

Developing  
Common Core Criteria  
*for Paints*

*Final Report submitted to*  
Global Eco-labeling Network  
(GEN)

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# 1. Background

Eco-labeling acceptance has been growing worldwide as a market based instrument to promote pollution prevention and sustainability. Currently there are more than 40 such programs from most part of the world. Of them, twenty-five (25) eco-labeling organizations have joined the international association, the Global Eco-labeling Network (GEN).

Because each program is being implemented in a way that reflects domestic environmental priority, full international harmonization is not occurring, thus raising concerns as a potential unnecessary barrier to trade. There is a need from many national eco-labelling programs to develop mutual recognition for a more sustainable production of products and international trade facilitation.

# 2. Objective

The goal for the project is to develop mutual recognition agreements among the Asian country Eco-labelling programs, through the development of common Eco-labelling criteria. Paints have been identified as one of the products for which Common Core Criteria will be developed. The project is the first regional co-operation in Asia and is expected to create more collaboration about eco-labelling in the region.

# 3. Common Core Criteria

## 3.1 Scope

The criteria apply to:

1. Water-based paints and varnishes
  - 1.1 Emulsion paints
  - 1.2 Others
    - 1.2.1 Water-soluble paints
    - 1.2.2 Water-dispersing paints
    - 1.2.3 Water-slurry paints
2. Solvent-based paints and varnishes

## 3.2 Definitions

The following definitions apply within the scope of the product group:

1. Emulsion paint  
Paint, which uses emulsion resin incorporated with hydrophilic polymer, ion group or emulsifier. Major agents are emulsified organic or inorganic binders.
2. Water-soluble paint  
Paint, which uses water-soluble resin or binder that have hydrophilic functional group.

3. Water-dispersing paint  
Paint, which uses water-dispersing resin or binder dispersed in coating material.
4. Water-slurry paint  
Paint, which uses organic or inorganic binders with the size bigger than 1.0  $\mu\text{m}$
5. Solvent-based paint  
Paint, which uses organic compounds as solvent, including those not using solvent.
6. Volatile Organic Compound (VOC)  
Any hydrocarbon with, at standard conditions for pressure, a boiling point lower or equal to 250°C, using ISO 11890-1 or 11890-2 test methods.

### 3.3 Core Criteria

#### 1. Volatile organic compounds content (VOC)

Maximum VOC depends on the product:

Product	VOC
Emulsion paints	shall not exceed 50 g/l
Other water-based paints and varnishes	shall not exceed 100 g/l
Solvent-based paints and varnishes	shall not exceed 380 g/l

*Compliance Verification:*

1. The applicant shall declare compliance with the requirement and present the test report according to the test method under ISO 11890-1, ISO 11890-2, ISO/DIS 17895, ASTM D 3690 or the national standard if available. OR
2. The applicant shall submit a test report, according to the test method under ISO 11890-1, ISO 11890-2, ISO/DIS 17895, ASTM D 3690 or the national standard if available, done by either third party or manufacturer itself who receives ISO 17025 certification or national accreditation system. Sampling of 5 colors – red, blue, white, yellow and black shall be carried out.

*Note:*

1. ISO 11890-1: Paints and varnishes – Determination of VOC content – Part I: Difference method
2. ISO 11890-2: Paints and varnishes – Determination of VOC content – Part II: Gas-chromatographic method
3. ISO 17895: Paints and varnishes – Determination of VOC content – content of low-VOC emulsion paints (in-can VOC)

## 2. Heavy Metals

Ingredients (substances or preparations) used in the formula shall not contain the following heavy metals:

- mercury,
- lead,
- cadmium,
- hexavalent chromium,
- arsenic,
- antimony

Triphenyl tins (TPT) and Tributyl tins (TBT) shall not be used.

Ingredients may however contain impurities or traces deriving from raw materials. The sum of mercury, lead, cadmium and hexavalent chromium shall not exceed 0.1% (1,000 ppm) by weight.

### *Compliance Verification:*

1. The applicant shall submit a test report, according to the test method under ISO 3856-1 or ASTM D 3335 for lead, ISO 3856-4 or ASTM D 3335 for cadmium, ISO 3856-5 for hexavalent chromium, and ISO 3856-7 or ASTM-D 3624 for mercury. Sampling of 5 colors – red, blue, white, yellow and black shall be carried out.
2. To verify the absence of arsenic, antimony, TBT, and TPT, the applicant shall declare compliance with the requirement and present the test report according to the test method under ISO or the national standard if available.

