

**Proposal for Control of Volatile Organic Compound Emissions
from Vehicle Refinishing Paints,
Marine Vessel Paints, and Pleasure Craft Paints**



Environmental Protection Department
Hong Kong Special Administrative Region Government

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PURPOSE

This paper sets out the Hong Kong Special Administrative Region Government's proposed regulatory scheme to reduce emissions of Volatile Organic Compounds (VOCs) from vehicle refinishing paints, marine vessel paints and, and pleasure craft paints used in Hong Kong. You are invited to take time to read this consultation paper to help shape the final scheme by sending us your views on or before **20 June 2008**.

BACKGROUND

VOCs and Air Pollution

2. VOCs are emitted as gases from certain solids or liquids. They are found in a wide array of products. Examples include solvent-borne paints, printing inks and many consumer products, adhesives and sealants. VOCs play a significant role in the formation of ozone and respirable suspended particulates (RSPs) in the atmosphere. Under sunlight, they react with nitrogen oxides (NO_x) to form ozone through a photochemical process. Ground level ozone is a highly reactive gas, and when in high concentration can irritate the eyes and bring upper and lower respiratory symptoms to healthy people. It may also provoke asthmatic attacks in people who already have asthma. There is also evidence that prolonged exposure to high concentration of ozone may cause permanent damage to lung tissue and interfere with functioning of the immune system. RSPs can penetrate deeply into the lung and interfere with functioning of the respiratory system. Apart from the long-term health effects, RSPs can also exacerbate smog phenomenon and impair visibility of the region, which is a very important factor in the public's perception of a city's environmental condition.

Overseas Practices

3. In view of the harmful effects of VOCs, some countries have started years ago to introduce statutory VOC limits on various paint types, including the United States, European Union (EU) and Japan. VOC limits are imposed nationwide for paints and selected consumer products in the United States. Among various states, California has been pioneering on the most stringent VOC limits, driven by the adverse air quality in the South Coast areas in the past. In the EU, eco-labelling criteria have been set for paints since 1999, and the European Parliament, in March 2004, passed a directive to reduce VOC contents in decorative and vehicle paints and varnishes. The directive takes

effect in two stages in 2007 and 2010 respectively.

Regional Air Quality

4. To improve the air quality of the Pearl River Delta Region, the Hong Kong Special Administrative Region Government (the Government) and the Guangdong Provincial Government reached a consensus in April 2002 to reduce, on a best endeavour basis, the regional emissions of four major pollutants, namely sulphur dioxide, NO_x, RSPs and VOCs by 40%, 20%, 55% and 55% respectively by 2010, using the emission levels at 1997 as a base. Achieving the emission reduction targets will enable Hong Kong to meet its current air quality objectives. This will also significantly improve the smog problem.

5. The Government has been implementing a series of programmes to reduce pollutant emissions, including VOCs, from various major sources including motor vehicles. A regulation was introduced in 1999 and amended in 2005 to require the use of effective vapour recovery systems to reduce petrol vapour emissions (which are VOCs) during petrol unloading and vehicle refuelling at petrol filling stations. A regulation¹ was introduced on 1 April 2007 to impose VOC limits on architectural paints/coatings, printing inks and selected consumer products, as well as requiring emission reduction devices to be installed on certain printing machines. Through these measures, VOC emissions will be significantly reduced. However, to ensure that the 55% VOC reduction target will be achieved by 2010 and to tackle the smog problem, we need to take further action to reduce VOC emissions as far as possible.

Relevant Control on Paint Works

6. Apart from the proposal to control the VOC emissions from the paint products, the Government is planning to bring the "Paint Works" now in Schedule 1 to the Air Pollution Control Ordinance into operation as a Specified Process² to control emissions from processes producing or manufacturing coating products including paints, vanishes and lacquers of capacity exceeding 35 m³. As a Specified Process, it is required to apply from the authority a licence for operation and fulfil the environmental standards in using best practical

¹ Air Pollution Control (Volatile Organic Compounds) Regulation.

