



RESTRICTED SUBSTANCE MANAGEMENT STANDARD

December 23, 2003

RESTRICTED SUBSTANCE MANAGEMENT STANDARD

INTRODUCTION

In order to help ensure that Federal-Mogul, and customers using our parts and components, fully meet applicable legal and customer standards regarding toxic materials used in our products and theirs, we are issuing this Standard. The products we produce come largely from materials you supply to us. Therefore, this Standard seeks to inform you of the materials we must exclude from our products altogether and the limits we have on the amount of certain other materials, because of environmental and related concerns. The Standard is based largely on the product content standard issued by Ford Motor Company, a major Federal-Mogul customer which has some of the most extensive product content requirements, not limited to those specified by law.

This Standard will take effect on April 1, 2004. A number of selected suppliers have already reviewed it and provided comments as we requested. But we want to give all suppliers an opportunity to review the Standard and raise any questions they may have. We will clarify or modify the Standard as may be warranted in response to comments. (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.)

If you are currently shipping to us materials that contain substances banned by this standard, or amounts of substances that exceed concentration or weight limits specified in the standard, please notify us as soon as possible, via e-mail to ***Restricted_Substances@fmo.com***. Please specify whether you believe you will be able to eliminate or sufficiently reduce such materials so that you can comply with the Standard by April 1, 2004. If you indicate not, we will contact you to discuss how we can mutually resolve the situation.

By the effective date of the Standard, we will expect all suppliers who have notified us of their definite or possible inability to meet this Standard to file with us a short verification that, as of the effective date, they do or will meet the Standard. Those who do not file such verification, or who do not indicate they have an effective plan in place to meet the Standard very promptly, are subject to termination as suppliers.

For some products and/or toxic 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 banned or limited toxic substance. Federal-Mogul will contact affected suppliers as and when such requirements may be needed.

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.

If you have any questions or comments on this Standard, please contact Federal-Mogul Supply Chain at ***Restricted_Substances@fmo.com*** or your Supply Chain representative.

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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 factory 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.

Section 3 relates to general requirements affecting all products supplied to Federal-Mogul. Individual restricted substances are alphabetically listed, with the type of restriction indicated, in Table 1, Section 4 details more specific requirements for general materials and hazard types.

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, EH&S or Laboratory personnel.

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

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3.1 ALL PRODUCTS

- 3.1.1 In addition to information required for compliance to this Standard, Supplier, upon request, 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 EH&S office. Prior to making any change to the composition or hazard labelling of such products, the supplier shall advise the appropriate Federal-Mogul EH&S office.
- 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 Products containing 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 BIOCIDES (see Definitions, Appendix 1) shall not be supplied or submitted without prior notification to and acknowledgement from Federal-Mogul.

3.2 SUBSTANCE RESTRICTIONS

- 3.2.1 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” shall not be supplied in any products, subject to the stated directions on content threshold and affected applications.
- 3.2.3 Substances designated as “Restricted” may not be desirable in some applications. Future prohibition is possible. Technically and economically feasible substitutes should be investigated. These substances shall not be supplied in any products without prior notification to, and acknowledgement from Federal-Mogul.
- 3.2.4 Substances designated as “Reportable” are of health, environmental, and/or performance interest and shall not be supplied in any products without prior notification to , and acknowledgement from Federal-Mogul.

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- 3.2.5 Certain substances are subject to a specified upper threshold, stated as weight percent content in a material (see Appendix 1). Where no threshold is specified, Prohibited substances concerned should not be present in quantities greater than trace levels as established by best industry practice. Thresholds for heavy metals are to be calculated on the basis of the elemental form of the metal.
- 3.2.6 Specific CAS numbers for substances listed in this Standard are illustrated in the current Ford Restricted Substance List, available as a downloadable Excel file. 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.

4. SPECIFIC REQUIREMENTS

4.1 Dangerous Substances

4.1.1 E.E.C. Legislation

E.E.C. directives 67/548/EEC, 73/173/EEC, 77/728/EEC and 80/781/EEC refer to the classification, packaging and labelling/provisions for dangerous substances, preparations, solvents, paints, adhesives, printing inks and related products.

