RESTRICTED SUBSTANCE MANAGEMENT STANDARD

May 24, 2011

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INTRODUCTION

Federal-Mogul has issued this standard in order to help ensure that Federal-Mogul, and customers using our parts and components, fully meet applicable legal and customer standards regarding materials used in our products and theirs. Most of our products contain materials that you supply to us. Therefore, this standard seeks to inform you, our suppliers, of the materials we must exclude from our products altogether and the limits we have on the amount of certain other materials. These restrictions are primarily based on environmental or other related concerns.

Ford Motor Company is a major Federal-Mogul customer and has some of the most extensive product content requirements, not limited to those specified by law. Rather then publish our own specific list of materials, Federal-Mogul has chosen to reference Ford Motor Company's Engineering Material Specification WSS-M99P9999-A1.

Federal-Mogul's standard originally took effect on April 1, 2004 and this new version will be effective on May 24, 2011 We will clarify or modify the standard on an annual basis to seek to be consistent with the most current Ford specification, changes to public law or other customer requirements. We cannot alter the limits that public laws or our customers have imposed on us, but we can make changes if warranted to enhance clarity, for example. However, it is ultimately the responsibility of each supplier to ensure that they are in compliance with the most current version of this standard and other applicable laws governing product content.

If you are currently shipping to us materials that contain substances prohibited by this standard, or amounts of substances that exceed concentration or weight limits specified in the standard, please notify your Supply Chain representative as soon as possible. Suppliers which cannot provide verification of compliance with this standard, or who do not indicate they have an effective plan in place to meet the standard very promptly, are subject to termination as suppliers.

Except where Federal-Mogul has specified testing requirements and procedures, it expects that the statements made by its suppliers will be based on good faith, expert judgment and/or testing that the supplier is already doing or has done. For certain materials, Federal-Mogul may determine that all or particular suppliers will need to perform and send to us the results of periodic tests on product content. This could apply, for example, in certain cases of minerals that may be subject to natural contamination by a prohibited or restricted substance. Federal-Mogul will contact affected suppliers if and when such requirements may be needed.

If you have any questions or comments on this standard, please contact your Supply Chain representative or Federal-Mogul's Global EHS Department.

1. SCOPE

This specification gives requirements related to environment health and safety for substances, materials and products supplier to Federal-Mogul. It includes references to National and International Government legislation as well as requirements necessary to meet internal standards and customer specifications.

The purpose of this standard is to inform suppliers to Federal-Mogul, of restrictions pertaining to certain substances. By regulation or by Federal-Mogul direction, these substances shall be restricted in or excluded from parts, materials, equipment, machinery and/or tooling, hereinafter referred to as "product(s), supplied to and /or manufactured by Federal-Mogul or intended for use in Federal-Mogul products". This standard supplements but does not supersede the responsibility of each supplier to comply with laws and regulations for the receiving Federal-Mogul location(s). It is the duty of all Suppliers of product to comply with this Restricted Substance Management Standard. This specification is not a definitive statement of National and International legislation, and cannot be relied upon as such. In addition to this specification suppliers are themselves, responsible for ensuring compliance with any legislation that may affect them or their product.

2. APPLICATION

This specification applies to all components, whether partially or fully finished assemblies, chemicals, consumable processing materials, surface finishes and treatments that are supplied to Federal-Mogul. The requirements apply to any supplier to any Federal-Mogul facility worldwide.

3. REQUIREMENTS

The primary intent of this Standard is to control restricted substances within formed articles or within materials such as minerals or powders that Federal-Mogul will incorporate into formed articles. However, it should be noted that non-dimensional materials (e.g., liquid chemicals) and articles which are intrinsically hazardous, or which form or release hazardous substances during use, recycling or disposal, are also subject to these requirements. Approval according to these requirements must be completed prior to supply of product to Federal-Mogul.

It may be necessary for the supplier to divulge, in confidence, detailed compositional, toxicity, and health and safety information on his products on request from Federal-Mogul, and if necessary this will involve confidential discussion with the relevant medical, EHS and/or laboratory personnel.

It is the duty of all Suppliers of product to Federal-Mogul to comply with this Restricted Substance Management Standard.

All exception requests or questions should be directed to ***Federal-Mogul's Global EHS Department***.

3.1 ALL PRODUCTS

3.1.1 In addition to information required for compliance to this Standard, Supplier shall provide the composition (chemical identity of each constituent and its proportion by weight) of products supplied or proposed to be supplied and all TOXICITY, HEALTH, SAFETY and DANGEROUS GOODS TRANSPORTATION data/guidance to the requesting Federal-Mogul site. Prior to making any change

to the composition or hazard labelling of such products, the supplier shall request approval from the appropriate Federal-Mogul site(s).

3.1.2 Supplier, upon request, shall disclose information for assessment of disposal or effluent treatment if product constituents are anticipated to be released into AIR, WATER OR SOIL, or require special declaration or control.

3.1.3 All products shall be supplied in compliance with the regulations on substance REGISTRATION, NOTIFICATION OR NEW CHEMICALS/SUBSTANCES, PACKAGING AND LABELLING which are in place in the Federal-Mogul receiving location(s) where the products are supplied.

3.1.4 Non-dimensional materials (e.g., chemicals) and "hazardous articles" that contain substances which have been identified as having any CARCINOGENIC, MUTAGENIC, REPRODUCTIVE TOXICITY, ECOTOXICITY, or SENSITISING PROPERTIES (see Definitions, Appendix 1) by testing or human experience, shall not be supplied or submitted without prior notification to and acknowledgement from Federal-Mogul.

3.1.5 Products of or from ENDANGERED SPECIES must not be supplied to Federal-Mogul in any form.

3.1.6 Radioactivity contamination should meet "Unconditional Use Clearance Level" requirements consistent with International Atomic Energy Agency (IAEA) and the Commission of European Communities (CEC) standards for individual radionuclides IAEA-TECDOC-85 (1996) & Safety Series RS-G-1.7 (2004).

http://www-pub.iaea.org/MTCD/publications/

3.2 SUBSTANCE RESTRICTIONS

3.2.1 Substance Restrictions are identified in Table 1 by substance name, type of restriction, threshold limit (where applicable), applications affected/exempted, and effective dates.

3.2.2 Substances designated as "Prohibited" (P) shall not be supplied in any products, subject to the stated directions on content threshold and affected applications.

3.2.3 Substances designated as "Declarable" (D) when present in a material or part, and are legally regulated, projected to be regulated or required to be tracked for information gathering purposes. These substances shall not be supplied in any products without prior notification to, and acknowledgement from Federal-Mogul.

3.2.4 Monomers. catalysts and accelerators remaining in cured polymeric articles (including paints) as residual content need not be reported at less than 0.1% by weight per homogeneous material, unless subject to explicit threshold content limits specified by this Standard (e.g., vinyl chloride). Thresholds for heavy metals are to be calculated on the basis of the elemental form of the metal.

3.2.5 Specific Chemical Abstracts Service (CAS) numbers for substances listed in this Standard are illustrated in the Global Automotive Declarable Substance List (GADSL, http:///www.gadsl.org), also available on the "Ford Supplier Portal" (FPS) at http://portal.covsint.com. It is the supplier's responsibility to ensure that they identify all affected substances – some of which may not be specifically identified in the Restricted Substance List.

3.2.6 This standard identifies substances and applications that are currently prohibited, as well as some that will become prohibited at a specific future date. To avoid unnecessary re-design / testing, suppliers should ensure that new production parts will comply with these future prohibitions of substances by the dates shown in Table 1 of this Standard.

3.2.7 For products imported to regions implementing the EU End of Life Vehicle Directive, the Effective Date column of Table 1 reflect customs clearance dates in these regions.

4. GENERAL INFORMATION

4.1 Definitions for technical terms are provided in Appendix 1.

4.2 Relevant national and international legislation are provided in Appendix 2.

4.3 Information regarding the preparation of raw wollastonite by a modified Addison-Davies technique for PLM analysis is provided in Appendix 3.

Table 1 – Substance Restrictions

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
1	Acetaldehyde	D	Yes	0.1%	All Products	Immediate
2	Acetamide	D	Yes	0.1%	All Products	Immediate
3	Acetonitrile	D	Yes	0.1%	All Products	Immediate
4	Acrylamide	D	Yes	0.1%	All Products	Immediate
5	Acrylonitrile	D	Yes	0.1%	All Products	Immediate
6	Alkylphenols (Nonyl / Octyl)					
6.1	Nonylphenols	P	No	0.1%	Detergent (surfactants), cleaners, metal working products and wastewater treatment plant chemicals	Immediate
6.2	Nonylphenols	D	No	0.1%	All Products	Immediate
6.3	Octylphenol	D	No	0.1%	All Products	Immediate
7	Alkylphenol Ethoxylates (Nonyl / Octyl)					
7.1	Nonylphenol ethoxylates	P	Yes (c)	0.1%	Detergent (surfactants), cleaners, metal working products and wastewater treatment plant chemicals	Immediate
7.2	Nonylphenol ethoxylates	D	No	0.1%	All Products	Immediate
7.3	Octylphenol ethoxylate	D	No	0.1%	All Products	Immediate
8	Aniline and its salts	D	Yes	0.1%	All Products	Immediate
9	Anthracene	D	Yes	0.1%	All Products	Immediate
10	Antimonytrioxide (Diantimonytrioxide)	D	Yes	0.1%	All Products	Immediate
11	Aromatic amines or their salts:					
11.1	4-Aminobiphenyl or its salts	P	Yes	0.01%	All Products	Immediate
11.2	Benzidine or its salts	P	Yes	(d)	All Products	Immediate
11.3	2-Naphthylamine or its salts	P	Yes	0.01%	All Products	Immediate
11.4	4-Nitrobiphenyl or its salts	P	Yes	0.01%	All Products	Immediate
12	Aromatic Azo Substances which may break down to certain Aromatic Amines, substances which may break down to certain Benzidines and the corresponding aromatic amines or Benzidines	P/D	No	0.1%	All Products	Declarable (Jan 2011 – Oct 2013) Prohibited (01 Oct 2013)

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
13	Arsenic or its compounds	P/D	Yes	Prohibited at 0.01% (unless present in metals & alloys, then the declaration limit is 0.05%)	All Products	Immediate
13.1	Organoarsenic compounds	P	Yes (as Arsenic compound)	0.01%	All Products	Immediate
14	Asbestos	P	Yes	Not Detectable	All Products	Immediate
15	Amines, carcinogenic, which are formed from Azo-dyes					
15.1	Amines, carcinogenic, which are formed from Azo-dyes – Prohibited Applications	P	Yes	0.003% (30ppm) in textiles (virgin) or leather; 0.007% in recycled fibers(e)	Textiles & leather	Immediate
15.2	Amines, carcinogenic, which are formed from Azo-dyes – Declarable Applications	D	Yes	0.1%	Solvents used for mineral oil coloring	Immediate
16	Amines, which can form carcinogenic Nitrosamines	D	Yes	0.1%	All Products	Immediate
17	Barium compounds (organic or water soluble)	D	Yes	1.0%	All Products	Immediate
18	Benzene	P	Yes	0.01%	All Products) except those listed below	Immediate
18.1	Benzene	D	Yes	0.1%	Fuel constituent	Immediate
19	Benzidine-based dyes and benzidine congener-based dyes					
19.1	Benzidine-based dyes	D/P	No	0%	All Products	Declarable (Immediate) Prohibited (Pending SNUR)