### *Note:*

1. ISO 3856-1: Determination of lead content – Flame atomic absorption spectrometric method and dithizone spectrophotometric method
2. ISO 3856-4: Determination of cadmium content – Flame atomic absorption spectrometric method and polarographic method
3. ISO 3856-5: Determination of hexavalent chromium content of the pigment portion of the liquid paint of the paint in powder form – Diphenylcarbazide spectrophotometric method
4. ISO 3856-7: Determination of mercury content of the pigment portion of the paint and of the liquid portion of water-dilatable paints – Flameless atomic absorption spectrometric method

## 3. Aromatic Hydrocarbons

Aromatic hydrocarbons shall not be used as solvent.

Product	Contamination by weight
Emulsion paints	shall not exceed 0.1%

Other water-based paints and varnishes	shall not exceed 1%
Solvent-based paints and varnishes	shall not exceed 5%

*Compliance Verification:*

The applicant shall submit a test report, according to the test method under ASTM D 3257 or the national standard if available. Sampling of 5 colors – red, blue, white, yellow and black shall be carried out.

*Note:*

ASTM D 3257: Standard Test Methods for Aromatics in Mineral Spirits by Gas Chromatography

#### **4. Halogenated Hydrocarbons**

Halogenated hydrocarbons shall not be used.

*Compliance Verification:*

The applicant shall declare compliance with the requirement and present the test report according to the test method under ASTM D 4457 or the national standard if available.

#### **5. Formaldehyde**

Formaldehyde shall not be used.

*Compliance Verification:*

The applicant shall declare compliance with the requirement and present a self-declaration by the manufacturer.

#### **6. Packaging material**

Lead shall not be contained in metal containers.

*Optional:*

1. Plastic identification symbol shall be used on plastic containers by each program to facilitate recycling activities.
2. Returnable can

*Compliance Verification:*

The applicant shall declare compliance with the requirement and present the sample or declaration from the manufacturer.

## **Annex: About this Study**

### **A1. Paints and their Environmental Impact**

Paint means a pigmented coating material, in liquid or in paste or powder form, which when applied to a substrate, forms an opaque film having protective, decorative or specific technical properties. After application, paint dries to a solid, adherent and protective, coating. Paint is a simple mixture of ingredients including pigments, a binder and a diluent or thinner (in latex paint it is water; in solvent paints, it is a petroleum solvent).

Paints are products manufactured from a wide range of organic and inorganic materials. They can contain components, which can impact adversely on the environment at different stages of the product's life cycle. The life-cycle assessment carried out by the expert task group concluded that the most significant environmental aspects of the life cycle of paint concerned:

- Release of solvents, heavy metals and other toxic substances used in their manufacture
- Release of solvents, heavy metals and other toxic substances during the life of a paint
- Coating and in its removal and disposal.

The Eco-labelling criteria developed for paints aim in particular at:

1. The efficient use of the product and the minimization of waste,
2. Reducing the environmental and other risks (such as tropospheric ozone) by reducing solvent emissions,
3. Reducing discharges of toxic or otherwise polluting substances into waters.

### **A2. Study Methodology**

The study consisted of;

- Status Review for various Eco-labelling programs was conducted and the eco-labelling criteria for the product paint were then reviewed within each eco-labelling program by the literature review.
- Additional information collection through interviews/email communication

#### **1. Status Review for Paint Eco-labels**

The Eco-labelling criteria for these two types of paints were reviewed from countries around the world, viz., Korea, Thailand, Taiwan, Japan, Australia, New Zealand, Germany, European Union, Netherlands and Canada and India.

The information was gathered mainly from the Global Eco-labelling Network website. (<http://www.gen.gr.jp/eco.html>). From this web portal, the individual websites for the eco-labeling program for different countries were reviewed. These programs included;-

- The Australian Ecolabel: <http://www.aela.org.au/StandardsRegister.htm>

- Blue Angel (Germany): [http://www.blauer-engel.de/englisch/navigation/body\\_blauer\\_engel.htm](http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm)
- Ecomark Scheme (India): <http://envfor.nic.in/cpcb/>
- Eco Mark (Japan): <http://www.jeas.or.jp/ecomark/english/nintei.html>
- Environmental Choice New Zealand: [http://www.enviro-choice.org.nz/published\\_criteria.html](http://www.enviro-choice.org.nz/published_criteria.html)
- Environmental Choice Program (Canada): <http://www.environmentalchoice.com/guidelines/guide.cfm?content=Guidelines&Name=>
- Environmental Labelling Program (Korea): <http://www.kela.or.kr/english/>
- Green Label Program (Thailand): [http://www.tei.or.th/Program\\_Projects/bep/GL\\_Home\\_Related/GL\\_home.htm](http://www.tei.or.th/Program_Projects/bep/GL_Home_Related/GL_home.htm)
- Green Mark Program [R.O.C.(Taiwan)]
- Milieukeur (the Netherlands): <http://www.milieukeur.nl/english/>
- EU Eco-Label Scheme (including Denmark and UK): <http://europa.eu.int/comm/environment/ecolabel/producers/productgroups.htm>