In particular these include restrictions on the following chemicals, which should not be present in any component or material supplied to Federal-Mogul

- 5.1.1.1 Polybrominated Biphenyls (PBBs)
- 5.1.1.2 Polychlorinated Biphenyls (PCBs)
- 5.1.1.3 Polychlorinated Terphenyls (PCTs)
- 5.1.1.4 Tris (2,3 Dibromopropyl) Phosphate
- 5.1.1.5 Tris (Aziridinyl) Phosphin oxide
- 5.1.1.6 Polychlorinated naphthalene (P.C.N.)
- 5.1.1.7 Di-n-butylphtalate DBP
- 5.1.1.8 Butylbenzylphtalate BBP

4.2 Chemical Substances

Examples of individual National and International legislation are listed in Appendix 2 which are relevant to these substances.

It should not be assumed that the list is comprehensive.

- 4.2.1 Any paint or other solvent based material in uncured form shall not contain toluene and/or xylene in excess of 45% of the total product.
- 4.2.2 Materials supplied to Federal-Mogul shall not contain benzene, amino benzene, xylene, carbon tetrachloride, toluene or halogenated hydrocarbon without notification and prior approval.
- 4.2.3 All suppliers wherever possible shall conform to legislation as laid down by the Montreal Protocol relating to use of chlorinated solvents in the manufacture of products and materials supplied to Federal-Mogul. This legislation is particularly relevant to the use of methylene chloride, trichloroethylene, tetrachloroethylene, 1.1.1 trichloroethane, 1.1.2 trichloroethane trichloromethane, 1.1.1.2 tetrachloroethane and 1.1 dichloroethelene.
- 4.2.4 Fully halogenated chlorofluoroalkanes shall not be used as propellants for aerosol supplies to Federal-Mogul.

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4.3 Toxic and Dangerous Waste

A supplier shall divulge to Federal-Mogul the presence of any ingredient or constituent in their product which either is capable of causing pollution in water, air or soil, or is subject to special notification or control by legislation in force at the locations in which it is to be used or disposed of, or both. The information submitted shall be adequate for assessment of whether the proposed material will be compatible with existing effluent treatment process. A supplier shall give details of any treatment that will enable used or surplus material to be broken down satisfactorily, prior to disposal through suitable effluent plant.

4.4 Carcinogens, Teratogens and Mutagens

Products or materials containing chemicals which have been identified as having any carcinogenic, teratogenic, or mutagenic properties in humans must not be supplied to Federal-Mogul unless specifically identified to Federal-Mogul and subsequent approval granted.

4.4.1 Nitrosamines

Products or material must not be supplied (unless specifically identified to and approved by Federal-Mogul, which contain combinations of nitrites, amines and/or amides, which could combine to produce harmful concentrations of nitrosamines or nitrosamides.

Particular attention is drawn to National and International legislation in this respect.

4.5. Sensitisers – Skin and Inhalation

Products or materials which contain chemicals which have been identified as confirmed or potential sensitisers, either by animal experimentation, human testing or human experience, shall not be supplied to Federal-Mogul unless these chemicals have been specifically identified to Federal-Mogul and prior approval granted.

Particular attention is drawn to National and International legislation in this respect.

4.6 Cadmium

4.6.1 Cadmium shall not be present in any component or material supplied to Federal-Mogul including in the following forms:

- (a) As a corrosion protective finish
- (b) As a paint pigment
- (c) As a pigment or stabiliser in any other materials such as plastics, elastomers etc.
- (d) As an impurity in any material or component including the above uses, in excess of level to be specified
- (e) Particular attention is drawn to National and International legislation in this respect and in particular End of Life Vehicle directive 2000/53/EC

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4.7 Asbestos

- 4.7.1 Asbestos in any form shall not be present at any detectable level whether added intentionally or otherwise in any other component or material supplied to Federal-Mogul unless specifically approved in advance by Federal-Mogul. If the presence of any form of asbestos is detected in an existing product F-M must be informed immediately. The supplier must instigate appropriate actions to eliminate the asbestos at the earliest opportunity subject to approval by Federal-Mogul.
- 4.7.2 All components or material containing asbestos approved by Federal-Mogul under 4.7.1 must be clearly labelled, either individually or on the smallest package, that they contain asbestos in accordance with national and international requirements.
- 4.7.3 Particular attention is drawn to National and International legislation in this respect.

4.8 Isocyanates

No materials or compounds shall be supplied, unless specifically identified to Federal-Mogul, which contain isocyanates in levels that are likely to exceed a control limit of 0.02 mgm/m³ as NCO in the surrounding atmosphere.

4.8.1 Polyurethanes

All polyurethanes supplied to Federal-Mogul systems shall contain no free isocyanates. Polyurethanes shall not be used in components or materials where isocyanates are likely to be generated by heat.