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
19.2	Benzidine Congener-based dyes	D/P	No	0%	All Products	Declarable (Immediate) Prohibited (Pending SNUR)
20	Beryllium or its compounds					
20.1	Beryllium or its compounds	P	Yes	0.1%	Dry friction Material (e.g., brake or clutch pad)	Immediate
20.2	Beryllium or its compounds	D	Yes	0.1%	All Products	Immediate
21	Biocidal coatings / biocidal additives (also see Triorganotin compounds (trialkyl- and triaryltin compounds))					
21.1	Biocidal coatings / biocidal additives – Declarable Applications	D	Yes	0.1%	All Products	Immediate
21.2	Biocidal coatings / biocidal additives - Prohibited Applications	P	Yes	0.1%	All Products	Immediate
22	Brominated flame retardants Note: Separate Table 1 entries/classifications exist for the following members of this group: • Polybrominated biphenyls [PBB] • Polybrominated diphenyl ethers [PBDE], • Tris(2,3-dibromopropyl)phosphate [TRIS]	D (see separate entries)	Yes (f)	0.1%	All Products	Immediate
22.1	Hexabromocyclododecane (HBCD)	D	Yes	0.1%	All Products	Immediate
22.2	Hexabromocyclododecane (HBCD)	P	Yes	0.1%	Vehicle interior fabric	1 July 2011
22.3	Tetrabromobisphenol A (TBBPA)	D	Yes	0.1%	All Products	Immediate
23	Butadiene (1,3 - Butadiene)	D	Yes	0.1%	All Products	Immediate
24	Butylphenol(2(2H-1,2,3-benzotriazol-2-yl)-4,6-ditert)-	D	Yes	0.1%	UV Stabilizer in Plastics	Immediate
25	Butylphenol, 2,4,6-tri-tert	D	Yes	0.1%	All Products	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
26	Cadmium or its compounds	P	Yes	0.01%	All applications except those listed below	Immediate
26.1	Cadmium or its compounds	P	Yes	0.01%	Batteries for electric vehicles; except NiCd batteries used as replacement parts for vehicles put on the market before 31 Dec 2008	Immediate (ff)
25.2	Cadmium or its compounds	D	Yes	0.01%	NiCd batteries used as replacement parts for vehicles put on the market before 31 Dec 2008. Note: Also, applications with future effective dates for prohibitions are declarable.	Immediate
27	Carbon disulfide	D	No	0.1%	All Products	Immediate
28	Carcinogenic Substances	D	No	0.1%	All Products	Immediate
29	Canadian Chemical Regulations	D	Yes	(g)	All Products	Immediate
29.1	Canadian Chemical Challenge Program Substances (see link found in foot note (g) for CAS#)	D	Yes	(g)	All Products	Immediate
29.2	Canadian Hazardous Products Act (see link found in foot note (gg) for CAS#)	D	Yes	0.1% (carcinogens) 1.0% (non-carcinogens	All Products	Immediate
30	Chlorinated Ethers (selected)					
30.1	Bis(Chloromethyl) ether (BCME)	P	Yes	(h)	All Products	Immediate
30.2	Chloromethyl methyl ether	P	Yes	(h)	All Products	Immediate
30.3	NCC ether	P	Yes	(h)	All Products	Immediate
31	Chlorinated hydrocarbons:					
31.1	Carbon tetrachloride (Tetrachloromethane)	P	Yes	0.1%	All Products	Immediate
31.2	1,1,2,2-Tetrachloroethane	P	No	0.1%	Diffuse applications, cleaning and/or products for sale to the general public tp the EU	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
31.3	1,1,2,2-Tetrachloroethane	D	Yes	0.1%	All Products	Immediate
31.4	1,1,1,2 Tetrachloroethane	P	Yes	0.1%	Diffuse applications, cleaning and/or products for sale to the general public tp the EU	
31.5	1,1,1,2 Tetrachloroethane	D	Yes	0.1%	All Products	Immediate
31.6	Pentachloroethane	P	Yes	0.1%	Diffuse applications, cleaning and/or products for sale to the general public tp the EU	
31.7	Pentachloroethane	D	Yes	0.1%	All Products	Immediate
31.8	Pentachlorobenzene	P	Yes	(h)	All Products	Immediate
31.9	Tetrachlorobenzenes (TeCB)	P	Yes	(h)	All Products	Immediate
31.10	Trichlorobenzenes	P	Yes	0.1%	All Products in the EU	Immediate
31.11	Trichloromethane (Chloroform)	P	No	0.1%	Diffuse applications, cleaning and/or products for sale to the general public tp the EU	Immediate
31.12	Trichloromethane (Chloroform)	D	Yes	0.1%	All Products	Immediate
31.13	1,1,2 Trichloroethane	P	No	0.1%	Diffuse applications, cleaning and/or products for sale to the general public tp the EU	Immediate
31.14	1,1,2 Trichloroethane	D	Yes	0.1%	All Products	Immediate
31.15	1,1 Dichloroethylene (Vinylidene chloride)	D	Yes	0.1%	All Products	Immediate
31.16	1,1 Dichloroethylene (Vinylidene chloride)	P	No	0.1%	Diffuse applications, cleaning and/or products for sale to the general public tp the EU	Immediate
31.17	1,1,1 Trichloroethane (Methyl chloroform)	P	Yes	0.1%	All Products	Immediate
31.18	Dichloromethane (Methylene chloride)	D	Yes	0.1%	All Products	Immediate
31.19	Trichloroethylene (Trichloroethene)	D	Yes	0.1%	All Products	Immediate
31.20	Tetrachloroethylene (Perchloroethylene)	D	Yes	0.1%	All Products	Immediate
32	Chlorinated or brominated Dioxins or Furans	P	Yes	Content >10 ppb	All Products	Immediate
33	Chloroaniline	D	Yes	0.1%	All Products	Immediate
34	Chloroepoxypropane (1-Chloro-2,3-epoxy-propane)	D	Yes	0.1%	All Products	Immediate
35	Chlorofluorocarbons (CFC's)	P	Yes	0.1%	All Products - except those below:	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
35.1		D	Yes	0.1%	CFCs used to service existing equipment where legally permitted	Immediate
36	Chloroparaffins / Chlorinated Olefins (i)					
36.1	Short Chain Chloroparaffins, unbranched - C10 to C13) (SCCPs)	P	Yes	0.1%	All Products	Immediate
36.2	Medium Chain Chloroparaffins, unbranched - (C14 to C17) (MCCPs)	D(j)	Yes	0.1%	All Products	Immediate
36.3	Long Chain Chloroparaffins, unbranched – (C18 to C28) (LCCPs)	D(j)	No	0.1%	Non-dimensional Products	Immediate
37	Chromium(VI)-salts (Cr+6; Hexavalent)	P	Yes	0.1% (k)	All Products	Immediate
38	Cobalt or its compounds	D	Yes	0.1%	Cobalt compounds and alloys, excluding cobalt in steels	Immediate
39	Colophony (Rosin)	D	Yes	0.1%	All Products	Immediate
40	Copper, metallic	D	Yes	0.1%	All Products	Immediate
40.1	Copper, metallic	P	Yes	5.0%	Brake Friction Materials	1 Jan 2021
40.2	Copper, metallic	P	Yes	0.5%	Brake Friction Material	1 Jan 2025
41	Cyclohexane, hexachloro	D	Yes	0.1%	All Products	Immediate
42	Diamino-diphenyl-methane (4,4`-Diaminodi-phenylmethane)	P	Yes	0.1%	All Products	Immediate
43	Dichlorodiphenyltrichloroethane (DDT)	P	No	0.01%	All Products	Immediate
44	Dichloropropanol (1,3-Dichloro-2-propanol)	D	Yes	0.1%	All Products	Immediate
45	Diorganotin compounds (e.g. dialkyltin compounds)					
45.1	Diorganotin compounds (e.g. dialkyltin compounds)	D	Yes	0.1%	All Products	Immediate
45.2	Dibutyltin (DBT)	P	Yes	0.1%	All Products in EU for supply to general public except those listed in 44.3 – 44.6	1 Jan 2012
45.3	Dibutyltin (DBT)	P	Yes	0.1%	One-component and two component room temperature vulcanisation sealants (RTV-1 and RTV-2 sealants) and adhesives in EU for sale to general public	1 Jan 2015