² More information about the Air Pollution Ordinance and the control of emissions from Specified Processes can be found in "*A Concise Guide to the Air Pollution Control Ordinance*" which can be accessed at the following website:

http://www.epd.gov.hk/epd/english/environmenthk/air/guide_ref/guide_apco.html

means to avoid causing air pollution. This measure will prevent unacceptable emissions from paint manufacturing activities if large scale paint manufactory revives in Hong Kong in the future.

THE PROPOSAL

Overall Framework

7. The proposed control scheme will be incorporated into the existing Air Pollution Control (Volatile Organic Compounds) Regulation¹ (the Regulation) by extending the regulated product lists to cover vehicle refinishing paints, marine vessel paints, and pleasure craft paints (Regulated Products); and following the control framework of the current regulation.

8. The proposed control scheme comprises:

- (i) Maximum limits will be imposed on the VOC content of the Regulated Products;
- (ii) Importers and local manufacturers will be banned from importing or local manufacturing Regulated Products exceeding the VOC limit after the relevant VOC limit becomes effective (the Effective Date) for local sale and use;
- (iii) Importers and local manufacturers are required to disclose the product information (including the VOC content) in the Material Safety Data Sheets, trade catalogues, packaging or containers of any Regulated Products manufactured or imported after the relevant VOC limit becomes effective;
- (iv) Importers and local manufacturers are required to report annual sales amount and other requested information of the Regulated Products for the preceding calendar year, by 31 March of each year, starting in the year immediately after the year the relevant VOC limit becomes effective; and
- (v) Importers and local manufacturers are required to keep records for at least three years of the sales amount and other information reported to the Environmental Protection Department (the Authority), and to produce

¹ Reference about the regulation can be found at following website:
http://www.epd.gov.hk/epd/english/environmenthk/air/prob_solutions/voc_reg.html

them upon request for inspection by the Authority.

Coverage and VOC Content Limits

9. A product categorisation list with associated VOC content limits to be imposed by reference to the requirements of California can be found in Annex 1 to 3. California has a long history in regulating VOCs in their fight against smog pollution in the South Coast area. It is noted that the Californian authority has fully considered commercial as well as technological feasibilities and other relevant socio-economic factors when introducing the statutory VOC limits. It is also a set of evolving standard, taking into account social and technological advancements over time. It should be stressed that the standard is trade neutral, i.e. any products complying with the standard may be imported and sold in the market irrespective of the origin of production.

10. A total of 41 types of paints appeared in the list with their respective limit value ranging from 60 to 780 grams of VOCs per litre.

11. Annex 4 gives the definition of exempt compounds not counted as VOC, and Annex 5 gives the calculation method for determining VOC content in paints.

Determination of VOC Content

12. VOC testing would not necessarily be the only basis for determining the VOC content in the Regulated Products as manufacturers should be able to ascertain the VOC content of their products by virtue of their formulations. However, it serves as the means for ascertaining and confirming the VOC content figures. Importers or manufacturers may like to exercise due diligence and resort to laboratory testing should they find it warranted in case of doubt.

13. However, VOC testing in accordance with designated testing methods would be the Authority's basis to check compliance of the legal VOC limits.

Designated Testing Methods

14. The US Environmental Protection Agency Test Method 24 '*Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings*' shall be used for determining the VOC content and the South Coast Air Quality Management District (SCAQMD)

Method 303 '*Determination of Exempt of Compounds*' shall be used for determining the exempt compounds content.

15. The designated testing methods shall be the version most recently approved by the authority.

Display of Product Information

16. To make it easier for consumers to compare and choose from the wide variety of Regulated Products, and the Authority to enforce the Regulation, product information such as the category of paints, date of manufacture, manufacturer's recommendations regarding thinning, reducing, or mixing of product and the recommended mixing ratios, if applicable, and maximum VOC content on ready to use condition when used in accordance with manufacturer's recommendation, shall be provided in the product's Material Safety Data Sheet, catalogue, packaging, or container.

Sales-reporting

17. In order to ascertain the effectiveness of the proposed control, it is necessary to maintain accurate emission inventories before and after its implementation. Critical piece of information that would affect significantly the accuracy of the emission inventories are the sales volumes of paint products in Hong Kong. Among others, the best approach for ensuring the accuracy of the data is to require the importers and local manufacturers to provide their respective sales volume and VOC content data to the Government on a confidential basis.

