Carbon tetrachloride	56-23-5
Chloroform	67-66-3
Dibromochloromethane	124-48-1
Methylene chloride	75-09-2
Methyl chloride	74-87-3
Chlorinated Ethanes [9 items]	
Chloroethane	75-00-3
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
Hexachloroethane	67-72-1
Pentachloroethane	76-01-7
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Chlorinated Ethylenes [5 items]	
1,1-Dichloroethylene	75-35-4
cis-1,2-Dichloroethylene	156-59-2
trans-1,2-Dichloroethylene	156-60-5
Tetrachloroethylene	127-18-4
Trichloroethylene	79-01-6

Appendix H: Ozone Depleting Chemicals

Ozone Depleting Chemicals [62 items]	CAS No.
1,1,1-Trichloroethane (methyl chloroform) and its isomers except 1,1,2-trichloroethane	71-55-6
1,1,2-Trichloro-1,2,2 trifluoroethane (CFC-113) 1,1,1-Trichloro-2,2,2 trifluoroethane (CFC-113a)	76-13-1 354-58-5
1,1,2,2-Tetrachloro-1,2-difluoroethane (CFC-112) 1,1,1,2-Tetrachloro-2,2-difluoroethane (CFC-112a)	76-12-0 76-11-9
1,2,2-Trichloropentafluoropropane (CFC-215aa) 1,2,3-Trichloropentafluoropropane (CFC-215ba) 1,1,2-Trichloropentafluoropropane (CFC-215bb) 1,1,3-Trichloropentafluoropropane (CFC-215ca) 1,1,1-Trichloropentafluoropropane (CFC-215cb)	1599-41-3 76-17-5 – – 4259-43-2
Bromochlorodifluoromethane (Halon 1211)	353-59-3
Bromochloromethane	74-97-5
Bromodifluoroethane	420-47-3, 357188-74-0
Bromodifluoromethane	1511-62-2
Bromodifluoropropane	–
Bromoethane (ethyl bromide)	74-96-4
Bromofluoroethane	762-49-2
Bromofluoromethane	373-52-4
Bromofluoropropane	1871-72-3
Bromohexafluoropropane	2252-78-0
Bromomethane (methyl bromide)	74-83-9
Bromopentafluoropropane	460-88-8
Bromotetrafluoroethane	124-72-1
Bromotetrafluoropropane	679-84-5
Bromotrifluoroethane	421-06-7
Bromotrifluoromethane (Halon 1301)	75-63-8
Bromotrifluoropropane	421-46-5
Chloromethane (methyl chloride)	74-87-3
Chlorotrifluoromethane (CFC-13)	75-72-9
Dibromodifluoroethane	75-82-1
Dibromodifluoromethane (Halon 1202)	75-61-6
Dibromodifluoropropane	460-25-3
Dibromofluoroethane	358-97-4
Dibromofluoromethane	1868-53-7
Dibromofluoropropane	51584-26-0

Ozone Depleting Chemicals	CAS No.
Dibromopentafluoropropane	431-78-7
Dibromotetrafluoroethane (Halon 2402)	124-73-2
Dibromotetrafluoropropane	–
Dibromotrifluoroethane	354-04-1
Dibromotrifluoropropane	431-21-0
Dichlorodifluoromethane (CFC-12)	75-71-8
Dichlorohexafluoropropane (CFC-216)	661-97-2
Dichlorotetrafluoroethane (CFC-114)	76-14-2
Heptachlorofluoropropane (CFC-211) 1,1,1,2,2,3,3-Heptachloro-3-fluoropropane (CFC-211aa) 1,1,1,2,3,3,3-Heptachloro-2-fluoropropane (CFC-211ba)	135401-87-5 422-78-6 422-81-1
Hexabromofluoropropane	–
Hexachlorodifluoropropane (CFC-212)	3182-26-1
Monochloroheptafluoropropane (CFC-217)	422-86-6, 76-18-6
Monochloropentafluoroethane (CFC-115)	76-15-3
Pentabromodifluoropropane	–
Pentabromofluoropropane	–
Pentachlorofluoroethane (CFC-111)	354-56-3
Pentachlorotrifluoropropane (CFC-213)	2354-06-5; 134237-31-3
Tetrabromodifluoropropane	–
Tetrabromofluoroethane	306-80-9
Tetrabromofluoropropane	–
Tetrabromotrifluoropropane	–
Tetrachloromethane (carbon tetrachloride)	56-23-5
Tetrachlorotetrafluoropropane (CFC-214) 1,2,2,3-Tetrachloro-1,1,3,3-tetrafluoropropane (CFC-214aa) 1,1,1,3-Tetrachloro-2,2,3,3-tetrafluoropropane (CFC-214cb)	29255-31-0 2268-46-4 –
Tribromodifluoroethane	–
Tribromodifluoropropane	70192-80-2
Tribromofluoroethane	–
Tribromofluoropropane	75372-14-4
Tribromotetrafluoropropane	–
Tribromotrifluoropropane	–
Trichlorofluoromethane (CFC-11)	75-69-4
Trifluoroiodomethane (trifluoromethyl iodide)	2314-97-8