4.8.2 Paints and Varnishes

Paints or varnishes containing free isocyanates shall not be used on components or products supplied to Federal-Mogul

4.9 Beryllium

Components or materials containing beryllium shall not be supplied to Federal-Mogul unless specified on a components drawing or specification

Materials containing beryllium shall not be supplied for any welding or other high temperature thermal activities.

4.10 Antimony

No component shall be supplied to Federal-Mogul, which contains antimony compounds unless specific approval has been obtained from Federal-Mogul.

4.11 Lead

Components or material supplied to Federal-Mogul shall not contain deliberate additions of lead or lead compounds unless specified on a drawing or specification or specific approval has been sought and obtained from Federal-Mogul for the particular application. Where lead is present as an impurity Federal-Mogul shall be advised of the level. The product or material must comply with the End of Life Vehicle directive 2000/53/EC.

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4.12 Products of Endangered Species of Plants or Animals

These shall not be present in any material or components.

4.13 Other specific chemicals as listed below, and as shown in Table 1

4.13.1 Phosphorus

4.13.2 Dioxins

Polychlorinated Dibenzodioxins

Polychlorinated Dibenzofurans

Polybrominated Dibenzodioxins

Polybrominated Dibenzofurans

Coplanar PCB

4.13.3 Endocrine disrupters (oestrogens)

Alkylphenol ethoxylates

4.14 Chromium in its compounds

Chromium and its compounds (particularly hexavalent chromium) shall not be used in any form that may generate mist or fine powder. The presence of hexavalent chromium in all metal finishing coatings such as passivation finishes on zinc and zinc alloy coatings, non electrolytic coatings or etch primers and sealants for aluminium, shall comply with the requirements of End of Life Vehicle directive 2000/53/EC. For all new products introduced after January 2001 hexavalent Cr free finishes shall be specified where possible.

4.15 Nickel and its compounds

Nickel and its compounds shall not be used in any form.

4.16 Cobalt

Cobalt and its compounds shall not be used in any form that may generate mist or fin powders. This restriction does not apply to plating or other processes specified and approved by Customer Design Engineering.

4.17 Mercury

Mercury and its compounds shall not be used in any form. Particular attention is drawn to the EU End of Life Vehicle directive 2000/53/EC.

5. REPORTING

It is the responsibility of the supplier to submit a request for approval using the format shown as Attachment 1. The form should be submitted to the EH&S office of the Federal-Mogul site that purchased the product.

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6. GENERAL INFORMATION

- 6.1 Definitions for technical terms are provided in Appendix 1.
- 6.2 Additional information may be obtained through the activities shown in Appendix 2.

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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
- 4)

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

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.

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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 Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species
2. European Community (EC) Regulation EG Nr. 558/95 regarding “endangered plants”
3. United States Endangered Species Act

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.

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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.

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

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" shall not be supplied in any products, subject to the stated directions on content threshold and affected applications. If prohibited substances are identified in products supplied to Federal-Mogul, they must be reported and suppliers must institute immediate corrective measures.

PROHIBITED WITH THRESHOLD:

Substances designated as "prohibited with Threshold" shall not be supplied in any products, above stated content threshold in affected applications. In such cases, the substances must be reported and suppliers must institute immediate corrective measures. If such substances are present at or below stated content threshold, suppliers need not report these unless otherwise specified in the Standard.

RECYCLED MATERIAL:

POST-INDUSTRIAL

Material generated during any production step that has been recovered or diverted from the waste stream.

POST-CONSUMER

Material / product generated by a business or consumer that has served its intended end use and has been recovered or otherwise diverted from the waste stream for recycling purposes.

RESTRICTED:

Substances designated as "Restricted" may not be desirable in some applications. Future prohibition is possible. Technically and economically feasible substitutes should be investigated. These substances shall not be supplied in any products without prior reporting to, and acknowledgement from Federal-Mogul.

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RESTRICTED WITH THRESHOLD:

Substances designated as “Restricted with Threshold” may not be desirable in some applications above the stated threshold content limit. Future prohibition is possible. Technically and economically feasible substitutes should be investigated. These substances shall not be supplied in any products above the stated threshold content limit without prior reporting to, and acknowledgement from Federal-Mogul. Suppliers need not report such substances at or below the stated threshold content limit.

REPORTABLE:

Substances designated as “Reportable” are of health, environmental, and/or performance interest and shall not be supplied in any products without prior reporting to, and acknowledgement from Federal-Mogul.