Offences and Penalties

18. Offences in the Regulation will include, *inter alia*, manufacturing or importing Regulated Products in excess of the relevant VOC limits and failing to report the sales data. Existing laws also provide for offences in failing to provide information about the origin of suspected products without reasonable defence, providing false information and obstructing the Authority in carrying out the inspection or collection of testing samples. Penalties in the Regulation ranges from fines of up to \$200,000 and imprisonment of up to six months, depending on the severity of the offences (see Annex 6).

The Effective Date

19. Given the pressing need to improve Hong Kong's air quality, we consider it appropriate to aim to enact the amended Regulation no later than mid of 2009, with the VOC limits to be effective by phase on 1 January 2010 and 1 January 2011.

YOUR VIEWS

20. We invite your views and comments on the proposed regulatory control scheme for vehicle refinishing paints, marine vessel paints and pleasure craft paints. Please send in your comments to us before **20 June 2008** by mail/electronic mail/facsimile to the following:

Environmental Protection Department
33/F, Revenue Tower
5 Gloucester Road
Wanchai
Hong Kong
(Attn.: VOC Consultation - Paints)
E-mail address: VOCConsult@epd.gov.hk
Facsimile: 2838 2155
Telephone enquiry: 2594 6593

21. Please note that the Government would wish, either in discussion with others or in any subsequent report, whether privately or publicly, to be able to refer to and attribute views submitted in response to this consultation document. Any request to treat all or part of a response in confidence will be respected, but if no such request is made, it will be assumed that the response is not intended to be confidential.

Annex 1

Proposed VOC Control on Vehicle Refinishing Paints

(a) Scope of Products Regulated

The proposed control applies to all paint/coating products represented on the container or in accompanying literature (e.g. label, sticker, packaging, etc.) for use in refinishing and servicing of all types of motor vehicles and mobile equipment but excluding the following products:

- (i) any aerosol coating product;
- (ii) any coating applied during the manufacture on an assembly line of motor vehicles, mobile equipment or their associated parts and components; or
- (iii) any vehicle refinishing coating sold in 14.8 millilitres or smaller containers.

(b) Proposed Effective Date: 1 January 2010

(c) VOC Content Limit

Regulated Vehicle Refinishing Paint Type	Maximum Limit of VOC Content in Ready to Use Condition* (grams/litre of paint, less water and less exempt compounds)
(1) Adhesion Promoter	540
(2) Clear Coating	250
(3) Colour Coating	420
(4) Multi-Colour Coating	680
(5) Pretreatment Coating	660
(6) Primer	250
(7) Single-Stage Coating	340
(8) Temporary Protective Coating	60
(9) Truck Bed Liner Coating	310
(10) Underbody Coating	430
(11) Uniform Finish Coating	540
(12) Other Vehicle Refinishing Coatings [#]	250

* For the purpose of compliance check, the VOC content in ready to use condition would be the maximum VOC content when the paint is in a condition ready to be applied to the surface, i.e. no more dilution or conditioning of the paint is required, in accordance to the manufacturer's recommendations for application. For example, when a range of ratios is recommended for dilution with organic solvent, the highest dilution ratio should be used to give the maximum VOC content.

[#] Any vehicle refinishing coating not regulated by Type (1) to Type (11) shall comply with the limit of Type (12).

(d) Most Restrictive Limit

If by any representation on the container or in accompanying literature (e.g. label, sticker, packaging, etc.) of the product states that the product is suitable for more than one regulated type in Section (c) above, the lowest VOC content limit shall apply.