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
45.4	Dibutyltin (DBT)	P	Yes	0.1%	Paints and coatings containing DBT compounds as catalysts when applied on articles in EU for sale to general public	1 Jan 2015
45.5	Dibutyltin (DBT)	P	Yes	0.1%	Soft polyvinyl chloride (PVC) profiles whether by themselves or coextruded with hard PVC in EU for sale to general public	1 Jan 2015
45.6	Dibutyltin (DBT)	P	Yes	0.1%	Fabrics coated with PVC containing DBT compounds as stabilizers when intended for outdoor applications in EU for sale to general public	1 Jan 2015
45.7	Dioctyltin (DOT)	P	Yes	0.1%	Textile articles intended to come into contact with the skin for use by general public in EU	1 Jan 2012
45.8	Dioctyltin (DOT)	P	Yes	0.1%	Wall and floor coverings for use by general public in EU	1 Jan 2012
45.9	Dioctyltin (DOT)	P	Yes	0.1%	Two component room temperature vulcanization moulding kits (RTV-2 moulding kits)	1 Jan 2012
45.10	Dioctyltin (DOT)	P	Yes	0.1%	gloves; footwear or part of footwear intended to come into contact with the skin in EU	1 Jan 2012
46	Dodecachloropentacyclo1,3,4-Metheno-1H-cyclobuta(cd)pentalene,1,1a,2,2,3,3a,4,5,5,5a,5b,6-dodecachlorooctahydro- decane (Mirex)	P	No	0.01%	All Products	Immediate
47	Ecotoxic Substances	D	No	0.1%	All Products	Immediate
48	Ethanol, 2,2',2''-nitrilotris (Triethanolamine)	D	Yes	0.1%	Engine coolants	Immediate
49	Formaldehyde (Free)	D	Yes	0.001% (10 mg/kg)	Interior trim (by weight of finished parts)	Immediate
50	Glycols or their Acetates					
50.1	2-Methoxyethanol (2ME)	P	Yes	(c)	All Products	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
50.2	2-Methoxyethanol within DEGME	P	Yes	≥ 0.5%	All Products	Immediate
50.3	2-Methoxyethyl acetate	D	Yes	0.1%	All Products	Immediate
50.4	2-Ethoxyethanol	D	Yes	0.1%	All Products	Immediate
50.5	2-Ethoxyethyl acetate	D	Yes	0.1%	All Products	Immediate
51	2-Butoxyethanol	D	Yes	0.01% (l)	All Products	Immediate
52	2-(2-butoxyethoxy)ethanol (DEGBE)	D	Yes	0.1%	All Products	Immediate
53	Halons	P	Yes	0.1%	All Products	Immediate
54	Hexachlorobenzene (HCB)	P	Yes	20 ppb	All Products	Immediate
54.1	Hexachlorobenzene (HCB)	D	Yes	10 ppb	All Products	Immediate
55	Hexachloro-1,3-butadiene (HCBD)	P	Yes	(h)	All Products	Immediate
56	Hexamines (See Polyamine Curing Agents)					
57	Hydrazine	D	Yes	0.1%	All Products	Immediate
58	n-Hexane	D	No	0.1%	All Products	Immediate
59	Hydrobromofluorocarbons (HBFC's)	P	Yes	NA (m)	All Products	Immediate
60	Hydrochlorofluorocarbons (HCFC's)	P	Yes	NA (m)	Solvents, blowing agents and all vehicle applications, except for servicing vehicles produced prior to December 2001 (where legally permitted)	Immediate
60.1	Hydrochlorofluorocarbons (HCFC's)	D	No	NA (m)	All other products containing or manufactured using HCFCs	Immediate
61	Hydrofluorocarbons (HFC's)	P	Yes	NA (m)	All vehicle-related applications except for refrigerants	Immediate
61.1	Hydrofluorocarbons (HFC's)	D	Yes	NA (m)	All vehicle-related refrigerants	Immediate
61.2	Hydrofluorocarbons (HFC's)	D	No	NA (m)	Non-vehicle related products	Immediate
62	Hydrogen Sulfide	D	No	0.1%	All Products	Immediate
63	Lead or its compounds	P	Yes	0.1%	All products except vehicle and facility applications separately listed below	Immediate
63.1	Lead or its compounds	P	Yes	0.35%	Steel, for machining purposes and galvanized steel	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
63.2	Lead or its compounds	P	Yes	0.4%	Aluminum, for machining purposes	Immediate
63.3	Lead or its compounds	P	Yes	0.1%	Bearing shells and bushings in engines, transmissions and air conditioning compressors	Prohibited after 30- Jun-11
63.4	Lead or its compounds	P	Yes	4.0%	Copper alloys	Immediate
63.5	Lead or its compounds	P	Yes	0.1%	Vulcanising agents and stabilisersfor elastomers in brake hoses, fuel hoses, air ventilation hoses, elastomer/metal parts in the chassis applications, and engine mountings. Spare parts for vehicles on the market after 1 July 2006 allowed to contain up to 0.5% lead by weight	Immediate
63.6	Lead or its compounds	D	Yes	0.1%	Electrical components which contain lead in a glass or ceramic matrix compound, except glass in bulbs and glaze of spark plugs (n)	Immediate
63.7	Lead or its compounds	P	Yes	0.1%	Bonding agents for elastomers in powertrain applications. Up to 0.5% is allowed in spare parts for vehicles put on the market before July 2009	Immediate
63.8	Lead or its compounds	P	Yes	0.1%	Copper in friction materials of brake linings (o)	Immediate
63.9	Lead or its compounds	P	Yes	0.1%	Valve seats for engine types developed **after** 30 June 2003	Immediate
63.10	Lead or its compounds	D	Yes	0.1%	Spare part valve seats for engine types developed before 30 June 2003	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
63.11	Lead or its compounds	P	Yes	0.1%	Pyrotechnic initiators for vehicles type approved in regions following the EU ELV Directive & Japan after 30 June 2006 and replacement initiators for these vehicles.	Prohibited if type approved after 30-Jun-06
63.12	Lead or its compounds	D	Yes	0.1%	All Products (q), including vehicle Batteries(n); vibration dampers mounted to body or chassis (n/p); absorption refrigerators in motor homes or counter weights for facility based equipment;	Immediate
63.13	Lead or its compounds	P	Yes	0.1%	Lead in solders to attach electrical and electronic components to electronic circuit boards and lead in finishes on terminations of components other than electrolyte aluminum capacitors, on component pins and on electronic circuit boards (n)	Prohibited if type approved after 1 Jan 2016
63.14	Lead or its compounds	P	Yes	0.1%	Lead in solders in electrical applications other than soldering on electronic circuit boards or on glass (n)	Prohibited if type approved after 1 Jan 2011
63.15	Lead or its compounds	P	Yes	0.1%	Lead in finishes on terminals of electrolyte aluminum capacitors (n)	Prohibited if type approved after 1 Jan 2013
63.16	Lead or its compounds	P	Yes	0.1%	Lead used in soldering on glass in mass airflow sensors (n)	Prohibited if type approved after 1 Jan 2015

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
63.17	Lead or its compounds	D	Yes	0.1%	Lead in high melting temperature type solders (i.e. lead-based alloys containing 85% by weight or more lead) (n)	Immediate
63.18	Lead or its compounds	D	Yes	0.1%	Lead in compliant pin connector systems (n)	Immediate
63.19	Lead or its compounds	D	Yes	0.1%	Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages (n)	Immediate
63.20	Lead or its compounds	D	Yes	0.1%	Lead in solder to attach heat spreaders to the heat sink in power semiconductor assemblies with a chip size of at least 1 cm^2 of projection area and a nominal current density of at least 1 A/mm2 of silicon chip area (n)	Immediate
63.21	Lead or its compounds	P	Yes	0.1%	Lead in solders in electrical glazing applications on glass except for soldering in laminated glazing (n)	Prohibited in vehicles type approved after 1 Jan 2013
63.22	Lead or its compounds	D	Yes	0.1%	Lead in solders for soldering in laminated glazing (n)	Immediate
63.23	Lead or its compounds	P	Yes	0.1%	Lead in friction materials (e.g. brake and clutch pads)	Immediate
64	Mercury or its compounds	P	Yes	0.1%	All applications except those listed below	Immediate
64.1	Mercury or its compounds	P	Yes	0.1%	High Intensity Discharge Lamps (o)	Prohibited for scalability UP3-UP6 program launches

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
64.2	Mercury or its compounds	D	Yes	0.1%	Discharge lamps for headlight applications And fluorescent tubes used in instrument panel displays (o)	Immediate
64.3	Mercury or its compounds	P	Yes	0.1%	Fluorescent tubes used in instrument panel displays	Prohibited if type approved after 30 June 2012
65	Methanol	D	Yes	0.1%	All Products	Immediate
66	Methylacrylamidomethoxy-acetate	D	Yes	0.1%	All Products	Immediate
67	Methyl bromide (See Halons)					
68	Methylcyclopentadienyl manganese tricarbonyl (MMT)	P	No	2 mg of Manganese per litre	Fuel in EU	1 Jan 2014
69	Mineral fibers (Natural or Synthetic) except Continuous Filament Fibers	D	Yes	See (r)	All Products	Immediate
69.1	Ceramic fibers	D	Yes	0.1%	All Products	Immediate
70	Monomethyldibromodiphenylmethane	D	Yes	0.1%	All Products	Immediate
71	Monomethyldichlorodiphenylmethane	D	Yes	0.1%	All Products	Immediate
72	Monomethyltetrachlorodiphenylmethane	D	Yes	0.1%	All Products	Immediate
73	Mutagenic substances	D	No	0.1%	All Products	Immediate
74	N,N-Dimethylformamide	D	Yes	0.1%	All Products	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
75	N,N'-ditolyl-p-phenylenediamine	D	Yes	0.1%	All Products	Immediate
76	N,N'-dixylyl-p-phenylenediamine	D	Yes	0.1%	All Products	Immediate
77	Naphthalene	D	Yes	0.1%	All Products	Immediate
78	Nickel or its compounds	D	Yes	0.1%	All products, except stainless steels and alloys containing metallic nickel	Immediate
78.1	Nickel or its compounds	D	Yes	0.5 µg/cm2/week (Ni release rate threshold)	Component surfaces likely to be routinely touched, e.g., handles and buckles (release rate as determined by test method BSEN1811:1999) (s). Phosphated surfaces are exempted	Immediate
78.2	Nickel or its compounds	P	Yes	0.1%	Dry Friction Materials (e.g. brake and clutch pads)	Immediate
79	Nitrites	D	Yes	0.1%	Additives in engine coolants, vulcanizing agents in rubber products, anticorrosion surface additive.	Immediate
80	N-Nitrosoamines/N-Nitrosoamides	P	Yes	0.1% (t)	All Products	Immediate
80.1	N-Nitrosoamines/N-Nitrosoamides	P	No	Not Detectable	Metalworking fluids containing mixtures of nitrites and amines/ amides that may form N-Nitrosamines/ N-Nitrosamines	Immediate
81	N-Nitrosodiummethylamine	P	Yes	(h)	All Products	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
82	N-tolyl-N'-xylyl-p-phenylenediamine	D	Yes	0.1%	All Products	Immediate
83	Organotin compounds (see Diorganotins and Triorganotins)					
84	Ozone depleting substances (see definition in Appendix 1)					
85	Pentachlorophenol (PCP) or its salts	P	Yes	0.0005% (5 ppm)	All Products	Immediate
86	Perchlorates	D	Yes	0.1%	All Products	Immediate
87	Perfluoroalkyl compounds, includes: Perfluoroalkyl sulfonates (e.g. PFAS), fluorotelomers, and telomere-based polymeric substances	D	Yes	0.001% (c) 0.1% (d) 1µg/m2 (e)	All Products	Immediate
87.1	PFOA and its salts, Perfloroocatonic acids C8F1502X (X=H, NH4, and Metals salts)	D	Yes	0.1% by mass in components made from fluoropolmers	All Products	Immediate
87.2	PFOA and its salts, Perfloroocatonic acids C8F1502X (X=H, NH4, and Metals salts)	P	No	0.001% (u)	All non-dimensional products made with specified Fluorotelomer-based Substances	Immediate
87.3	Perfluorooctane sulfonates C8F17SO2X (X=OH, Metal salt, halide, amide and other derivatives including polymers)	P	Yes	0.001% (u) 0.1% (v) 1µg/m2 (w)	All Products	Immediate
88	Phenol	D	Yes	0.1%	All Products	Immediate
89	Phenylenediamines or its salts	D	Yes	0.1%	All Products	Immediate
90	Phthalates	D	Yes	0.1%	All Products	Immediate
91	Polyamine Curing Agents (includes Hexamines)	D	Yes	0.1%	Interior trim (by weight of finished parts)	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
92	Polycyclic aromatic hydrocarbons (PAH; PCAH)	D	Yes	See individual thresholds (x)	Vehicle-related parts	Immediate
92.1		P	Yes	3% (total PAH content per basestock as quantified by IP 346) (y)	Petroleum mineral oil basestocks in lubricants	Immediate
92.2		P	Yes	1mg/kg BaP 10mg/kg total of PAH (z)	Tires for EU Markets	1 Jan 2010
93	Polybrominated biphenyls (PBB)	P	Yes	0.001%	All Products	Immediate
94	Polybrominated diphenyl ethers (PBDE)					
94.1	Decabromodiphenyloxide [Decabromodiphenyl ethers (deca BDE)]	P	Yes	0.1%	All Products	1 July 2011
94.2	Decabromodiphenyloxide	D	Yes	0.1%	All Products	Immediate
94.3	Pentabromodiphenyloxide	P	Yes	0.1%	All Products	Immediate
94.4	Octabromodiphenyloxide	P	Yes	0.1%	All Products	Immediate
94.5	Tetrabromo-diphenyl ethers (Tetra-BDE) congeners, and any resin or polymer containing these substances	P/D	Yes	0.1%	All Product	Declarable (Immediate); Prohibited (after Jan 2013)
94.6	Hexabromo-diphenyl ethers (Hexa-BDE) congeners, and any resin or polymer containing these substances	P/D	Yes	0.1%	All Product	Declarable (Immediate); Prohibited (after Jan 2013)