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

SENSITISERS:

Substances which have been identified as confirmed or potential sensitisers 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 sensitisers 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 sensitising 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

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APPENDIX 2

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. 78/319/EEC 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 Agents
11. 83/264/EEC Tris (Aziridiny) Phosphin oxide & 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. 83/478/EEC Restrictions on Marketing and use of Asbestos
21. 92/2455/EEC Council regulations on import / export of dangerous substances 94/3135/EEC
22. 91/549/EEC Council regulations on substances that deplete the ozone layer
23. 94/3093/EEC Italian Regulations
24. 89/677/EEC List of carcinogenic and mutagenic materials 94/60/EEC
25. 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

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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 & Safty 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

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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 marchandis Dangereuses
CEFIC	European Council, Chemical Manufacturers Federation
OECD	Organisation for Economic Co-operation and Development
IMO	International Maritime Organisation

o) **COMPANY SPECIFICATIONS**

Nissan Engineering Standard N.E.S. MO0301 [200-N]

Ford W.S.S. – M99 P.9999 – A1

Nedcar VC04556

Renault – 00-10.050/-C

Daimler Chrysler CS-9003 change E.

BMW SNR817512. /S11389.0 Part 2.

Volkswagen A.G. V.W91101

Delphi 10949001

General Motors GMW3059

VDA 232-101

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1. NOTES FOR THE USER ON THE INFORMATION IN TABLE 1

Substance	The column contains chemical compounds or substance groups, respectively. Substance groups are normally referred to by their root substance.
CAS No.	Chemical Abstracts Services, numbering system for chemicals. For the groups of chemicals compounds (e.g. benzidine or its salts) the CAS No. of the root chemical is noted.
Concentration	For “prohibited substances” the maximum concentration of the specified substance allowed to be present in a material is noted. “Declarable substances” have to be reported if their concentration exceeds the specification above. The actual concentrations have to be reported in each case.
Type	See definition in Appendix 1.
Danger/Risks	Remarks on classification according to chemical legislation or concerning usage in materials of cars and / or car manufacturing
Source	Listed here are laws, regulations and rules containing usage prohibitions or restrictions. Supplementary and amendment directives should also be observed.
Application Affected And Comments	The examples show typical automotive related usage for environmentally relevant hazardous substances. Substances contained in construction materials and substances used during production, which can be present as residues, are listed as well. This column contains information on detailed usage prohibitions and specific details, including industry specific restrictions.
Threshold	<p>For Prohibited substances the level should be as stated otherwise it should not be present in quantities greater than trace levels as established by industry best practice or the applicable regulation.</p> <p>For restricted substances a general level of 0.1% is applicable unless a specific level is shown.</p>

RESTRICTED SUBSTANCE MANAGEMENT STANDARD

2. ABBREVIATIONS USED

C_x^{*}) Carcinogenic, classification according to EU-D 67/548/EEC or TRGS 905

M_x^{*}) Mutagenic, classification according to EU-D 67/548/EEC or TRGS 905

R_{EX}^{*}) Substances which are embryotic (EU-D 67/548/EEC or TRGS 905)

R_{FX}^{*}) Substances which affect the fertility (EU-D 67/548/EEC or TRGS 905)

T Toxic (EU-D 67/548/EEC)

T+ Very toxic (EU-D 67/548/EEC)

TRGS Technical rules for hazardous substances

*) X = 1 proven to affect humans; effect known
X = 2 proven to affect animals; effects apply to humans as well
X = 3 supposed effects of the substances on man