Appendix I: Ozone Depleting Chemicals—Hydrochlorofluorocarbons

Hydrochlorofluorocarbons [34 items]	CAS No.
1,1,2,2-Tetrachloro-1-fluoroethane (HCFC-121) 1,1,1,2-Tetrachloro-2-fluoroethane (HCFC-121a)	354-11-0 354-14-3
Chlorodifluoroethane (HCFC-142) 2-Chloro-1,1-difluoroethane (HCFC-142) 1-Chloro-1,1-difluoroethane (HCFC-142b) 1-Chloro-1,2-difluoroethane (HCFC-142a)	25497-29-4 338-65-8 75-68-3 338-64-7
Chlorodifluoromethane (HCFC-22)	75-45-6
Chlorofluoromethane (HCFC-31)	593-70-4
Chlorotetrafluoroethane (HCFC-124) 2-chloro-1,1,1,2-tetrafluoroethane 1-chloro-1,1,2,2-tetrafluoroethane (HCFC-124a)	63938-10-3 2837-89-0 354-25-6
Chlorotrifluoroethane (HCFC-133) 1-Chloro-1,2,2-trifluoroethane (HCFC-133) 2-Chloro-1,1,1-trifluoroethane (HCFC-133a) 1-Chloro-1,1,2-trifluoroethane (HCFC-133b)	431-07-2 1330-45-6 75-88-7 421-04-5
Dichlorodifluoroethane (HCFC-132) 1,2-Dichloro-1,2-difluoroethane (HCFC-132) 1,1-Dichloro-2,2-difluoroethane (HCFC-132a) 1,2-Dichloro-1,1-difluoroethane (HCFC-132b) 1,1-Dichloro-1,2-difluoroethane (HCFC-132c)	25915-78-0 431-06-1 471-43-2 1649-08-7 1842-05-3
Dichlorofluoroethane (HCFC-141) 1,2-Dichloro-1-fluoroethane (HCFC-141) 1,1-Dichloro-2-fluoroethane (HCFC-141a) 1,1-Dichloro-1-fluoroethane (HCFC-141b)	25167-88-8 430-57-9 430-53-5 1717-00-6
Dichlorofluoromethane (HCFC-21)	75-43-4
Dichlorotrifluoroethane (HCFC-123) Dichloro-1,1,2-trifluoroethane 2,2-dichloro-1,1,1-trifluroethane 1,2-dichloro-1,1,2-trifluroethane (HCFC-123a) 1,1-dichloro-1,2,2-trifluroethane (HCFC-123b)	34077-87-7 90454-18-5 306-83-2 354-23-4 812-04-4
Trichlorodifluoroethane (HCFC-122) 1,2,2-Trichloro-1,1-difluoroethane (HCFC-122) 1,1,2-Trichloro-1,2-difluoroethane (HCFC-122a) 1,1,1-Trichloro-2,2-difluoroethane (HCFC-122b)	41834-16-6 354-21-2 354-15-4 354-12-1
Trichlorofluoroethane (HCFC-131) 1-Fluoro-1,2,2-trichloroethan 1,1,2-Trichloro-1-fluoroethane (HCFC-131a) 1,1,1-trichloro-2-fluoroethane (HCFC-131b)	27154-33-2 359-28-4 811-95-0 2366-36-1