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
94.7	Heptabromo-diphenyl ethers (Hepta-BDE) congeners, and any resin or polymer containing these substances	P/D	Yes	0.1%	All Product	Declarable (Immediate); Prohibited (after Jan 2013)
94.8	Nonabromo-diphenyl ethers (Nona-BDE) congeners, and any resin or polymer containing these substances	P/D	Yes	0.1%	All Product	Declarable (Immediate); Prohibited (after Jan 2013)
95	Polybrominated Terphenyls (PBT)	D	Yes	0.001%	All Products	Immediate
96	Polychlorinated Biphenyls (PCB)	P	Yes	Not Detectable(aa)	All Products	Immediate
97	Polychlorinated Naphthalenes	D	Yes	0.1%	All Products	Immediate
98	Polychlorinated Terphenyls (PCT)	P	Yes	0.001%	All Products	Immediate
99	Products of Endangered Species	P	Refer to Section 3.1.5	Not Detectable	All Products	Immediate
100	Pyrotechnical compounds	D	Yes	0.1%	Air Bags, Seat belt pretensioners, etc.	Immediate
100.1	Ammonium Perchlorate	D	Yes	0.1%	Pyrotechnical Compound	Immediate
100.2	Nitrocellulose	D	Yes	0.1%	Pyrotechnical Compound	Immediate
100.3	Sodium Azide	D	Yes	0.1%	Pyrotechnical Compound	Immediate
101	Radioactive substances (including scrap metal contaminants)	P	No (see section 3.1.6	(bb)	All Products	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
102	Reproductive toxicants	D	No	0.1%	All Products	Immediate
103	Selenium and its compounds	D	Yes	0.1%	All Products	Immediate
104	Sensitizing substances	D	No	0.1%	All Products	Immediate
105	Silica, Crystalline - Quartz	D	Yes	(cc)	All Products	Immediate
106	Styrene (Vinyl benzene)	D	Yes	0.1%	All Products	Immediate
107	Styrene oxide (Epoxy styrene)	D	Yes	0.1%	All Products	Immediate
108	SVHCs (Substances of Very High Concern according to REACH (dd)	D	Yes	0.1%	All Products	Immediate
109	Sulfur Hexafluoride	P	Yes	NA (m)	Vehicle applications	Immediate
109.1	Sulfur Hexafluoride	P	No	NA (m)	Processing (casting) of Magnesium	Immediate
109.2	Sulfur Hexafluoride	D	No	NA (m)	Closed systems (a system that is normally hermetically closed), e.g., electrical installations	Immediate
110	Tetrafluoromethane	P	Yes	0.1%	All Products	Immediate
111	Thallium or it's compounds	D	Yes	0.1%	All Products	Immediate
112	Thioperoxydicarbonic diamide ([(H2N)C(S)]2S2), tetramethyl- ("Thiram")	D	Yes	0.1%	All Products	Immediate
113	Toluene	D	Yes	0.1%	All Products	Immediate
113.1	Toluene	P	No	0.1%	Adhesives and spray paints intended for sale to the general public in the EU	Immediate

Row Number	Substance[a]	Classification	GADSL (to be reported in IMDS)	Threshold [b]	Applications Affected	Effective Date
113.2	o-Toluidine generating substances	D	Yes	0.1%	All Products	Immediate
114	Tris(2-chloroethyl)phosphate	D	Yes	0.1%	All Products	Immediate
115	Trichlorophenol or its salts	D	Yes	0.1%	All Products	Immediate
116	Trichloropropane (1,2,3 - Trichloropropane)	D	Yes	0.1%	All Products	Immediate
117	Trimethylphosphate	D	Yes	0.1%	All Products	Immediate
118	Triorganotin compounds (trialkyl- and triaryltin compounds)	P	Yes	0.1%	All articles including Vehicle related parts	Immediate
118.1	Triorganotin compounds (trialkyl- and triaryltin compounds)	D	No	0.05%	All products other than artilces	Immediate
119	Triphenylphosphate	D	Yes	0.1%	All Products	Immediate
120	Tris-(1-aziridinyl) phosphine oxide	P	Yes	0.1%	All Products	Immediate
121	Tris(2,3-dibromopropyl)phosphate [TRIS]	P	Yes	0.1%	All Products	Immediate
122	Wollastonite (ee)	D	No	Non Detectable	All Products	Immediate
123	Vinyl chloride	P	Yes	0.0005% (5 ppm as monomer)	All Products	Immediate
124	dimethyl fumarate	P	No	0.1%	All consumer products	Immediate
125	Conflict Minerals (hh)	D	Yes	Non Detectable	All Products	Immediate
126	Any substance that is mined and not otherwise listed in this Table	D	No	Non Detectable	All Products	Immediate

Table 1 End Notes:

a) All substances listed in Table 1 must be immediately declared if their current percent content by weight, per homogeneous material exceeds the stated threshold for future prohibition.
b) Certain substances are subject to a specified upper threshold, stated as weight percent content in a material (see the definition of "Material" in Appendix 1). Suppliers must report content if substances exceed listed the threshold percentage, by weight per homogeneous material (See definition of Homogeneous Material in Appendix 1). Monomers, catalysts and accelerators remaining in cured polymeric articles (including paints) as residual content need not be reported at less than 0.1% by weight per homogeneous material, unless subject to explicit threshold content limits specified by this standard (e.g. vinyl chloride). Thresholds for heavy metals are to be calculated on the basis of the elemental form of the metal.
c) Only Nonylphenol ethoxylates on the GADSL are required to be reported in IMDS.
d) Benzidine and Benzidine Dihydrochloride are prohibited at any concentration, if intentionally added for the Canadian market. Benzidine or its salts are prohibited above 0.1% for all other markets.
e) The threshold applies to cleaved amine content in materials. For recycled fibers, until 1 January 2005, the allowable threshold is 0.007%. EU Directive 76/769/EEC, 19th Amendment provides further technical guidance on which azodyes are affected.
f) PBB, PBDE and TRIS are GADSL listed
g) See http://www.chemical substanceschimiques.gc.ca/challenge-defi/index_e.html for CAS#s requiring declaration at any concentration in both dimensional (hard parts) and non-dimensional materials. Declaration is required for all listed substances, in finalized and proposed batches.
h) Prohibited if intentionally added at any concentration
i) Currently in North America, Chemical Abstract s Service (CAS#s) listed in TSCA (http://www.epa.gov/srs/) are insufficient to distinguish between short, medium and long chain length, and only “generic” CAS#s are available, and MUST be used in declarations.
j) In North America various feedstocks used to create chlorinated paraffins/olefins are known to contain short-chain length paraffins/olefins resulting in the presence of SCCPs within the MCCPs & LCCPs upon chlorination. Hence, non-dimensional products containing medium & long chain chloroparrafins/olefins require documentation that their presence does not cause exceedance of the SCCP threshold of 0.1% by weight. Sufficient documentation includes the following:
    1. Product name (as shown on the MSDS) of the chlorinated paraffin/olefin blended within the subject product and its weight percent within the final product, and
    2. full disclosure of the weight percent of each short-chain length paraphin/olefin within the feedstock of the chlorinated paraffins/olefin in the final product
k) A maximum value of 0.1% by weight, of Hexavalent Chromium, per homogenous material will be tolerated, (this percentage is based on the weight of the coating containing the Hexavalent Chromium, not the part weight).
l) Exceedance to threshold limits for select products requires permits, see: http://www.cc.gc.ca/CEPARegistry/documents/regs/g2-14026_r1.pdf
m) NA = Not Applicable
n) Components must be identified for dismantling, if the average per vehicle lead content exceeds 60 grams for electronic circuit boards, electrical components that contain lead in a glass or ceramic matrix compound (except bulbs and spark plugs) and all other electric applications.
o) Components must be made identifiable for pre-treatment.
p) The lead exemption for vibration dampers is meant as a temporary design fix for vibration issues encountered late in new program development. These dampers are expected to be designed out as soon as practical.
q) Also applications with future effective dates for prohibitions are declarable.
r) See Appendix 1, definition for FIBER
s) Test Method BSEN1811 can be accessed at http://www.cenorm.be/
t) Residual N-Nitrosoamines/N-Nitrosoamides in cured polymeric articles need not be reported, nor will be subject to, the Prohibition at less than or equal to the stated threshold of 0.1 %, which is considered to reflect the aggregate mass percent of all carcinogenic N-Nitrosoamines/N-Nitrosoamides present.
u) For Chemical Preparations.
v) For semi-finished products.
w) For coated materials.
x) See GADSL, Reference List, available as a downloadable file at **http://www.gadsl.org** and in the "News" section of IMDS at, http://www.mdsystem.de/html/en/home_en.htm.
y) Institute of Petroleum test method for PAH content can be found at http://www.energyinst.org.uk/
z) The PAH's to be reported are identified under PAH definition in Appendix 1.
aa) Per SW-846 Method 8082; samples must be ground and composited by contract laboratory so that a representative sub-sample(s) is used for analysis; only heated soxhlet solvent extraction shall be used; lowest achievable MDL are expected; highest acceptable MDL must not exceed most stringent US State/Local requirement – currently 490ppb - this must be affirmed at time of testing.) Matrix dependent alternate method will be considered by Ford. For concrete recycling, this method must be coupled with representative sampling methods specified in EQO Memorandum EQR05-047_US.

bb) Radioactivity should meet "Unconditional Use Clearance Level" requirements consistent with International Atomic Energy Agency (IAEA) and the Commission of European Communities (CEC) standards for individual radionuclides IAEA-TECDOC-855 (1996) & Safety Series RS-G-1.7 (2004). (See 3.1.11). Radioactive sources used in manufacturing processes are exempted.
cc) Any intentionally introduced content must be reported.
dd) See http://echa.europa.eu/ for more information. A list of SVHC identified as of January 13, 2010 is provided for reference in Appendix 3.
ee) See Appendix 4 for the PREPARATION OF RAW WOLLASTONITE BY A MODIFIED ADDISON-DAVIES TECHNIQUE FOR PLM ANALYSIS
ff) Declarable if present at any concentration
gg) http://www.canlii.org/en/ca/laws/regu/sor-88-64/latest/sor-88-64.html
hh) Conflict Minerals include columbite-tantalite (coltan, niobium, tantalum) cassiterite (tin), gold, and wulframite (tungsten), and their derivatives, obtained from mining or transport in the Democratic Republic of Congo (DRC).

ii) **APPENDIX 1**

DEFINITIONS

ARTICLE:

Under the definition provided by the US Occupational Safety and Health Administration (OSHA), "Article" means a manufactured item other than a fluid or particle:

1) which is formed to a specific shape or design during manufacture
2) which has end use function(s) dependent in whole or in part upon its shape or design during end use
3) which under normal conditions of use does not release more than very small quantities, e.g. minute or trace amounts of a hazardous chemical (as determined under section 1910.1200(d) of volume 29 of the US Code of Federal Regulations), and does not pose a physical hazard or health risk

BIOCIDES:

Additives intended to prevent or restrict microbiological growth.