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
1	Acetaldehyde	75-07-0		Restricted	C3		All products
2	Acetamide	75-07-0	EU directive 67/548/EEC	Restricted	C3		All products
3	Acrylamide	79-06-1	EU directive 67/548/EEC	Restricted	C2,M2	0.01%	All products
4	Acrylonitrile	107-13-1	EU directive 67/548/EEC	Restricted	C2	0.01%	
5	Alkylphenol ethoxylates			Prohibited			Detergents and cleaners
6	4-Aminobiphenyl and its salts	92-57-7	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	C1	0.10%	All products
7	Ammonia emitting substances	(7664-41-7)		Restricted			All products
8	Aniline and its salts	(62-53-3)	EU directive 67/548/EEC	Restricted	(C3)		All products
9	Antimonytrioxide (Diantrimonytrioxide)	1309-64-4	EU directive 67/548/EEC	Restricted	C3		All products
10	Aromatic amines or their salts: 4-Aminobiphenyl or its salts Benzidine or its salts 2-Naphthylamine or its salts 4-Nitrobiphenyl or its salts	(92-67-1) (92-87-5) (91-59-8) 92-93-3	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	C1		All products
11	Arsenic or its compounds	(7440-38-2)	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	T		All products
12	Asbestos	various	EU directive 76/769/EEC	Prohibited	C1	not detectable	All products
13	Azo-dyes as defined by TRGS 614 containing carcinogenic amine components			Prohibited	C1-2		All products
14	Barium Compounds (organic or water soluble) except Ba-carboxylate or sulphate	(7440-39-3)	EU directive 67/548/EEC	Restricted	X _n		All products
15	Benzene (free)	73-43-2	EU directive 76/769/EEC	Restricted	C1,M2		All products
16	Benzidine and its salts	92-87-5	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	C1	0.10%	All products
17	Beryllium or Beryllium alloys	(7440-41-7)	EU directive 67/548/EEC	Restricted	C2		All products
18	Beryllium salts or -oxides	(7440-41-7)	EU directive 67/548/EEC	Restricted	C2		All products
19	Biocides (see Definitions Appendix)	various		Reportable			All products
20							Triorganotin and organoarsenic biocides are subject to more stringent control (see below)
21	Organoarsenic compounds			Prohibited		0.01%	All products
22	Trialkyl- and Triaryltin compounds (triorganotin compounds)	(triorganotin)	EU directive 76/769/EEC	Restricted		0.05%	All products

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
23	Bis(chloromethyl)ether [BCME]			Prohibited			All products, includes BCME formed from precursors such as formaldehyde and hydrogen chlorine
24	Brominated flame retardants (organic compounds); note separate entries for PBBs and PBDEs			Restricted			All products
25	Butadiene (1,3 - Butadiene)	106-99-0	EU directive 67/548/EEC	Restricted	C2	0.01%	All products
26	Cadmium and its compounds	7440-43-9	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	C2		All products, except Cadmium in batteries for electric vehicles and batteries for facility based equipment
27	Carbon black			Restricted			Exempt from reporting requirements when present in "Articles". (see Appendix 1 "Definitions")
28	Carbon disulphide (free)			Restricted			All products
29	Carbon tetrachloride			Prohibited			All products
30	Carcinogenic substances			Restricted			All products
31	Chlorofluorocarbons (CFCs)			Prohibited			All products, includes halocarbon/ CFC blends; except for the applications listed below:
				Restricted			CFCs used to service existing equipment, where legally permitted
32	Chlorinated hydrocarbons (free) - see separate entries for Dichloromethane, Perchloroethane (trichloroethylene) Trichloromethane (chloroform) and Chlorinated paraffins.	various	EU directive 67/548/EEC EU directive 76/769/EEC	Restricted	C3		All products
33	Chlorinated paraffins (chloroalkanes) (defined as: Liquid or solid chlorinated products or paraffins with a chain length of more than 6 carbon atoms and a chlorine content between 15 to 70%)	various		Prohibited			Petroleum products, e.g. oils, lubricants and metal working fluids
				Prohibited			All other products including flame retardants and plasticizers
				Restricted			All products
34	Chloroaniline	106-47-8	EU directive 67/548/EEC	Restricted	(C2)	0.01%	All products
35	1-Chloro-1,3 -epoxy-propane	106-89-8	EU directive 67/548/EEC	Restricted	C2	0.00%	All products