Hydrochlorofluorocarbons	CAS No.
Chlorofluoroethane (HCFC-151) 1-Chloro-2-fluoroethane (HCFC-151) 1-Chloro-1-fluoroethane (HCFC-151a)	110587-14-9 762-50-5 1615-75-4
Chlorohexafluoropropane (HCFC-226) 2-Chloro-1,1,1,3,3,3-hexafluoro-propane (HCFC-226da)	134308-72-8 431-87-8
Chloropentafluoropropane (HCFC-235) 1-Chloro-1,1,3,3,3-pentafluoropropane (HCFC-235fa)	134237-41-5 460-92-4
Dichloropentafluoropropane (HCFC-225) 2,2-Dichloro-1,1,1,3,3-pentafluoropropane (HCFC-225aa) 2,3-Dichloro-1,1,1,2,3-pentafluoropropane (HCFC-225ba) 1,2-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225bb) 3,3-Dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca) 1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb) 1,1-Dichloro-1,2,2,3,3-pentafluoropropane (HCFC-225cc) 1,2-Dichloro-1,1,3,3,3-pentafluoropropane (HCFC-225da) 1,3-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225ea) 1,1-Dichloro-1,2,3,3,3-pentafluoropropane (HCFC-225eb)	127564-92-5 128903-21-9 422-48-0 422-44-6 422-56-0 507-55-1 13474-88-9 431-86-7 136013-79-1 111512-56-2
Dichlorotetrafluoropropane (HCFC-234) 1,2-Dichloro-1,2,3,3-tetrafluoropropane (HCFC-234db)	127564-83-4 425-94-5
Hexachlorofluoropropane (HCFC-221) 1,1,1,2,2,3-Hexachloro-3-fluoropropane (HCFC-221ab)	134237-35-7, 29470-94-8 422-26-4
Pentachlorodifluoropropane (HCFC-222) 1,1,1,3,3-pentachloro-2,2-difluoropropane (HCFC-222ca) 1,2,2,3,3-pentachloro-1,1-difluoropropane (HCFC-222aa)	134237-36-8 422-49-1 422-30-0
Pentachlorofluoropropane (HCFC-231) 1,1,1,2,3-pentachloro-2-fluoro-propane (HCFC-231bb)	134190-48-0 421-94-3
Tetrachlorodifluoropropane (HCFC-232) 1,1,1,3-Tetrachloro-3,3-difluoropropane (HCFC-232fc)	134237-39-1 460-89-9
Tetrachlorofluoropropane (HCFC-241) 1,1,2,3-Tetrachloro-1-fluoropropane (HCFC-241db)	134190-49-1 666-27-3
Tetrachlorotrifluoropropane (HCFC-223) 1,1,3,3-Tetrachloro-1,2,2-trifluoropropane (HCFC-223ca) 1,1,1,3-Tetrachloro-2,2,3-trifluoropropane (HCFC-223cb)	134237-37-9 422-52-6 422-50-4
Trichlorotetrafluoropropane (HCFC-224) 1,3,3-Trichloro-1,1,2,2-tetrafluoropropane (HCFC-224ca) 1,1,3-Trichloro-1,2,2,3-tetrafluoropropane (HCFC-224cb) 1,1,1-Trichloro-2,2,3,3-tetrafluoropropane (HCFC-224cc)	134237-38-0 422-54-8 422-53-7 422-51-5
Trichlorotrifluoropropane (HCFC-233) 1,1,1-Trichloro-3,3,3-trifluoropropane (HCFC-233fb)	134237-40-4 7125-84-0 7125-83-9