CARCINOGENS:

Including:

1) any member of Group 1, 2A or 2B, in the latest edition of Monographs of the International Agency for Research on Cancer (IARC)
2) any "select carcinogen" listed by the United States Occupational Safety and Health Administration (refer to 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances)
3) any "known carcinogen" or substance "reasonably anticipated to be a carcinogen" by the United States National Toxicology Programme (NTP) in the latest edition of Annual Report on Carcinogens
4) any "A1", "A2" or "A3" carcinogen listed by the American Conference of Governmental Industrial Hygienists (ACGIH) in the latest edition of *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*
5) any carcinogen listed by the Deutsche Forschungs Gemeinschaft (DFG) in the latest edition of their Maximale Arbeitsplatz Konzentration (MAK) list in Categories 1-2 and 3-5 (as listed in the Ford Restricted Substance List)
6) any chemical "known to" the State of California to cause cancer, pursuant to The Safe Drinking Water and Toxic Enforcement Act of 1986 ("Proposition 65")
7) substances classified as Category 1 or 2 carcinogens under the provisions of the European EC Directives on the Classification, Packaging and Labelling of Dangerous Substances and Dangerous Preparations (EC Council Directive 67/548/EC3).

CONFLICT MINERALS

Conflict Minerals include columbite-tantalite (coltan, niobium, tantalum) cassiterite (tin), gold, and wulframite (tungsten), and their derivatives, obtained from mining or transport in the Democratic Republic of Congo (DRC).

DECLARABLE

Substances are designated as “Declarable” (D) when present in a material, or part in a vehicle, and are legally regulated, projected to be regulated or required to be tracked for information gathering purposes.

ECOTOXICANTS

Substances posing recognised hazard to the environment, in general, or to specific ecosystems, including: substances so classified, due to their ecotoxicity, under the provisions of the European EC Directives on the Classification, Packaging and Labelling of Dangerous Substances and Dangerous Preparations and as classified by ASTM STP 1179, p 34, 1993.

ENDANGERED SPECIES (PRODUCTS OF):

Includes any substance or material that originates from an endangered species. Lists of endangered species include:

1. Latest “International Union for Conversation of Nature and Natural Resources (IUCN) Red List of Threatened Species: http//www.redlist.org/”.
2. European Union (EU) Regulation 338/97 on the protection of species of wild fauna and flora by regulating trade therein, and in its amendments.
3. United States Endangered Species Act.
4. UNEP-WCMC Species Database http://sea.unep-wcmc.org/species/dbases/about.cfm.

EU ELV (End of Life Vehicle) DIRECTIVE:

European Union Directive 2000/53/EC on ELV’s
http://europa.eu.int/

FIBER:

Unless otherwise indicated in this Standard, a FIBER is defined as a particle that is five micrometers or longer with as aspect ratio of at least 3 to 1.

HAZARDOUS:

Hazardous substances/materials are those that have the capacity of producing injury or illness through ingestion, inhalation, or absorption through any body surface, or creating an adverse effect upon the environment.

HOMOGENOUS MATERIAL:

The physical definition of homogeneity is: the quality of having all properties independent of the position. The compositional homogeneity of any material means: the chemical composition is same for all substances forming or being an ingredient of the material (e.g., impurities) at any spot of measurement. The opposite: an inhomogenous material is composed in a way that the amount of the chemical ingredients is dependent on the spot of measurement.

INTENTIONALLY INTRODUCED:

Deliberately utilized in the formulation of a material or component where its continued presence is desired in the final product to provide a specific characteristic, appearance or quality. The use of recycled materials as feedstock for the manufacture of new products, where some portion of the recycled materials may contain RSMS-listed substances, are not to be considered as intentionally introduced.

GLOBAL AUTOMOTIVE DECLARABLE SUSTANCE LIST (GADSL):

This is a common list of substances agreed by all of the automobile manufacturers that subscribe to IMDS. The purpose of this list is to commonize the reporting requirements for all users of IMDS (http//www.gadsl.org).

MACHINING:

Material formed and shaped by tool.

MATERIAL:

Within the text of this Standard means the primary medium that may contain a “substance”, which is restricted by this Standard. Acceptable material descriptions are Industry standards or Federal-Mogul standards / specifications. Where these are not available to define the material, a Supplier’s standards / specification may be used.

MATERIAL, DIMENSIONAL:

Dimensional items are those having their own shape and are essentially solid. Most are considered “articles” (See definition of “Article”)

MATERIAL, NON-DIMENSIONAL:

Non-dimensional items are those that have no intrinsic shape without containing structure. Examples of these items are fluids, gases, powders and semi-solids (pastes) like adhesives and greases.

MATERIAL, NON-PRODUCTION:

Non-production materials are those materials used in Federal-Mogul facilities which do not remain on products marketed by Federal-Mogul.

MATERIAL, POST-PRODUCTION:

Post-production materials are those materials used to service a vehicle after it exits the assembly plant.

MATERIAL, PRODUCTION:

Production materials are those materials used for the fabrication of production parts, complete vehicles, or other materials that remain on products marketed by Federal-Mogul.

MUTAGENS:

Any chemical that can produce a genetic mutation, i.e. an induction of DNA damage, or changes in chromosome structure or number, including: substances classified as Category 1, 2 or 3 mutagens under the provisions of the EC Directives on the Classification, Packaging and Labelling of Dangerous Substances and Dangerous Preparations.

NEW PRODUTION PARTS:

New Production Parts are newly drawn parts that are not in current production or carried over from previous production.

Parts are not considered new parts if only the part number changes, in line with current practices (i.e., the prefix changes to accommodate a year change, or a suffix changes to accommodate a minor engineering change of a current part).

OZONE DEPLETING SUSBTANCES (ODS):

Ozone Depleting Substances (ODS) – are defined as chemicals that have been linked to the depletion of the stratospheric ozone layer, and restricted under that 1987 Montreal Protocol, listed by U.S. Environmental Protection Agency regulations under 40 Code of Federal Regulations, Part 82, Appendix F to subpart A, and addressed by the European Union Directive – 2037/2000/EC, chemicals are collectively identified as ozone depleting substances (ODSs) and include CFCs (chlorofluorocarbons), HCFCs (hydrochlorofluorocarbons) and several brominated- carbons including Halons. The following RSMS Chemical Groupings and Categories should identify all ODSs (from Table 1):

(27.1)	Chlorinated hydrocarbons (carbon tetrachloride)
(27.9)	Chlorinated hydrocarbons (methyl chloroform)
(31)	Chlorofluorocarbons (CFCs)
(48)	Halons
(54)	Hydrobromofluorocarbons (HBFCs)

(55 & 55.1) Hydrochlorofluorocarbons (HCFCs)

PAH (Polycyclic-aromatic hydrocarbons):

Regulations prohibiting the use of PAH extender oils in tires (Directive 2005/69/EC, for EU markets) from January 1, 2010 require the sum of the following 8 PAH's NOT to exceed 10mg/kg:
Benzo(a)pyrene CAS # 50-32-8 (individual concentration not to exceed 1 mg/kg)
Benzo(e)pyrene CAS # 192-97-2
Benzo(ah)anthracene CAS # 56-55-3
Chrysene CAS # 218-01-9
Benzo(b)fluoranthene CAS # 205-99-2
Benzo(j)fluoranthene CAS # 205-82-3
Benzo(k)fluoranthene CAS # 207-08-9
Dibenzo(ah)anthracene CAS # 53-70-3

These limits are regarded as kept, if the PAH extract is <3% by mass, as measured by the Institute of Petroleum standard IP346.

PERCENT (%) BY WEIGHT:

Unless otherwise stated, the ratio of the masses of the individual substance and material (see definition of "Material" above) containing the substance multiplied by 100.

$$\frac{\text{Mass Substance}}{\text{Mass Material}} \times 100 = \text{Percent Weight}$$

POLYMERIC:

Non-metallic materials, including plastics, elastomers, wood and cardboard. This includes"

- All injection molded, blow molded and heat-pressed thermoplastic parts (PP, ABS, PA, PVC, etc.)
- All molded thermoset parts (UP, PUR)
- All foamed plastic parts (PUR, EPP, EPS, etc.)
- Natural and synthetic rubbers (NR, EPDM, etc.)
- Synthetic fibers (Polyester, Polyamide) such as in carpets, package trays, seat covers,

PRODUCT(S):

Is the entity that is supplied to Federal-Mogul, which can be an assembly, part (component), sub-component, material, or substance. This could include the restricted substance itself (e.g. lead sulphide), a material containing the restricted substance (e.g. a friction material containing lead sulphide), or a component or assembly containing the restricted substance (e.g. a brake assembly with a lead-containing friction material).

PROHIBITED:

Substances designated as “Prohibited” (P) shall not be supplied in any products, subject to the stated directions on content threshold and affected applications. A maximum value of 0.1% by weight of per homogeneous material shall be tolerated for these substances, or subject to specific threshold limits specified by this Standard. If prohibited substances are identified in products supplied to Federal-Mogul, they must be reported and suppliers must institute immediate corrective measures.

RECYCLED CONTENT:

The portion of a material’s or product’s weight that is composed of materials that have been recovered from or otherwise diverted from the scrap stream, either from the manufacturing process (PIR) or after consumer use (PCR). Recycled content consists of PIR and PCR, but not home scrap.

- Post-Industrial Recyclates (PIR): Scrap which is a by-product of the manufacturing process (excluding home scrap) and is re-used in the manufacture of the part.
- Home Scrap: Material commonly re-used by the industry within the original manufacturing process. Examples include materials which are regranulated and re-fed within a facility. Home scrap is not considered recycled content.
- Post-Consumer Recyclates (PCR): Scrap generated by consumers which has been re-used in the manufacturing of a new part.

Reporting of recycled content:

- Only the weight of the recyclate within the component or assembly should be reported. Do not report the component or assembly weight as recycled content. This weight is reported and totalled separately.
- For PCR only, suppliers do not have to report “Declarable” substances unless otherwise specified, although suppliers must report any substances that are listed in this Standard as “Prohibited” or “Prohibited above threshold”.