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
36	Chromium, hexavalent (Cr6+) compounds	14977-61-8	EU directive 67/548/EEC EU directive 2000/53/EEC	Prohibited	C2	0.01%	All products, except those separately listed below:
				Prohibited			Anodic electrocoat approved in non-dimensional materials, for internal use only
				Prohibited			All other products, except those with corrosion protection coatings (not exceeding 0.01% Cr6+ content)
				Restricted			All products unless otherwise prohibited
37	Chromium, trivalent (Cr3+)			Reportable			All products
38	Cobalt or Cobalt compounds; C0 alloys	(7440-48-4)		Restricted	C3		All products
39	Copper			Reportable			All products including copper alloys
40	Diamino-diphenyl-methane (4,4'-Diaminodiphenylmethane)	(101-77-9)	EU directive 67/548/EEC	Restricted	C2		All products
41	Dichloromethane (methylene chloride)			Restricted			All solvent uses (including surface coating removal and degreasing), aerosol propellant, blowing agent
42	Dichloropropanole (1,3-Dichloropropanole)	96-23-1	EU directive 67/548/EEC	Restricted	C2		All products
43	Di-(2-ethyl)hexylphthalate (DEHP), see as well DOP)	117-81-7		Restricted			All products
44	Di-u-oxo-di-n-butystannohydroxborane (DBB) see Tin organic compounds		EU directive 76/769/EEC	Prohibited			All products
45	Dimethylformamide (free)			Restricted			All products
46	DOP (Di-octyl-phthalate) s. DEHP (Di-(2-ethyl-hexylphthalate)			Restricted			All products
47	Ecotoxic substances			Restricted			All products
48	Epichlorhydrine see 1-Chloro-2,3-epoxy-propane						All products
49	Ethyl-/Methyl-Glycols or their acetates e.g Ethyleneglycol-ethyletheracetate, Ethyleneglycol-methylether	111-15-9 109-86-4	EU directive 67/548/EEC	R _{F2} , R _{E2}			All products
50	Fibres, mineral and synthetic			Restricted			All products containing fibres or fibrils 5 µm (microns), or less, in diameter with a length: diameter ratio equal to or greater than 3:1. Asbestos fibres - see separate entry above
51	Formaldehyde	50-00-0	EU directive 67/548/EEC		C3		All products
52	Formaldehyde (free)			Restricted		10 mg/kg	Interior trim (by weight on finished parts)

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
53	Halons		EU regulation 594/91/EEC	Prohibited			All products
54	Hexachlorobutadiene			Prohibited			All products
55	Hexamines			Restricted		0.20%	Interior trim (by weight on finished parts)
56	n-Hexane			Restricted		1.00%	All products except gasolines
57	Hydrazine	302-01-2	EU directive 67/548/EEC	Restricted	C2	0.01%	All products
58	Hydrobromofluorocarbons			Prohibited			All products
59	Hydrochlorofluorocarbons (HCFCs)			Prohibited			Solvent, blowing agents and all vehical applications, except for servicing vehicles produced prior to December 2001 (where legally allowed)
				Restricted			All other products containing or manufactured using HCFCs, includes R-22
60	Hydrofluorocarbons (HFCs)			Prohibited			All on-board vehicle applications except for refrigerants
				Restricted			All refrigerant applications
				Reportable			All non-vehicle applications
61	Hydrogen Sulphide emitting substances	06/04/7783		Restricted	T+		All products
62	Lead and its compounds	7439-92-1	EU directive 67/548/EEC EU directive 2000/53/EEC	Prohibited			All products, except facility based equipment and those separately listed below:
				Prohibited			Electrocoat
				Prohibited		0.35%	Steel alloy (including galvanized steel)
				Restricted		0.09%	Steel alloy (including galvanized steel)
				Prohibited		0.40%	Aluminium alloy except Aluminium wheels, engine parts, window levers and copper alloy
				Restricted		0.05%	Aluminium alloy including aluminium wheels, engine parts, window levers
				Prohibited		4.00%	Aluminium wheels, engine parts, window levers and copper alloy
				Restricted		0.05%	Aluminium wheels, engine parts, window levers and copper alloy
				Prohibited			Exterior coated fuel tanks and filler necks
				Restricted			Wheel weights, coatings inside fuel tanks, vibration dampers, vulcanizing agent for fuel or high pressure hoses, solder in electronic circuit boards and other electronic applications, batteries, lead / bronze bearing-shells and brushes

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
63	Mercury and its compounds		EU directive 67/548/EEC EU directive 2000/53/EEC	Prohibited	T		All products except bulbs, e.g. High Intensity Discharge (HID) lamps, and instrument panel displays, e.g. Cold Cathode Fluorescent Tubes (CCFT), and the following facility-based equipment: batteries, thermometers, thermostats, pressure sensing equipment and fluorescent lighting systems
				Restricted			Bulbs and instrument panel displays
64	Methylacrylamidomethoxy-acetate	77402-03-0	EU directive 67/548/EEC	Restricted	C2, M2	0.01%	All products
65	Methyl bromide			Prohibited			All products
66	Methyl chloroform (1, 1, 1-trichloroethane)			Prohibited			All products
							All products
67	4, 4'-Methylenedianiline (4, 4'-Diaminodiphenylmethane)			Prohibited		0.10%	All products when present in the unreacted state
68	Mineral fibres - see 'Fibres, mineral and synthetic'				Cx		All products
69	Monoethylene glycol ethers / acetates (free)			Restricted			All Products
70	Mono- and Dialkyle-Tin compounds			Prohibited			All products
71	Monomethyldibromodiphenyl-methane	99688-47-8	EU directive 67/548/EEC	Prohibited			All products
72	Monomethyldichlorodiphenyl-methane	81161-70-8	EU directive 67/548/EEC	Prohibited			All products
73	Monomethyltetrachlorodiphenyl-methane	76253-60-6	EU directive 67/548/EEC	Prohibited			All products
74	Mutagenic substances			Restricted			All products
75	2-Naphthylamine and its salts	91-59-8	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	C1	0.10%	All products
76	Nickel and its compounds	7449-20-0	EU directive 76/769/EEC	Restricted	C3		All products except stainless steels and alloys containing metallic nickel
				Restricted		0.5 ug/cm ² / week (Ni release rate threshold)	Component surfaces likely to be routinely touched, e.g. handles and buckles (release rate as determined by test method EN1811:1998c). Phosphated surfaces are exempted
77	Nitrites (cancer causing and Nitrosamine forming) see "Nitrosamines"		EU directive 67/548/EEC	Restricted			All products