(e) Major Definitions Relevant to the Regulated Vehicle Refinishing Paints

- (1) “adhesion promoter” means a coating, which is labelled and formulated to be applied to uncoated plastic surfaces to facilitate bonding of subsequent coatings, and on which, a subsequent coating is applied.
- (2) “aerosol coating” means a pressurized coating product containing pigments or resins that dispenses product ingredients by means of a propellant, and is packaged in a disposable can for hand-held application.
- (3) “vehicle refinishing paint” means any coating or coating component used or recommended for use in motor vehicle or mobile equipment refinishing, service, maintenance, repair, restoration, or modification, except metal plating activities. Any reference to vehicle refinishing or vehicle coating made by a person on the container or in product literature constitutes a recommendation for use in motor vehicle or mobile equipment refinishing.
- (4) “clear coating” means any coating that contains no pigments and is labelled and formulated for application over a colour coating or clear coating.
- (5) “colour coating” means any pigmented coating, excluding adhesion promoters, primers, and multi-colour coatings, that requires a subsequent clear coating and which is applied over a primer or adhesion promoter. Colour coatings include metallic/iridescent colour coatings.
- (6) “metallic/iridescent colour coating” means any coating that contains more than 5 grams per litre of metal or iridescent particles as applied when tested by SCAQMD Method 311, where such particles are visible in the dried film.
- (7) “mobile equipment” means any device that may be drawn and/or driven on rails or a roadway including, but not limited to, trains, railcars, truck trailers, mobile cranes, bulldozers, street cleaners, and implements of husbandry or agriculture.
- (8) “motor vehicles” means any self-propelled vehicle, including, but not limited to, cars, trucks, buses, golf carts, vans, motorcycles, tanks, and armoured personnel carriers.
- (9) “multi-colour coating” means any coating that exhibits more than one colour in the dried film after a single application, is packaged in a single container, and hides surface defects on areas of heavy use, and which is applied over a primer or adhesion promoter.
- (10) “pretreatment coating” means any coating that contains a minimum of 0.5% acid by weight when tested by ASTM Method D1613 and not more than 16 percent solids by weight necessary to provide surface etching and is labelled and formulated for application directly to bare metal surfaces to provide corrosion resistance and adhesion.
- (11) “primer” means any coating, which is labelled and formulated for application to a substrate to provide 1) a bond between the substrate and subsequent coats, 2) corrosion resistance, 3) a smooth substrate surface, or 4) resistance to penetration of subsequent coats, and on which a subsequent coating is applied. Primers may be pigmented.

- (12) “single-stage coating” means any pigmented coating, excluding primers and multi-colour coatings, labelled and formulated for application without a subsequent clear coat. Single-stage coatings include single-stage metallic/iridescent coatings.
- (13) “temporary protective coating” means any coating which is labelled and formulated for the purpose of temporarily protecting areas from overspray or mechanical damage.
- (14) “truck bed liner coating” means any coating, excluding colour, multi-colour, and single stage coatings, labelled and formulated for application to a truck bed to protect it from surface abrasion.
- (15) “underbody coating” means any coating labelled and formulated for application to wheel wells, the inside of door panels or fenders, the underside of a trunk or hood, or the underside of the motor vehicle.
- (16) “uniform finish coating” means any coating labelled and formulated for application to the area around a spot repair for the purpose of blending a repaired area’s colour or clear coat to match the appearance of an adjacent area’s existing coating.

Annex 2

Proposed VOC Control on Marine Vessel Paints

(a) Scope of Products Regulated

The proposed control applies to all paint/coating products represented on the container or in accompanying literature (e.g. label, sticker, packaging, etc.) to be applied by any means to ships, boats, and their appurtenances, and to buoys, and their drilling rigs intended for the marine environment but excluding the following products:

- (i) any coating to be applied on any pleasure crafts, their associated parts and components;
- (ii) any aerosol coating product;
- (iii) any marine coating to be applied to interior surfaces of potable water containers;
- (iv) any touch-up coating; or
- (v) any antifouling coating applied to aluminium hulls.

(b) Proposed Effective Date: 1 January 2010

(c) VOC Content Limit

Regulated Marine Vessel Paint Type	Maximum Limit of VOC Content in Ready to Use Condition* (grams/litre of paint, less water and less exempt compounds)
(1) Antenna Coating	530
(2) Antifouling	400
(3) Elastomeric Adhesives with 15% or more by Weight Natural or Synthetic Rubber	730
(4) Extreme High-Gloss	490
(5) Heat Resistant	420
(6) High Gloss	340
(7) High Temperature	500
(8) Low Activation Interior Coating	420
(9) Metallic Heat Resistant	530
(10) Navigational Aids	340
(11) Pretreatment Wash Primer	780
(12) Repair & Maintenance Thermoplastic	550
(13) Sealant Coat for Wire-Sprayed Aluminium	610
(14) Solvent-based Inorganic Zinc	650
(15) Special Marking	490
(16) Tack Coat	610
(17) Undersea Weapons Systems	340