REPRODUCTIVE TOXICANTS:

Substances or other agents which may affect male or female fertility, cause damage to the unborn or newborn child, or provoke miscarriage, including:

1. Any chemical known to the State of California to cause reproductive harm or birth defects, pursuant to The Safe Drinking Water and Toxic Enforcement Act of 1986 (“Proposition 65”)
2. Substances classified as Category 1, 2 or 3 due to adverse effects of fertility, or their developmental toxicity under the provisions of the EC Directives on the Classification, Packaging and Labelling of Dangerous Substances and Dangerous Preparations

SENSITIZERS:

Substances which have been identified as confirmed or potential sensitizers by animal experimentation or human experience include but are not limited to chemicals which:

1. Cause a “substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical” (refer to Occupational Safety and Health Administration Standard, 29 CFR 1910.1200)
2. Cause on “normal living tissue through an allergic or photodynamic process a hypersensitivity which becomes evident on re-application of the same substance” (refer to Federal Hazardous Substances Act 16 CFR 15.00.3(b)(9)
3. Are classified as inhalation or contact sensitizers under the provisions of the EC Directives on the Classification, Packaging and Labelling of Dangerous Substances and Dangerous Preparations
4. Are classified as such according to the World Health Organisation “criteria for classification of skin and airway sensitizing substances in the work and general environments” (1996)

SUBSTANCE:

The basic chemical or chemical compound listed in this Standard, e.g. lead or lead sulphide

APPENDIX 2

RELEVANT NATIONAL AND INTERNATIONAL LEGISLATION

Examples of National and International legislation that are relevant to these requirements are indicated below. These lists are not comprehensive and do not necessarily represent the current issue of that legislation by way of amendments or supplement.

It is the supplier's responsibility to avail himself of these and other pertinent regulations from the appropriate regulation authority, when relevant to his product.

a) **INTERNATIONAL** (Abbreviations shown at end of list)

1. 67/548/EEC Classification, Packaging and Labelling of Dangerous Substances
2. 75/442/EEC Waste
3. 76/403/EEC Disposal of PCB's and PCT's
4. 76/464/EEC Discharge of Dangerous Substances in Aquatic Environment
5. 76/769/EEC Restrictions on Marketing and Use of Certain Dangerous Substances and Preparations
6. 78/319EEC Toxic Waste Disposal
7. 78/610/EEC Worker Protection from VCM
8. 78/831/EEC Notification of New Substances
9. 80/779/EEC Air Quality Limits
10. 80/1107/EEC Protection of Workers from Risks of Chemical / Physical / Biological Age Agents
11. 83/264/EEC Tris (Aziridinyl) Phosphinoxide & PBB's
12. 83/477/EEC Worker Protection from Asbestos Risks
13. IATA Dangerous Goods Regulations 1983
14. ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air
15. (ADR) Euro Agreement on International Carriage of Dangerous Goods by Road
16. (RID) International Regulations on Carriage on Dangerous Goods by Rail
17. CEFIC Labelling Code
18. OECD Good Laboratory Practice (GLP)
19. IMO International Maritime Dangerous Goods Code (IMDG)
20. REACH Registration, Evaluation and Authorization of Chemicals (REACH) European Union (EU) No. 1927/2006
21. 83/478/EEC Restrictions on Marketing and use of Asbestos
22. 92/2455/EEC Council regulations on import / export of dangerous substances 94/3135/EEC
23. 91/549/EEC Council regulations on substances that deplete the ozone layer
24. 94/3093/EEC Italian Regulations
25. 89/677/EEC List of carcinogenic and mutagenic materials 94/60/EEC
26. Directive 2000/53/EC of the European Parliament and the council of 18th September 2000 on the end of life vehicles

b) **USA**

1. Occupational Safety & Health Act
2. Toxic Substances Control Act
3. Resource Conservation & Recovery Act
4. Hazardous Material Transportation Act
5. Clean Air Act
6. Clean Water Act
7. Consumer Product Safety Act
8. Poison Prevention Packaging Act
9. Federal Hazardous Substances Act
10. Endangered Species Act

c) **SPAIN**

1. Order 15993 of 1977-06-28 on Chemicals Labelling
2. Crown Decree 668, 1980-04-14 Storage of Dangerous Substances
3. Decrees 20507, 1982-07-21 & 24732, 1984-10-31 Controlling Asbestos Risks

d) **BELGIUM**

1. General Regs. For Employment Protection Titel 111 Chap 111 Royal Decree 1980-04-09.

   1.1 Benzene / Toluene / Xylene prohibitions, Art 723a 15.3
   1.2 Vinyl Chloride Monomer prohibitions, Art 723a 15.6
   1.3 Controlled Production & Use Subs. Art 723a 16 & App V.

e) **SWEDEN**

1 Ordinances 1973:334 and SFS 1979:771 Cadmium Prohibition
2 Ordinances AFS 1981:23 & AFS 1983:21, Asbestos
3 Ordinances AFS 1981:12 Certain Nitrosamines
4 Ordinances SNFS 1982:5 PK: 14, Classification & Labelling of Hazardous Substances & Preparations

f) **DENMARK**

1 Order 468 of 1979-11-13 & 148 of 1980-04-30 on Asbestos
2 Order 540 of 1982-09-02 on Substances & Materials
3 Order 408 of 1980-09-17, Classification, Packaging, Labelling, Sale & Storage of Dangerous Products

g) **ITALY**

1 Law No. 245, 1963-03-05, Limitation on Use of Benzene / Toluene / Xylene in Work Activities
2 Presidential Decree 303, 1956-03-19 on Hygiene at Work (Aromatic Amines)

h) **NETHERLANDS**

1 Decree 547, 1978-10-26 on Aerosols-Chlorofluoromethanes
2 Decree 413, 1983-09-06, Asbestos Decree (Goods Act)

j) **GREAT BRITAIN**

1 Clean Air Act 1960
2 Control of Pollution 1974
3 Health & Safety at Work etc. Act 1974
4 Carcinogenic Substances Regulations, SI's 1967/879, 230, 1975
5 Notification of New Substances Regulations, SI 1982/1496
6 Asbestos (Prohibitions) Regulations, SI 1985/910

k) **GERMANY**

1 Carcinogenic Substances Control Law, 1980-07-29

l) **SWITZERLAND**

1 Trade in Toxic Substances Law, 1969-03-21

m) **NORWAY**

1. Act No. 4, 1977-02-04, Worker Protection & Environment
2. Decree 1983-11-26, Labelling & Sale Hazardous Chemicals

n) **FINLAND**

1. Decision 383, 1983-04-20, List Poison, Labelling Hazardous Substances
2. Decision 1060, 1983-12-21, Classification / Labelling Carcinogens

Abbreviations used are:

EEC European Economic Communities
IATA International Air Transport Association
ICAO International Civil Aviation Organisation
ADR Accord Dangereux Routiers
RID Reglement International concernant le transport des merchandis Dangereuses
CEFIC European Council, Chemical Manufacturers Federation
OECD Organisation for Economic Co-operation and Development
IMO International Maritime Organisation

o) **COMPANY SPECIFICATIONS**

Company	**Standard**
Nissan	Engineering Standard N.E.S. MO0301 [200-N]
Ford	WSS–M99P9999–A1
Nedcar	VC04556
Renault	00-10.050/-C
Daimler Chrysler	CS-9003
BMW	SNR817512. /S11389.0 Part 2
Volkswagen A.G.	V.W91101
Delphi	10949001
General Motors	GMW3059
VDA	232-101

Appendix 3

REACH
Substances of Very High Concern (SVHCs) – Candidate List

Substance name	EC No.	CAS No.	Substance composition	Date of inclusion	Reason for inclusion	**Supporting documentation**	Decision number
			Impurities (where relevant for C&L, PBT/vPvB)				
2,4-Dinitrotoluene	204-450-0	121-14-2	-	13.01.2010	Carcinogenic (article 57a)	(support doc.)	ED/68/2009
2-Ethoxyethanol	203-804-1	110-80-5	-	15.12.2010	Toxic for reproduction (article 57c)	(support doc.)	ED/95/2010
2-Methoxyethanol	203-713-7	109-86-4	-	15.12.2010	Toxic for reproduction (article 57c)	(support doc.)	ED/95/2010
4,4'-Diaminodiphenylmethane (MDA)	202-974-4	101-77-9	-	28.10.2008	Carcinogenic (article 57a)	(support doc.)	ED/67/2008
5-tert-butyl-2,4,6-trinitro-m-xylene (musk xylene)	201-329-4	81-15-2	-	28.10.2008	vPvB (article 57e)	(support doc.)	ED/67/2008
Acrylamide	201-173-7	79-06-1	-	30.03.2010	Carcinogenic and mutagenic (articles 57 a and 57 b)	(support doc.)	ED/68/2009
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	287-476-5	85535-84-8	-	28.10.2008	PBT and vPvB (articles 57 d and 57 e)	(support doc.)	ED/67/2008
Aluminosilicate Refractory Ceramic Fibres *are fibres covered by index number 650-017-00-*	-	Extracted from Index no.: 650-017-00-8	-	13.01.2010	Carcinogenic (article 57a)	(support doc.)	ED/68/2009

8 in Annex VI, part 3, table 3.2 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, and fulfil the two following conditions: a) Al_2O_3 and SiO_2 are present within the following concentration ranges: • *Al_2O_3: 43.5 – 47 % w/w, and SiO_2: 49.5 – 53.5 % w/w,* *or* • *Al_2O_3: 45.5 – 50.5 % w/w, and SiO_2: 48.5 – 54 % w/w,* *b) fibres have a length weighted geometric mean diameter less two standard geometric errors of 6 or less micrometres (µm).*							
Ammonium dichromate	232-143-1	7789-09-5	-	18.06.2010	Carcinogenic, mutagenic and toxic for reproduction (articles 57 a, 57 b and 57 c)	(support doc.)	ED/30/2010
Anthracene	204-371-1	120-12-7	-	28.10.2008	PBT (article 57d)	(support doc.)	ED/67/2008
Anthracene oil	292-602-7	90640-80-5	-	13.01.2010	Carcinogenic[1)], PBT and vPvB (articles 57a, 57d and 57e)	(support doc.)	ED/68/2009
Anthracene oil, anthracene paste	292-603-	90640-81-6	-	13.01.2010	Carcinogenic[2)], mutagenic[3)],	(support doc.)	ED/68/2009