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
78	4-Nitrobiphenyl and its salts	92-93-3	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited	C2	0.10%	All products
79	N-nitrosamines / N-nitrosamides			Prohibited			All products; includes N-nitrosamines and N-nitrosamides formed from precursors such as nitrites and amines / amides
				Restricted			All products
80	Ozone depleting substances - see Carbon tetrachloride, CFCs, Halons, HBFCs, HCFCs, Methyl bromide and Methyl Chloroform	various		Prohibited			All products
81	Pentachlorophenol (PCP) or its compounds	(87-86-5)	EU directive 67/548/EEC EU directive 76/769/EEC	Prohibited		0.01% in products	All products
82	Perchloroethane (tetrachloroethylene)			Restricted			All solvent uses (including degreasing and cleaning)
83	Perfluorocarbons (PFCs: Gaseous)			Prohibited			Open systems (a system where under normal working conditions a leakage rate above 1% per year occurs)
				Restricted			Closed systems (a system that is normally hermetically closed)
84	Phenol (free)	108-95-2	EU directive 67/548/EEC	Restricted	T	0.01%	All products
85	Phenylendiamine	25265-76-3					All products
86	Phenyl - 2-naphthylamine			Prohibited		0.10%	All products
87	Phthalates			Reportable			All products except for those separately listed below:
88	Butylbenzyl phthalate (BBP)			Restricted			All products
89	Dibutyl phthalate (DBP)			Restricted			All products
90	Di (2-ethylhexyl) phthalate (DEHP)			Restricted			All products
91	Diisononyl phthalate (DINP)			Restricted			All products
92	Polyaromatic hydrocarbons (PAHs)	various		Prohibited		3% (total)	Petroleum mineral oil base stocks in lubricants. PAH content as determined by Institute of Petroleum test method 346c
93	Polybrominated biphenyls (PBBs)	59536-65-1	EU directive 76/769/EEC	Prohibited		0.00%	All products
94	Polybrominated diphenylethers (PBDEs)			Prohibited			All products except those containing Decabromodiphenyloxyde
				Restricted			Products containing Decabromodiphenyloxyde
95	Polybrominated Terphenyls (PBT)						All products
96	Polychlorinated biphenyls (PCBs)	1339-39-3	EU directive 76/769/EEC	Prohibited		0.00%	All products
97	Polychlorinated terphenyls (PCTs)	61788-33-8	EU directive 76/769/EEC	Prohibited		0.00%	All products
98	Polyvinylchloride (PVC)			Reportable			All products
99	Products of endangered species			Prohibited			All products