Regulated Marine Vessel Paint Type	Maximum Limit of VOC Content in Ready to Use Condition* (grams/litre of paint, less water and less exempt compounds)
(18) Other Marine Vessel Coatings [#]	340

* For the purpose of compliance check, the VOC content in ready to use condition would be the maximum VOC content when the paint is in a condition ready to be applied to the surface, i.e. no more dilution or conditioning of the paint is required, in accordance to the manufacturer's recommendations for application. For example, when a range of ratios is recommended for dilution with organic solvent, the highest dilution ratio should be used to give the maximum VOC content.

[#] Any marine vessel coating not regulated by Type (1) to Type (17) shall comply with the limit of Type (18).

(d) Most Restrictive Limit

If by any representation on the container or in accompanying literature (e.g. label, sticker, packaging, etc.) of the product states that the product is suitable for more than one regulated type in Section (c) above, the lowest VOC content limit shall apply.

(e) Major Definitions Relevant to the Regulated Marine Vessel Paints

- (1) “aerosol coating” means a pressurized coating product containing pigments or resins that dispenses product ingredients by means of a propellant, and is packaged in a disposable can for hand-held application.
- (2) “antenna coating” is any coating applied to equipment and associated structural appurtenances which are used to receive or transmit electromagnetic signals.
- (3) “antifouling coating” is any coating applied to the underwater portion of a vessel to prevent or reduce the attachment of biological organisms.
- (4) “elastomeric adhesive” is any adhesive containing natural or synthetic rubber.
- (5) “extreme high-gloss coating” is any coating which achieves at least 95% reflectance on a 60° meter when tested by ASTM Method D-523.
- (6) “heat resistant coating” is any coating which during normal use must withstand temperatures of at least 204°C.
- (7) “high gloss coating” is any coating which achieves at least 85 percent reflectance on a 60° meter when tested by ASTM Method D523.
- (8) “high temperature coating” is any coating which must withstand temperatures of at least 426°C.
- (9) “inorganic zinc coating” is a coating which derives from zinc dust incorporated into an inorganic silicate binder for the express purpose of providing corrosion protection.
- (10) “low activation interior coating” is any coating used on interior surfaces aboard ships to minimize the activation of pigments on painted surfaces within a radiation environment.

- (11) “metallic heat resistant coating” is any coating which contains more than 5 grams of metal particles per litre of coating as applied when tested by SCAQMD Method 311 and to withstand temperatures over 80°C.
- (12) “navigational aids” are buoys or other governmental waterway markers.
- (13) “pretreatment wash primer” is any coating which contains at least 0.5% acids, by weight, when tested by ASTM Method D1613, to provide surface etching and is applied directly to metal surfaces to provide corrosion resistance, adhesion, and ease of stripping.
- (14) “repair and maintenance thermoplastic coating” is any resin-bearing coating, such as vinyl, chlorinated rubber, or bituminous coatings, in which the resin becomes pliable with the application of heat, and is used to recoat portions of a previously coated substrate which has sustained damage to the coating following normal coating operations.
- (15) “sealant coat for wire-sprayed aluminium” is any coating of up to 0.025 mm in thickness of an epoxy material which is reduced for application with an equal part of an appropriate solvent (naphtha, or ethylene glycol monoethyl ether) used on wire-sprayed aluminium surfaces.
- (16) “special marking coating” is any coating used for items such as flight decks, ships' numbers, and other safety/identification applications.
- (17) “tack coat” is an epoxy coating of up to 0.05 mm thick applied to an existing epoxy coating which have aged beyond the time limit specified by the manufacturer for application of the next coat.
- (18) “touch-up coating” is any coating used to cover minor imperfections prior to shipment appearing after the main coating operation.
- (19) “undersea weapons system” is any or all components of a weapons system that is launched or fired underwater.
- (20) “wire-sprayed aluminium” is a molten aluminium coating applied to a steel substrate using oxygen fuelled combustion spray methods.