In addition a number of other related websites were reviewed to collect the necessary background technical information. These have been cited under the [References](#).

## **2. Contact / interview**

In order to get more information regarding the technical background and the environmental aspects of paints the members were contacted by e-mail with specific queries. Some personal telephonic interviews were also made to get more information on the background of developing eco-labelling criteria.

The summary of information from different eco-labelling programs is compiled in a tabular form and is attached in the Annex 1.

## **A3. Common Elements and their Importance for Quality and Environment**

Upon reviewing the criteria for individual eco-label programs, a number of common elements were identified. This has been summarized as below.

### **1. Volatile Organic Compounds (VOCs)**

VOCs are mixed in paint as additives. Additives impart a variety of properties including flow, stability, defoaming, mildew resistance and viscosity. Additives are often used as “improvers” to a basically satisfactory paint. The amount of

solvents and other chemicals used in paints varies across the different types of paints. Some are solvent based and contain a large proportion of solvent, hence more VOC values; other are water based and contain less solvent hence less VOC values.

Volatile organic compounds used to describe solvents and other chemicals in paint, which evaporate during use, are the main contributors to adversely affect the environment. When released into the atmosphere, VOCs react with nitrogen oxide to form ozone, one of the main components of air pollution, particularly summer-time smog. VOCs also have impact on the human health as they cause damage to the human nervous system, blood, and kidneys, when exposed over a long period of time.

The threshold values of VOCs under the various eco-labeling schemes, when reviewed for the countries mentioned earlier, showed a range of values from:

<b><u>For Water based paints: -</u></b>	<b><u>50 g/l to 150g/l</u></b>
<b><u>For Solvent based paints: -</u></b>	<b><u>300g/l to 380 g/l</u></b>

## 2. Heavy Metals

Metals were used in paint manufacturing for different reasons. The metals to be **excluded** from paints in the manufacturing stage were reviewed from the countries mentioned and included: -

- **Mercury:** Mercury was added as biocide but Exposure to these metals either through respiration or direct contact results in long-term health effects, increasing with accumulated exposure.
- **Lead:** Lead was added in the paint as it provided paint drying, and corrosion resistance. But lead has severe health effects on the human health and hence their addition to paints has been reduced in recent years. Lead can affect almost every organ and system in human body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the immune system. The effects are the same whether it is breathed or swallowed.
- **Arsenic:** It is used in paints as a preservative. Inorganic arsenic is a human poison. Organic arsenic is less harmful. Arsenic damages many tissues including nerves, stomach and intestines, and skin. Breathing high levels can give you a sore throat and irritated lungs.
- **Cadmium:** Cadmium is another heavy metal, which has a severe effect on the human health. Breathing **high levels** of cadmium severely damages the lungs and can cause death. Eating food or drinking water with **very high levels** severely irritates the stomach, leading to vomiting and diarrhoea.
- **Hexavalent Chromium:** It is used in pigments in paints. These Cr(VI) compounds have been found to be carcinogenic in humans and hence their addition to the paint preparation is prohibited by most of the eco-labelling programs.
- **Antimony:** Antimony is used in paint as pigment. Exposure to antimony at high levels can result in a variety of adverse health effects. Hence its

use in paints preparation is prohibited by most of the eco-labelling programs mentioned earlier.

### 3. Aromatic Hydrocarbons

Volatile aromatic hydrocarbons are used as solvents in paints. These aromatic hydrocarbons have severe effects on the human body and the environment. They have a severe effect on the reproductive system and hence their **use is prohibited** by most of the eco-labelling programs around the world.

### 4. Halogenated Hydrocarbons

Halogenated hydrocarbons are known to be ozone-depleting substances and are toxic to human health. Hence it **shall not be used as a solvent in water-based paints**. But in solvent-based paints the amount of halogenated hydrocarbons should be limited taking into consideration the local laws and regulation.