Appendix I: Ozone Depleting Chemicals—Hydrochlorofluorocarbons

continued

Hydrochlorofluorocarbons	CAS No.
Chlorodifluoropropane (HCFC-262) 1-Chloro-2,2-difluoropropane (HCFC-262ca) 2-Chloro-1,3-difluoropropane (HCFC-262da) 1-Chloro-1,1-difluoropropane (HCFC-262fc)	134190-53-7 420-99-5 102738-79-4 421-02-3
Chlorofluoropropane (HCFC-271) 2-Chloro-2-fluoropropane (HCFC-271ba) 1-Chloro-1-fluoropropane (HCFC-271fb)	134190-54-8 420-44-0 430-55-7
Chlorotetrafluoropropane (HCFC-244) 3-Chloro-1,1,2,2-tetrafluoropropane (HCFC-244ca) 1-Chloro-1,1,2,2-tetrafluoropropane (HCFC-244cc)	134190-50-4 679-85-6 421-75-0
Chlorotrifluoropropane (HCFC-253) 3-chloro-1,1,1-trifluoropropane (HCFC-253fb)	134237-44-8 460-35-5
Dichlorodifluoropropane (HCFC-252) 1,3-Dicloro-1,1-difluoropropane (HCFC-252fb)	134190-52-6 819-00-1
Dichlorofluoropropane (HCFC-261) 1,1-Dichloro-1-fluoropropane (HCFC-261fc) 1,2-Dichloro-2-fluoro-propane (HCFC-261ba)	134237-45-9 7799-56-6 420-97-3
Dichlorotrifluoropropane (HCFC-243) 1,1-dichloro-1,2,2-trifluoropropane 2,3-dichloro-1,1,1-trifluoropropane 3,3-dichloro-1,1,1-trifluoropropane	134237-43-7 7125-99-7 338-75-0 460-69-5
Trichlorodifluoropropane (HCFC-242) 1,3,3,Trichloro-1,1-difluoropropane (HCFC-242fa)	134237-42-6 460-63-9
Trichlorofluoropropane (HCFC-251) 1,1,3-Trichloro-1-fluoropropane (HCFC-251fb) 1,1,2-Trichloro-1-fluoropropane (HCFC-251dc)	134190-51-5 818-99-5 421-41-0

Appendix J: Endocrine Disruptors

Endocrine Disruptors [11 items]	CAS No.
3-Benzylidene camphor 3-BC	15087-24-8
4-nitrophenol	100-02-7
4,4′-Dihydroxybenzophenone	611-99-4
Butylated hydroxytoluene	128-37-0
Metam natrium	137-42-8
Resorcinol	108-46-3
Tert-butylhydroxyanisole (BHA)	25013-16-5
Thiram	137-26-8
Triphenyl phosphate (TPHP)	115-86-6
Zineb	12122-67-7
Ziram	137-30-4

Appendix K: Additive Phosphorous Flame Retardants

Additive Phosphorus Flame Retardants [27 items]	CAS No.
2-Ethylhexyl diphenyl phosphate	1241-94-7
Aluminum diethylphosphinate	225789-38-8
Cetyl diphenyl phosphate	56827-92-0
Diethyl ethanephosphonate	78-38-6
Diethyl N,N′-bis(2-hydroxyethyl)aminomethylphosphonate	2781-11-5
Diphenyl cresyl phosphate	26444-49-5
Diphenyl octyl phosphate	115-88-8
Dodecyl diphenyl phosphate	27460-02-2
Isopropylated triphenyl phosphate	26967-76-0, 72668-27-0
Resorcinol bis(diphenyl phosphate)	57583-54-7
Tri-n-butyl phosphate	126-73-8
Tricresyl phosphate	1330-78-5
Triphenyl phosphate	115-86-6
Trixylyl phosphate	25155-23-1
Zinc diethylphosphinate	284685-45-6

Appendix K: Additive Phosphorous Flame Retardants continued

Additive Phosphorus Flame Retardants	CAS No.
Isodecyl diphenyl phosphate	29761-21-5
Melamine phosphate	41583-09-9
Piperazine pyrophosphate	66034-17-1
Red phosphorous	7723-14-0
Tetrakis(hydroxymethyl)phosphonium sulphate	55566-30-8
Tri-m-cresyl phosphate	563-04-2
Tri-o-cresyl phosphate	78-30-8
Tri-p-cresyl phosphate	78-32-0
Triethyl phosphate	78-40-0
Tris(2-butoxyethyl) phosphate	78-51-3
Tris(2-ethylhexyl) phosphate	78-42-2
Tris(4-tert-butylphenyl) phosphate	78-33-1

Appendix M: Brominated Organic Solvents

Brominated Organic Solvents [7 items]	CAS No.
1-Bromobutane	109-65-9
1-Bromopropane	106-94-5
2-Bromopropane	75-26-3
Bromodichloromethane	75-27-4
Bromoethane	74-96-4
Bromomethane	74-83-9
Dibromochloromethane	124-48-1