Proposed VOC Control on Pleasure Craft Paints**(a) Scope of Products Regulated**

The proposed control applies to all paint/coating products represented on the container or in accompanying literature (e.g. label, sticker, packaging, etc.) to be applied by any means to pleasure crafts, and their associated parts and components exposed to the marine environment but excluding the following products:

- (i) any aerosol coating product; or
- (ii) any unsaturated polyester resin (fiberglass) coating.

(b) Proposed Effective Date: 1 January 2011**(c) VOC Content Limit**

Regulated Pleasure Craft Paint Type	Maximum Limit of VOC Content in Ready to Use Condition* (grams/litre of paint, less water and less exempt compounds)
(1) Topcoats: Extreme High Gloss	490
(2) Topcoats: High Gloss	420
(3) Pretreatment Wash Primers	780
(4) Finish Primer/Surfacer	420
(5) High Build Primer/Surfacer	340
(6) Teak Primer	775
(7) Antifouling Coatings for Aluminium Substrate	560
(8) Antifouling Coatings for Other Substrates	330
(9) Clear Wood Finishes: Sealers	550
(10) Clear Wood Finishes: Varnishes	490
(11) Other Pleasure Craft Coatings [#]	420

* For the purpose of compliance check, the VOC content in ready to use condition would be the maximum VOC content when the paint is in a condition ready to be applied to the surface, i.e. no more dilution or conditioning of the paint is required, in accordance to the manufacturer's recommendations for application. For example, when a range of ratios is recommended for dilution with organic solvent, the highest dilution ratio should be used to give the maximum VOC content.

[#] Any pleasure craft coating not regulated by Type (1) to Type (10) shall comply with the limit of Type (11).

(d) Most Restrictive Limit

If by any representation on the container or in accompanying literature (e.g. label, sticker, packaging, etc.) of the product states that the product is suitable for more than one regulated type in Section (c) above, the lowest VOC content limit shall apply.

(e) Major Definitions Relevant to the Regulated Pleasure Craft Paints

- (1) “aerosol coating” means a pressurized coating product containing pigments or resins that dispenses product ingredients by means of a propellant, and is packaged in a disposable can for hand-held application.
- (2) “antifouling coating” is any coating applied to the underwater portion of a pleasure craft to prevent or reduce the attachment of biological organisms.
- (3) “clear wood finishes” are clear and semi-transparent topcoats applied to wood substrates to provide a transparent or translucent film.
- (4) “extreme high-gloss coating” is any coating which achieves at least 95% reflectance on a 60° meter when tested by ASTM Method D523.
- (5) “finish primer/surfacer” is a coating applied with a wet film thickness of less than 0.25 mm prior to the application of a topcoat for purposes of providing corrosion resistance, adhesion of subsequent coatings, a moisture barrier, or promotion of a uniform surface necessary for filling in surface imperfections.
- (6) “high build primer/surfacer” is a coating applied with a wet film thickness of 0.25 mm or more prior to the application of a topcoat for purposes of providing corrosion resistance, adhesion of subsequent coatings, or a moisture barrier, or promoting a uniform surface necessary for filling in surface imperfections.
- (7) “high gloss coating” is any coating which achieves at least 85 percent reflectance on a 60° meter when tested by ASTM Method D523.
- (8) “pleasure craft” means a vessel primarily built or used for sport or recreation.
- (9) “pretreatment wash primer” is a coating which contains no more than 12 percent solids, by weight, and at least 0.5 percent acids, by weight, when tested by ASTM Method D1613; is used to provide surface etching; and is applied directly to fiberglass and metal surfaces to provide corrosion resistance and adhesion of subsequent coatings.
- (10) “sealer” is a low viscosity coating applied to bare wood to seal surface pores to prevent subsequent coatings from being absorbed into the wood.
- (11) “teak primer” is a coating applied to teak or previously oiled decks in order to improve the adhesion of a seam sealer to wood.
- (12) “topcoat” is any final coating applied to the interior or exterior of a pleasure craft.
- (13) “varnishes” are clear wood topcoats formulated with various resins to dry by chemical reaction on exposure to air.