### 5. Use of Preservatives

Formaldehyde was used in paint as the biocide to prevent degradation of the paint. Formaldehyde is a colourless, strong-smelling gas. **Formaldehyde** has severe effects on the human health, and as it is a carcinogenic substance **it shall not be used** in paint.

### 6. Packaging materials

The packaging material also contributes to the environmental pollution as the packaging material contains plastic material. In order to reduce the environmental pollution **recyclable material** is used by most of the eco-labelling programs around the world.

## A4. Important Considerations for Developing Common Core Criteria

Upon reviewing individual programs, following common elements have been identified and hence, Common Core Criteria for the product category of paints shall focus on:

- Volatile Organic Compounds
- Exclusion of heavy metals in paints such as Antimony, Arsenic, Cadmium, Hexavalent Chromium, Lead, Mercury
- Aromatic Hydrocarbons
- Halogenated hydrocarbons
- Use of Biocides in Paints
- Packaging material

In addition, a few programs have included following important elements

- Carcinogens
- Mutagens
- TiO<sub>2</sub>

The above also may be considered; as they are important have impact on the environment as well as human health.

*Note: It might be essential to review the proposed common core criteria periodically. As such, the following proposed core criteria could be applicable for a period of say 2 –3 years as agreed by all the members.*

## **A5. References**

- The Australian Ecolabel: <http://www.aela.org.au/StandardsRegister.htm>
- Blue Angel (Germany): [http://www.blauer-engel.de/englisch/navigation/body\\_blauer\\_engel.htm](http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm)
- Ecomark Scheme (India): <http://envfor.nic.in/cpcb/>
- Eco Mark (Japan): <http://www.jeas.or.jp/ecomark/english/nintei.html>
- Environmental Choice New Zealand: [http://www.enviro-choice.org.nz/published\\_criteria.html](http://www.enviro-choice.org.nz/published_criteria.html)
- Environmental Choice Program (Canada): <http://www.environmentalchoice.com/guidelines/guide.cfm?content=Guidelines&Name=>
- Environmental Labelling Program (Korea): <http://www.kela.or.kr/english/>
- Green Label Program (Thailand): [http://www.tei.or.th/Program\\_Projects/bep/GL\\_Home\\_Related/GL\\_home.htm](http://www.tei.or.th/Program_Projects/bep/GL_Home_Related/GL_home.htm)
- Green Mark Program (R.O.C.(Taiwan))
- Milieukeur (the Netherlands): <http://www.milieukeur.nl/english/>
- EU Eco-Label Scheme (including Denmark and UK): <http://europa.eu.int/comm/environment/ecolabel/producers/productgroups.htm>
- ICI paints: <http://www.icipaints.com/ie/indexflash.htm>
- Benjamine Moore Company: <http://www.benjaminmoore.com>
- Environmental Issues: <http://environment.about.com/>
- ASTM standards worldwide: <http://www.astm.org/>



## A6. Table of Paints Criteria from different countries

ENVIRONMENTAL CRITERIA	COUNTRIES										
	AUSTRALIA	CANADA	EU	GERMANY	INDIA	JAPAN	KOREA	Nether lands	NEW ZEALAND	TAIWAN	THAILAND
Amount of VOCs in solvent based paints	<300 g/l	-	<30g/l for class 1 paint <200g/l for class 2 paints	< 700 ppm	<380 g/l	-	<380 g/l	-	< 300 g/l	-	-
Amount of VOCs in water based paints	Undercoats <70g/l Interior Low Sheen, Exterior Low Sheen <70g/l Interior Flat, Exterior Flat 70g/l Interior Semigloss, Exterior Semigloss <90g/l Interior Gloss, Exterior Gloss < 90g/l Sealers, Primers <	< 200 g/l	-	-	< 5%	-	< 50 g/l	< 75 g/l	< 100 g/l	< 100 g/l	150 g/l (interior paints), 200 g/l (exterior paints)