	2				PBT and vPvB (articles 57a, 57b, 57d and 57e)		
Anthracene oil, anthracene paste, anthracene fraction	295-275-9	91995-15-2	-	13.01.2010	Carcinogenic[2)], mutagenic[3)], PBT and vPvB (articles 57a, 57b, 57d and 57e)	(support doc.)	ED/68/2009
Anthracene oil, anthracene paste,distn. lights	295-278-5	91995-17-4	-	13.01.2010	Carcinogenic[2)], mutagenic[3)], PBT and vPvB (articles 57a, 57b, 57d and 57e)	(support doc.)	ED/68/2009
Anthracene oil, anthracene-low	292-604-8	90640-82-7	-	13.01.2010	Carcinogenic[2)], mutagenic[3)], PBT and vPvB (articles 57a, 57b, 57d and 57e)	(support doc.)	ED/68/2009
Benzyl butyl phthalate (BBP)	201-622-7	85-68-7	-	28.10.2008	Toxic for reproduction (article 57c)	(support doc.)	ED/67/2008
Bis (2-ethylhexyl)phthalate (DEHP)	204-211-0	117-81-7	-	28.10.2008	Toxic for reproduction (article 57c)	(support doc.)	ED/67/2008
Bis(tributyltin)oxide (TBTO)	200-268-0	56-35-9	-	28.10.2008	PBT (article 57d)	(support doc.)	ED/67/2008
Boric acid	233-139-2 / 234-343-4	10043-35-3 / 11113-50-1	-	18.06.2010	Toxic for reproduction (article 57 c)	(support doc.)	ED/30/2010
Chromic acid, Oligomers of chromic acid and dichromic acid, Dichromic acid	231-801-5 - 236-	7738-94-5 - 13530-68-2	-	15.12.2010	Carcinogenic (article 57a)	(support doc.)	ED/95/2010

	881-5						
Chromium trioxide	215-607-8	1333-82-0	-	15.12.2010	Carcinogenic and mutagenic (articles 57 a and 57 b)	(support doc.)	ED/95/2010
Cobalt dichloride	231-589-4	7646-79-9	-	28.10.2008	Carcinogenic (article 57a)	(support doc.)	ED/67/2008
Cobalt(II) carbonate	208-169-4	513-79-1	-	15.12.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/95/2010
Cobalt(II) diacetate	200-755-8	71-48-7	-	15.12.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/95/2010
Cobalt(II) dinitrate	233-402-1	10141-05-6	-	15.12.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/95/2010
Cobalt(II) sulphate	233-334-2	10124-43-3	-	15.12.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/95/2010
Diarsenic pentaoxide	215-116-9	1303-28-2	-	28.10.2008	Carcinogenic (article 57a)	(support doc.)	ED/67/2008
Diarsenic trioxide	215-481-4	1327-53-3	-	28.10.2008	Carcinogenic (article 57a)	(support doc.)	ED/67/2008
Dibutyl phthalate (DBP)	201-557-4	84-74-2	-	28.10.2008	Toxic for reproduction (article 57c)	(support doc.)	ED/67/2008
Diisobutyl phthalate	201-553-2	84-69-5	-	13.01.2010	Toxic for reproduction (article 57c)	(support doc.)	ED/68/2009

Disodium tetraborate, anhydrous	215-540-4	1303-96-4/ 1330-43-4/ 12179-04-3	-	18.06.2010	Toxic for reproduction (article 57 c)	(support doc.)	ED/30/2010
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified: Alpha-hexabromocyclododecane Beta-hexabromocyclododecane Gamma-hexabromocyclododecane	247-148-4 and 221-695-9	25637-99-4 3194-55-6 (134237-50-6) (134237-51-7) (134237-52-8)	-	28.10.2008	PBT (article 57d)	(support doc.)	ED/67/2008
Lead chromate	231-846-0	7758-97-6	-	13.01.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/68/2009
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	235-759-9	12656-85-8	-	13.01.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/68/2009
Lead hydrogen arsenate	232-064-2	7784-40-9	-	28.10.2008	Carcinogenic and toxic for reproduction (articles 57 a and 57 c)	(support doc.)	ED/67/2008
Lead sulfochromate yellow (C.I. Pigment Yellow 34)	215-693-7	1344-37-2	-	13.01.2010	Carcinogenic and toxic for reproduction (articles 57 a and 57 c))	(support doc.)	ED/68/2009
Pitch, coal tar, high temp.	266-028-2	65996-93-2	-	13.01.2010	Carcinogenic, PBT and vPvB (articles 57a, 57d and 57e)	(support doc.)	ED/68/2009
Potassium chromate	232-140-5	7789-00-6	-	18.06.2010	Carcinogenic and mutagenic (articles 57 a	(support doc.)	ED/30/2010

					and 57 b).		
Potassium dichromate	231-906-6	7778-50-9	-	18.06.2010	Carcinogenic, mutagenic and toxic for reproduction (articles 57 a, 57 b and 57 c)	(support doc.)	ED/30/2010
Sodium chromate	231-889-5	7775-11-3	-	18.06.2010	Carcinogenic, mutagenic and toxic for reproduction (articles 57 a, 57 b and 57 c)	(support doc.)	ED/30/2010
Sodium dichromate	234-190-3	7789-12-0/ 10588-01-9	-	28.10.2008	Carcinogenic, mutagenic and toxic for reproduction (articles 57a, 57b and 57c)	(support doc.)	ED/67/2008
Tetraboron disodium heptaoxide, hydrate	235-541-3	12267-73-1	-	18.06.2010	Toxic for reproduction (article 57 c)	(support doc.)	ED/30/2010
Trichloroethylene	201-167-4	79-01-6	-	18.06.2010	Carcinogenic (article 57 a)	(support doc.)	ED/30/2010
Triethyl arsenate	427-700-2	15606-95-8	-	28.10.2008	Carcinogenic (article 57a)	(annex XV rep.)	ED/67/2008
Tris(2-chloroethyl)phosphate	204-118-5	115-96-8	-	13.01.2010	Toxic for reproduction (article 57c)	(support doc.)	ED/68/2009
Zirconia Aluminosilicate Refractory Ceramic Fibres *are fibres covered by index number 650-017-00-8 in Annex VI, part 3, table 3.2 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and*	-	Extracted from Index no. 650-017-00-8	-	13.01.2010	Carcinogenic (article 57a)	(support doc.)	ED/68/2009

packaging of substances and mixtures, and fulfil the two following conditions: a) Al_2O_3, SiO_2 and ZrO_2 are present within the following concentration ranges: • *Al_2O_3: 35 – 36 % w/w, and* • *SiO_2: 47.5 – 50 % w/w, and* • *ZrO_2: 15 - 17 % w/w,* *b) fibres have a length weighted geometric mean diameter less two standard geometric errors of 6 or less micrometres (µm).*							

*)These are partly pre-filled substance data sets in IUCLID 5.3 format. They are provided as a support for importers or producers of articles preparing notifications for substances in articles. The notifying company remains, however, solely responsible for the appropriateness and correctness of the information submitted in the notification.
1) The substance does not meet the criteria for identification as a carcinogen in situations where it contains less than 0.005 % (w/w) benzo[a]pyrene (EINECS No 200-028-5)
2) The substance does not meet the criteria for identification as a carcinogen in situations where it contains less than 0.005 % (w/w) benzo[a]pyrene (EINECS No 200-028-5) and less than 0,1 % w/w benzene (EINECS No 200-753-7).]
3) The substance does not meet the criteria for identification as a mutagen in situations where it contains less than 0,1 % w/w benzene (EINECS No 200-753-7).]

Updated on 15/12/2010

APPENDIX 4

PREPARATION OF RAW WOLLASTONITE BY A MODIFIED ADDISON-DAVIES TECHNIQUE FOR PLM ANALYSIS

REVISION:	Original
DATE:	3/28/2003
WRITTEN BY:	R. Hatfield, W. Longo, S. Michels, M. Rigler, B. Peters

PURPOSE: To establish a standard operating procedure (SOP) by which raw wollastonite is prepared for polarized light microscopy (PLM) analysis on polycarbonate (PC) filters to determine the content of amphibole asbestos (tremolite). The acid/base dissolution preparation procedure was modeled after the Addison-Davies method described in “Analysis of Amphibole Asbestos in Chrysotile and Other Minerals” printed in the American Occupational Hygiene, Vol. 34 No. 2. pp 159-175, 1990 as a guideline.

PREPARATION OF RAW WOLLASTONITE SAMPLES FOR PLM ANALYSIS

1.0 SAMPLE RECEIPT

1.1 Inspection of Submitted Samples

1.1.1 Inspection of submitted samples is performed by the Quality Assurance (QA) Officer or other trained technical staff.

1.1.2 Carefully open the shipment under a HEPA-filtered negative air flow or biological safety hood and inspect the samples to assure that there was no shipping damage or packing irregularity.

1.1.3 Assure that the appropriate submittal (client) documentation (i.e. chain of custody, or COC) has been supplied.

1.1.4 Wet-wipe the sample (s) and seal in a plastic bag. Attach the submittal documents to the bag and transfer the samples to the person preparing the project file.

2.0 SAMPLE RECEIPT DOCUMENTATION

2.1 Sample receipt documentation functions may be performed by administrative staff.

2.1.1 Review Submittal Documents

Sign the submittal COC. Determine exactly which analytical technique is to be performed on the samples, as this will affect sample preparation. This information may be obtained from either the paperwork or the telephone records. If there is any question or ambiguity consult the Lab Manager or the QA Officer.

2.1.2 Assign Individual Sample Numbers

Each project (sample set) is consecutively coded as it is received, with a unique alphanumeric project identification number. The Ziploc® bag in which the samples are sealed is labeled accordingly. Individual sample numbers are assigned to each sample in the set and each sample is labeled accordingly.

3.0 SAMPLE PREPARATION DOCUMENTAION

3.1 File Review in Sample Preparation

The preparation technician reviews the file for completeness and to determine which samples are to be prepared by what method. The preparation tech notes the area sampled, the due date and any special instructions. The QAO or laboratory manager is notified if any data are missing

3.2 Acid Digestion Worksheet Preparation

Sample preparation is documented for each sample set on an "Acid/Base Dissolution Worksheet". The following data is recorded on this sheet.

3.2.1 Project number (s)

3.2.2 Analyst (s)

3.2.3 Date(s) Analyzed

3.2.4 Balance used

3.2.5 1st Balance QC Check by

3.2.6 2nd Balance QC Check by (an all subsequent balance checks for the sample set listed on the worksheet)

3.2.7 Sample number(s) are listed in the first column of the data table labeled: "Sample No."

3.2.8 The weight of the sample numbered Petri dish containing a polycarbonate filter for each of the samples are listed in the second column of the data tale labeled: "Petri + Filter Wt".

3.2.9 The weight of the raw wollastonite sample placed in the 100 mL beaker for acid digestion for each of the samples are listed in the third column of the data table labeled: "Sample Aliquot Weight".

3.2.10 The weight of the sample numbered Petri dish containing a polycarbonate filter with the raw wollastonite sample, after it has been acid digested and caustic washed, is listed in the fourth column of the data table labeled: "Post-dissolution Petri + Filter + Sample Weight".

3.2.11 The calculated weight of the raw wollastonite sample, after it has been acid digested and caustic washed, is determined by subtracting the weight listed in the second column from the weight listed in the fourth column of the data table. This calculated weight is listed in the fifth column of the data table labeled: "Post-dissolution Sample Weight".