Annex 4

List of Exempt Compounds for Vehicle Refinishing Paints, Marine Vessel Paints, and Pleasure Craft Paints

1. acetone
2. ethane
3. methyl acetate
4. parachlorobenzotrifluoride (PCBTF)
5. perchloroethylene (tetrachloroethylene)
6. 1,1,1-trichloroethane (methyl chloroform)
7. trichlorofluoromethane (CFC-11)
8. dichlorodifluoromethane (CFC-12)
9. 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
10. 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114)
11. chloropentafluoroethane (CFC-115)
12. chlorodifluoromethane (HCFC-22)
13. chlorofluoromethane (HCFC-31)
14. 2,2-dichloro-1,1,1-trifluoroethane (HCFC-123)
15. 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a)
16. 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)
17. 1,1-dichloro-1-fluoroethane (HCFC-141b)
18. 1-chloro-1,1-difluoroethane (HCFC-142b)
19. 1-chloro-1-fluoroethane (HCFC-151a)
20. 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC 225ca)
21. 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC 225cb)
22. methylene chloride (dichloromethane)
23. trifluoromethane (HFC-23)
24. difluoromethane (HFC-32)
25. 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC-43-10mee)
26. pentafluoroethane (HFC-125)
27. 1,1,2,2-tetrafluoroethane (HFC-134)
28. 1,1,1,2-tetrafluoroethane (HFC-134a)
29. 1,1,1-trifluoroethane (HFC-143a)
30. 1,1-difluoroethane (HFC-152a)
31. ethylfluoride (HFC-161)
32. 1,1,1,2,3,3-hexafluoropropane (HFC-236ea)
33. 1,1,1,3,3,3-hexafluoropropane (HFC-236fa)
34. 1,1,2,2,3-pentafluoropropane (HFC-245ca)
35. 1,1,2,3,3-pentafluoropropane (HFC-245ea)
36. 1,1,1,3,3-pentafluoropropane (HFC-245fa)
37. 1,1,1,2,3-pentafluoropropane (HFC-245eb)
38. 1,1,1,3,3-pentafluorobutane (HFC-365mfc)
39. cyclic, branched, or linear, completely methylated siloxanes (VMS)
40. cyclic, branched, or linear, completely fluorinated alkanes
41. cyclic, branched, or linear, completely fluorinated ethers with no unsaturations
42. cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations
43. sulphur-containing perfluorocarbons with no unsaturations and with sulphur bonds only to carbon and fluorine
44. 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane (C4F9OCH3 or HFE-7100)
45. 1-ethoxy-1,1,2,2,3,3,4,4-nonafluorobutane (C4F9OC2H5 or HFE-7200)
46. 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane [(CF3)2CFCF2OCH3]
47. 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane [(CF3)2CFCF2OC2H5]

Annex 5

Method of Calculating the VOC Content of Vehicle Refinishing Paints, Marine Vessel Paints, and Pleasure Craft Paints

The VOC content in ready to use condition in grams of VOC per litre of paint, less water and less exempt compounds, shall be calculated according to the following equation:

$$\text{Grams of VOC per Litre of Paint,} \quad = \quad \frac{W_a - W_b - W_c}{V_d - V_e - V_f}$$

Less Water and Less Exempt Compounds

where W_a = weight of volatile compounds in grams

W_b = weight of water in grams

W_c = weight of exempt compounds in grams

V_d = volume of material in litres

V_e = volume of water in litres

V_f = volume of exempt compounds in litres

Annex 6

Maximum Penalties for Various Offences

Offence	Maximum Penalty
Importing into Hong Kong or manufacturing in Hong Kong Regulated Products in excess of the statutory VOC limits	\$200,000 and 6 months' imprisonment
Failure to display product information, or to submit an annual report with specific information for Regulated Products	\$50,000 and 3 months' imprisonment
Failure to keep records or failure to retain such records for at least three years of Regulated Products imported or manufactured for local sale or use	\$50,000 and 3 months' imprisonment
Failure to produce upon request any record of Regulated Products for inspection by the Authority	\$50,000 and 3 months' imprisonment
Knowingly or recklessly displaying, giving, reporting or recording any information concerning the Regulated Products that is misleading, false or incomplete in a material particular	\$50,000 and 3 months' imprisonment