Appendix L: Bisphenol Chemicals

Bisphenol Chemicals [20 items]	CAS No.
2,2-bis(2-hydroxy-5-biphenylyl)propane [BPBP]	24038-68-4
4,4'-(1- methylpropylidene)bisphenol [BPB]	77-40-7
4,4'-(1-Phenylethylidene)bisphenol [BPAP]	1571-75-1
4,4'-(1,3-phenylene-bis(1-methylethylidene))bisphenol [BPM]	13595-25-0
4,4'-(1,4-Phenylenediisopropylidene)bisphenol [BPP]	2167-51-3
4,4'-(dichlorovinylidene)diphenol [BPC12]	14868-03-2
4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]diphenol [BPAF]	1478-61-1
4,4'-cyclohexylidenebisphenol [BPZ]	843-55-0
4,4'-ihydroxytetraphenylmethane [BPPH]	1844-01-5
4,4'-isopropylidenedi-o-cresol [BPC]	79-97-0
4,4'-isopropylidenediphenol [BPA]	80-05-7
4,4'-methylenediphenol [BPF]	620-92-8
4,4'-sulphonyldiphenol [BPS]	80-09-1
4,4′-Ethylidenebisphenol [BPE]	2081-08-5
9,9-Bis(4-hydroxyphenyl)fluorene [BPFL]	3236-71-3
Biphenyl-4,4'-diol [BP4,4′]	92-88-6
Bis(2-hydroxyphenyl)methane [BIS2]	2467-02-9
p,p′-oxybisphenol [DHDPE]	1965-09-9

Appendix N: Polybrominated Diphenyl Ethers (PBDEs)

Polybrominated Diphenyl Ethers (PBDEs) [10 items]	CAS No.
2,2',3,4,4'-Pentabromodiphenyl ether	182346-21-0
2,2',3,4,4',5'-Hexabromodiphenyl ether	182677-30-1
2,3',4,4'-Tetrabromodiphenyl ether	189084-61-5
2,3',4,4',6-Pentabromodiphenyl ether	189084-66-0
2,4,4',6-Tetrabromodiphenyl ether	189084-63-7
Bis(pentabromophenyl) ether	1163-19-5
Diphenyl ether, heptabromo derivative	68928-80-3
Diphenyl ether, hexabromo derivative	36483-60-0
Diphenyl ether, pentabromo derivative	32534-81-9
Diphenyl ether, tetrabromo derivative	40088-47-9

Appendix O: Adhesive monomers Group I

Adhesive monomers Group I [10+ items]	CAS No.
Butanediol diacrylate	1070-70-8
Tetrahydrofurfuryl acrylate	2399-48-6
4-tert-Butylcyclohexyl acrylate (TBCHA)	84100-23-2
2-Acryloyloxyethyl butylcarbamate	63225-53-6
Isobornyl acrylate	5888-33-5
1,6-Hexanediol diacrylate	13048-33-4
2-(2-Ethoxyethoxy)ethyl acrylate	7328-17-8
Trimethylolpropane triacrylate	15625-89-5
2-Phenoxyethyl acrylate (PHEA)	48145-04-6
Tripropylene glycol diacrylate	42978-66-5
Other adhesive monomers with similar properties	Multiple

Appendix P: Adhesive monomers Group II

Adhesive monomers Group II [19+ items]	CAS No.
Cyclic trimethylol-propane formal acrylate (CTFA)	66492-51-1
2-hydroxyethyl acrylate (HEA)	818-61-1
Tricyclododecane dimethanol diacrylate (TCDDMDA)	42594-17-2
Benzyl acrylate (BZA)	2495-35-4
Methyl phenylglyoxalate	15206-55-0
3,3,5-Trimethylcyclohexyl acrylate (TMCHA)	86178-38-3
4-Acryloylmorpholine (ACMO)	5117-12-4
Butyl acrylate	141-32-2
tert-Butyl acrylate	1663-39-4
Isobutyl acrylate	106-63-8
Acrylic acid	79-10-7
Isodecyl acrylate	1330-61-6
Ethyl trimethylbenzoyl phenylphosphinate	84434-11-7
2-Ethylhexyl acrylate	103-11-7
Methyl acrylate	96-33-3
N,N-Dimethylacrylamide	2680-03-7
Isobutyl methacrylate	97-86-9
Ethyl acrylate	140-88-5
Isobornyl methacrylate	7534-94-3
Other adhesive monomers with similar properties	Multiple