Table 1

Item Number	Substance	CAS number	Source	Type of Restriction	Danger/risk	Threshold (not to be exceeded)	Applications affected / Comments
100	Radioactive substances			Restricted			All products
101	Reproductive toxicants			Restricted			All products
102	Sensitizing substances			Restricted			All products
103	Sodiumazide	26628-22-8	EU directive 67/548/EEC	Restricted	T+		All products
104	Styrene (Vinyl benzene)	100-42-5	EU directive 67/548/EEC	Restricted			All products
105	Styrene oxide (Epoxy styrene)	96-09-3	EU directive 67/548/EEC	Restricted	C2		All products
106	Sulphur hexafluoride			Prohibited			Open systems (a system where under normal working conditions a leakage rate above 1% per year occurs), e.g. tyre inflation gas
				Prohibited			Processing (casting) of Magnesium
				Restricted			Closed systems (a system that is normally hermetically closed), e.g. electrical installations
107	Thallium or its compounds	7440-28-0	EU directive 67/548/EEC		T		All products
108	Toluene diisocyanate (All isomeric monomers)			Restricted		0.10%	All products containing unreacted monomer
109	Toluidine (o-Toluidine)	(95-53-4)	EU directive 67/548/EEC	Restricted	C2		All products
110	Trialkyl-and Triaryl tin compounds (triorganotin compounds) - see 'Biocides'						All products
111	Trichloroethene			Restricted			All solvents uses (including degreasing and cleaning) and heat transfer fluids
112	Trichloromethane (chloroform)			Restricted		0.10%	All products, except laboratory reagents
113	Trichlorophenol or its salts (2,4,6 - Trichlorophenol)	(88-06-2)	EU directive 67/548/EEC	Restricted	(C3)		All products
114	Trichloropropane (1,2,3 - Trichloropropane)	96-18-4	EU directive 67/548/EEC	Restricted	X _n		All products
115	Trimethylphosphate or related compounds	(512-56-1)	EU directive 76/769/EEC	Restricted			All products
116	Tris (1-aziridiny) phosphate oxide			Prohibited			All products
117	Tris (2,3-dibromopropyl) phosphate [TRIS]			Prohibited			All products
118	Vinyl chloride (monomer)	75-01-4	EU directive 67/548/EEC	Prohibited		0.00%	All products

**MATERIALS ANALYTICAL SERVICES (MAS)
METHOD FOR QUANTIFICATION OF TREMOLITE CONTAMINATION IN
RAW WOLLASTONITIE**

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.

MATERIALS ANALYTICAL SERVICES (MAS) METHOD FOR QUANTIFICATION OF TREMOLITE CONTAMINATION IN RAW WOLLASTONITE

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.

**MATERIALS ANALYTICAL SERVICES (MAS)
METHOD FOR QUANTIFICATION OF TREMOLITE CONTAMINATION IN
RAW WOLLASTONITIE**

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".

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METHOD FOR QUANTIFICATION OF TREMOLITE CONTAMINATION IN
RAW WOLLASTONITE**

- 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 wollastonite 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 (HNO₃) 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

MATERIALS ANALYTICAL SERVICES (MAS)
METHOD FOR QUANTIFICATION OF TREMOLITE CONTAMINATION IN
RAW WOLLASTONITIE

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.

**MATERIALS ANALYTICAL SERVICES (MAS)
METHOD FOR QUANTIFICATION OF TREMOLITE CONTAMINATION IN
RAW WOLLASTONITIE**

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. Care 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).

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RAW WOLLASTONITIE**

- 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.

REPEATABILITY AND REPRODUCIBILITY STUDY

Data Sheet

	1	2	3	4	1	2	3	4
Micropist	A – Darrell Duncan				B – Paul Hess			
Sample No.	1 st Trial	2 nd Trial	3 rd Trial	Range	1 st Trial	2 nd Trial	3 rd 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

Max X _{Diff}	0.1738
Min X _{Diff}	0.0977
X _{Diff}	0.0761

UCL _R	0.1084
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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: $(R_{Avg}) \times (D_4) = UCL_R$. 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 REPRODUCIBILITY STUDY

Sample No(s): 6, 7, 8, 10, 13
 Sample Description: NYAD G Raw Wollastonite

Date: 20-Mar-03

Project No: M30509
 Performed by: Stewart Michels

From Data Sheet:

R _{Avg}	
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X _{Diff}	
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MEASUREMENT UNIT ANALYSIS

Repeatability – Equipment Variation (EV)

$$EV = (R_{AVG}) \times (K_1)$$

No. of Trials	K ₁
2	4.56
3	3.06

$$\% EV = 100[(EV)^2 \div (R \& R) \times (TOLERANCE)]$$

EV	0.13
----	------

TOLERANCE	10%
-----------	-----

% EV	0.54
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Reproducibility – Appraiser Variation (AV)

$$AV = (X_{DIFF}) \times (K_2)$$

No. of Micropists	K ₂
2	3.65
3	2.70

$$\% AV = 100[(AV)^2 \div (R \& R) \times (TOLERANCE)]$$

EV	0.28
----	------

TOLERANCE	50%
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% AV	12.60
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Repeatability and Reproducibility (R & R)

$$R \& R = \sqrt{[(EV)^2 + (AV)^2]}$$

R & R	0.31
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$$\% R \& R = (\% EV) + (\% AV)$$

% R & R	13.14%
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NOTE: All calculation are based upon predicting 5.15σ (((% of the area under the normal curve)