	90g/l  Other (eg wood stains, clear varishes, texture coatings, fillers, surfacers, plasters, waterbased epoxy coatings, high solids industrial coatings) <100g/l										
Amount of aromatic hydrocarbons	<25%/w of hydrocarbon solvents, based on the total formulation  Aromatic HC solvents not to be used	Not to be used	< 0.2% for class 1 paints  < 0.5% for class 2 paints	-	- Not to be used in water-based  - < 10% by weight in solvent-based	Not to be used as solvent	<25%/w	Ethylene glycol as raw material not to be used  Volatile aromatic carbohydrates < 0.5% (m/m)	< 5% by weight  no ethylene glycol to be manufactured	Not contained	Not to be used
Amount of halogenated hydrocarbons in VOCs	Not to be used	Not to be used	-	-	Not to be used	-	<250 ppm	< 0.1% m/m	< 250 mg/l	Not contained	Not to be used
Heavy metals – not to be used	Hg, Pb, Ar, Cd, Cr+6, Antimony, Selenium  Excluded are impurities up 0.1% by	Hg, Pb, Cd, Cr	Cd, Pb, Cr+6, Hg, Arsenic	Pb, Cd, Cr+6  Excluded are unavoidable impurities contained in the raw material up	Hg and mercury compounds. Pb, Cd, Cr+6 and their oxides. Excluded are impurities up	Pb, Cd, Cr	Hg, Ar, Ti – not to be used  >0.1%/w	Hg, Cd – not to be used  Lead, Ar, Cr+6 < 50 mg/kg  cobalt,	Hg, Ar, Se, Pb, Cd, Cr+6, antimony  Exempted are impurities in	Hg and mercury compounds, Pb, Cd, Cr+6 and their oxides	Pb, Hg, Cd or Cd oxide, Cr +6 or Chromium oxide

	weight of non-volatile content			to 0.01 weight % (100 ppm) or up to 0.02 weight % for lead (200 ppm)	0.1% by weight which are contained in raw material			copper molybdenum and chrome (iii) < 5 mg/kg	raw materials not exceed a combined total of 0.1% by weight of non-volatile content		
Carcinogenic and mutagenic substances	Prohibited organic compounds (3.2) and other hazardous substances (3.3) not to be used	-	Carcinogenic as well as mutagenic substances listed in the hazardous substance list should not be added to paint preparation.	Carcinogenic as well as mutagenic substances listed in the hazardous substance list should not be added to paint preparation.	-	Toxic materials not to be used as pigments	-	These substances should be in below the level of labeling limit values of EU guidelines 67 / 548 / EEC	Substances listed in the Toxic Substances Regulations not to be used, with a cumulative total of < 0.5% by weight of these substances, based on the total formulation	-	-
Titanium dioxide	-	-	White pigments <= 40 g/m <sup>2</sup> of dry film  Reduced hazardous waste production during titanium dioxide production which is used as pigment in paints	Titanium dioxide must be produced in accordance with EU directives for reduction and further pollution by waste of titanium	-	-	Conform to KSM 5310 (exterior) and KSM 5320 (interior)	Production method conforms to the EU Guideline 91/112 /EEC	-	-	-

Preservatives or formaldehyde	Formaldehyde not to be applied	Formaldehyde not be used	-	No biocides except for microbiocides used as pot preservative  Content of free formaldehyde must not exceed 10 mg/kg (10 ppm)	Free formaldehyde should not be in excess of 10 mg/kg of paint	Preservatives (including mildew-proofing agents) in quantities not exceed 0.5% by weight	Not to be applied	Biocide - Where applicable, concentration must remain below the R-43 limit value in labeling guideline 67/548/Eec	Formaldehyde not to be applied	Formaldehyde not contained	No to be used
Flash Points of product	-	61 degrees C or greater	-	-	-	-	-	-	-	Must be equal to or greater than 6 degrees C	-
Use of CFCs	Paint sold in spray cans shall not contain CFCs, HCFCs, carbon tetrachloride, 1-1-1-trichloroethane	-	-	-	-	Paint sold in spray cans shall not contain CFCs, HCFCs, carbon tetrachloride, 1-1-1-trichloroethane	-	-	-	If products stored in cans the cans shall not contain CFCs	-
Packaging Criteria	Paint containers must be made of recyclable materials  Plastic containers must have plastic resin identification code clearly	-	Packaging should state that product if for indoor use  Packaging should give recommendations on material cleaning for reduced	-	Material used should be recyclable, reusable and biodegradable	-	-	Packaging should be made of recyclable material such as tinplate and polythene.  PVC or vinyls are not permitted	Appropriate and acceptable information describing disposal methods for the container and for any remaining paint, and methods of cleaning	-	Plastic containers must have plastic resin identification code clearly visible  Correct and appropriate instructions for use should be

	visible		<p>water pollution</p> <p>To reduce solid waste, packaging shall display recommendations concerning product storage conditions after opening</p>						<p>application equipment shall be provides with the product, or on packaging or labels.</p>		<p>clearly marked on the packaging</p>
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Note: “-“ means no criteria mentioned