3.2.12 The calculated sample percent of the raw wollastonite sample, after it has been acid digested and caustic washed, is determined by dividing the weight listed in the fifth column from the weight listed in the third column of the data table and multiplying by 100. This calculated sample percent is listed in the sixth column of the data table labeled: "Post-dissolution Sample %".

3.2.13 The seventh column labeled "Post-dissolution Tremolite %" and the eight column labeled "Original Sample Tremolite%" can be completed after the PLM analysis of the sample is completed. However, these two columns do not have to be filled in for the completion of the worksheet.

3.2.14 The "Reviewed by" and "Date" section at the bottom of the worksheet need to be completed before the sheet is placed in the project folder.

4.0 SAMPLE PREPARATION

4.1 Polycarbonate Filter and Petri dish Preparation

A 47 mm, 0.4-micron polycarbonate filter is placed in a labeled Petri dish. The weight of the filter and Petri dish is determined using an analytical balance. The weight is recorded on the "Acid Digestion Worksheet" to the nearest 0.00001-gram. The filter and Petri dish combinations prepared for this analysis are always handled with clean latex gloves and are stored in containers which will not affect the determination of the combined weight (aluminum foil, plastic sample bags, etc.).

4.2 Raw Wollastonite Sample Aliquot Preparation

Approximately 0.5 grams of raw wollstonite are removed from the sample container and placed on a piece of weigh paper using a sample spatula (scoopula, etc.). The weight of the raw wollastonite on the weigh paper is determined

4.3 Acid Digestion of Raw Wollastonite Sample

5 mL of concentrated hydrochloric acid (HCl) is added to the 100 mL beaker containing the raw wollastonite sample. Then, 5 mL of concentrated nitric acid (HNO_3) is added to the 100 mL beaker containing the raw wollastonite sample. The 100 mL beaker containing the hydrochloric acid, nitric acid, raw wollastonite sample and the PTFE stir bar is covered with the 50 mm watch glass and placed on heated plate with a magnetic stirring for 10 minutes of digestion. The heated plate is at a temperature setting that

assures that the acid mixture will achieve a temperature of 100 ± 10 °C by the end of the 10-minute digestion. The stirring setting of the heated plate is set to allow the PTFE stir bar to thoroughly mix the acid mixture in the 100 mL beaker during the 10-minute digestion. The acid digestion operations are performed in a fume hood because of the dangers associated with the handling and boiling of concentrated acids.

4.4 Microfiltration Assembly Preparation

During the 10 minutes of acid digestion, a 47 mm, 0.4 micron polycarbonate filter designated for the raw wollastonite sample that is being digested is removed from its labeled Petri dish and is mounted in the 47 mm vacuum microfiltration assembly. The 47 mm vacuum microfiltration assembly is composed of:

4.5 Filtration After Acid Digestion Operation

After the 10 minutes of heated and mixed acid digestion is completed:

4.5.1 The mixing of the acid/sample mixture in the 100 mL beaker is stopped.

4.5.2 The purified water in the 300 mL glass funnel that is now been heated to 60 ± 10°C is drained through the 47 mm polycarbonate filter by activating the vacuum pump.

4.5.3 The 50 mm watch glass is removed from the 100 mL beaker and rinsed with purified water (18 MΩ) from a wash bottle over the 300 mL glass funnel.

4.5.4 The PTFE stir bar is removed from the 100 mL beaker and rinsed with purified water (18 MΩ) from a wash bottle over the 300 mL glass funnel.

4.5.5 The contents of the 100 mL beaker are then poured onto the filter at the bottom of the 300 mL glass funnel in the vacuum micro filter assembly and the remnants are rinsed from the 100 mL beaker with purified water (18 MΩ) from a wash bottle over the 300 mL glass funnel.

4.5.6 The sides of the 300 mL glass funnel are rinsed with purified water (18 MΩ)from a wash bottle to assure that the entire acid digested sample is on the polycarbonate filter at the bottom of the 300 mL glass funnel in the vacuum micro filter assembly and that the sample has been thoroughly rinsed of all the acid.

4.5.7 After the rinsing is completed, the vacuum pump is turned off and the vacuum is released before any subsequent operations.

4.6 Sodium Hydroxide (Caustic) Wash Operation

After the acid digested sample has been thoroughly rinsed and deposited on the polycarbonate filter:

4.6.1 Approximately 80 mL of 4N sodium hydroxide solution (NaOH) is added to the 300 mL glass funnel in the vacuum micro filter assembly that is still being heated.

4.6.2 The mixture of sample and 4N sodium hydroxide solution at the bottom of the 300 mL glass funnel is hand mixed using a glass stir rod for 5 minutes. Car is taken not to disturb the polycarbonate filter during mixing.

4.6.3 At the end of the 5 minutes of mixing, the vacuum pump is activated and the sodium hydroxide solution is filtered through the polycarbonate filter.

4.6.4 When all the sodium hydroxide solution has been filtered through the polycarbonate filter, the glass stir rod is rinsed with purified water (18 MΩ) from a wash bottle over the 300 mL glass funnel.

4.6.5 The sides of the 300 mL glass funnel are rinsed with purified water (18 MΩ)from a wash bottle to assure that the entire sample is on the polycarbonate filter at the bottom of the 300 mL glass funnel in the vacuum micro filter assembly and that the sample has been thoroughly rinsed of all the sodium hydroxide solution.

4.6.6 After the rinsing is completed and all the water has been vacuumed through the filter, the vacuum pump is turned off, the vacuum is released, and the heated tape is turned off before any subsequent operations.

4.7 Final Filter Preparation for PLM Analysis

After the sodium hydroxide solution washed sample has been thoroughly rinsed and deposited on the polycarbonate filter:

4.7.1 The vacuum micro filter assembly is disassembled and the 47 mm, 0.4 micron polycarbonate filter with the treated raw wollastonite sample is carefully placed in the designated and labeled Petri dish (Gelman 50 x 9 mm sterile Petri dish or equivalent) for that sample.

4.7.2 The sample/filter/Petri dish is dried in a manner that assures no weight is added to the combination during the drying process (desiccant drying chamber, oven, or other where particulates would not collect on the combination during drying).

4.7.3 The weight of the dried sample/filter/Petri dish is determined using an analytical balance. The weight is recorded on the "Acid/Base Dissolution Worksheet" to the nearest 0.00001-gram. The sample/filter/Petri dish prepared for this analysis are always handled with clean latex gloves and are stored in containers which will not affect the determination of the combination's weight (aluminum foil, plastic sample bags, etc.).

4.7.4 The calculated sample percent of the raw wollastonite sample, after the heated acid digestion and caustic wash for the sample, is determined by dividing the weight listed in the fifth column of the "Acid/Base Dissolution Worksheet" by the weight listed in the third column of the data table and multiplying by 100. This calculated sample percent is listed in the sixth column of the data table labeled; "Post-dissolution Sample %".

4.7.5 The dried sample/filter/Petri dish is then submitted along with the project file folder for PLM analysis.

5.0 SAMPLE ANALYSIS BY PLM

5.1 Follow analytical protocol in general accordance with standard US EPA methods.

SAMPLE

Acid/Base Dissolution Preparation Worksheet

Materials Analytical Services

Project No(s)._____

Analyst(s):_____ **Date Analyzed:**_____

Balance Used:_____ **1st Balance QC Check by:**_____

2nd Balance QC Check by:_____

Sample No.	Petri + filter Weight (gm)	Sample Aliquot Weight (gm)	Post-dissolution Petri + Filter + Sample Weight (gm)	Post-dissolution Sample Weight (gm)	Post-dissolution Sample %	Post-dissolution Tremolite % by PLM	Original Sample Tremolite %

Comments:

Reviewed by:_____ **Date:**_____ **Page**____ **of** ____

REPEATABILITY AND REPORDUCABILITY STUDY
Data Sheet

	1	2	3	4	1	2	3	4
Micropist	A – Darrell Duncan				B – Paul Hess			
Sample No.	1st Trial	2nd Trial	3rd Trial	Range	1st Trial	2nd Trial	3rd Trial	Range
1	0.1492	0.1741	0.1492	0.0249	0.0995	0.1244	0.0497	0.0746
2	0.3022	0.3022	0.2720	0.0302	0.1209	0.1511	0.0907	0.0604
3	0.2111	0.1583	0.1056	0.1056	0.1056	0.0528	0.0792	0.0528
4	0.2386	0.2386	0.2386	0.0000	0.1670	0.1670	0.1431	0.0239
5	0.0191	0.0191	0.0287	0.0096	0.0382	0.0573	0.0191	0.0382
Totals	0.9203	0.8924	0.7940	0.1262	0.5312	0.5526	0.3818	0.1707
		0.9203	$R_{A\ Avg}$ →	0.0340		0.5312	$R_{B\ Avg}$ →	0.0500
		0.7940				0.3818		
	Sum →	2.6067			Sum →	1.4656		
	$X_{A\ Avg}$ →	0.1738			$X_{B\ Avg}$ →	0.0977		

$R_{A\ Avg}$	0.0340
$R_{B\ Avg}$	0.0500
Sum	0.0840
R_{Avg}	0.0420

No. Trials	D_4
2	3.27
3	2.58

UCL_R	0.1084

Max X_{Diff}	0.1738
Min X_{Diff}	0.0977
X_{Diff}	0.0761

Note:

A limit exists for the value of individual R's. Calculation of the mathematical value limit for individual R's is obtained by the following equation: (R_{Avg}) x (D_4) = UCL_R. Circle those that are beyond this limit. Correct R by repeating those readings using the same micropist and sample as originally used, or discard values and re-average and re-compute R and the limiting value UCL_R.

Comments:

_____
_____
_____
_____

REPEATABILITY AND REPORDUCABILITY STUDY

Sample No(s): 6, 7, 8, 10, 13 **Date:** 20-Mar-03 **Project No:** M30509
Sample Description: NYAD G Raw Wollastonite **Performed by:** Stewart Michels

From Data Sheet:

R_{Avg}	

X_{Diff}	

MEASUREMENT UNIT ANALYSIS

Repeatability – Equipment Variation (EV)

EV = (R_{AVG}) x (K_1)

No. of Trials	K_1
2	4.56
3	3.06

% EV = 100[(EV)^2 ÷ (R & R) x (TOLERANCE)]

TOLERANCE	10%

EV	0.13

% EV	0.54

Reproducibility – Appraiser Variation (AV)

AV = (X_{DIFF}) x (K_2)

No. of Micropists	K_2
2	3.65
3	2.70

% AV = 100[(AV)^2 ÷ (R & R) x (TOLERANCE)]

TOLERANCE	50%

EV	0.28

% AV	12.60

Repeatability and Reproducibility (R & R)

R & R = √ [(EV)^2 + (AV)^2]

% R & R = (% EV) + (% AV)

R & R	0.31

% R & R	13.14%

NOTE: All calculation are based upon predicting 5.15σ (((% of the area under the normal curve)