



# A Guide to the Air Pollution Control (Volatile Organic Compounds) Regulation



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Air Pollution Control  
(Volatile Organic Compounds) Regulation**



Environmental Protection Department  
Hong Kong Special Administrative Region Government  
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## *Introduction*

This Guidebook is prepared by the Environmental Protection Department (EPD) to provide general information to the public on basic knowledge about volatile organic compounds (VOCs), their use in daily products and how you may help to reduce their emissions and thus protect the environment.

The Guidebook gives also the general introduction on the Air Pollution Control (Volatile Organic Compounds) Regulation (hereunder referred to as “the Regulation”) which regulates the VOC contents in certain products and VOC emission from lithographic heatset web printing process. However, it shall not be read as an official interpretation of the law. Readers are suggested to consult professional legal advisers on specific questions relating to the law.

# ***Chapter 1 - General Questions***

## *Q1.1 What are Volatile Organic Compounds (VOCs)?*

Volatile organic compounds are organic chemical compounds that have high enough vapour pressures under normal conditions to significantly vaporize and enter the atmosphere. They are present in a wide variety of industrial and consumer products and upon use, are released inadvertently into the ambient air contributing to our smog pollution. Overseas jurisdictions have been using slightly different definitions of VOC and sometimes, adopting other names such as Non-Methane Hydrocarbons or Reactive Organic Gases but they mean largely the same thing. It is therefore not surprising that the VOC content of a product may vary slightly when a different definition of VOC is used for the same product.

## *Q1.2 Why is it important to regulate VOCs?*

VOCs are major contributors or precursors to the formation of ozone and smog at low atmospheric level by taking part in photochemical reactions with nitrogen oxides under sunlight. Smog pollution in Hong Kong is serious enough as exemplified by reduced visibility in the Victoria Harbour and other parts of the territory under certain climatic conditions. Regulating the emission of VOCs will help alleviate our ozone and smog pollution problems and thus safeguard the health of Hong Kong people.

## *Q1.3 What is the main purpose of the Regulation?*

The Regulation sets limits on the VOC content of architectural paints/coatings, vehicle refinishing paints/coatings, vessel paints/coatings,



pleasure craft paints/coatings, adhesives, sealants, printing inks and selected consumer products to reduce the emissions of VOCs from these products to the atmosphere. The Regulation also requires annual reporting of sales amount, product information display, labelling and/or prior notification for these regulated products; and installation of emission control device for all lithographic heatset web printing machines.

*Q1.4 What are the regulated products under the Regulation?*

Regulated products under Stage I control of the Regulation (effective in phases from 1 April 2007 to 1 January 2010) include 51 types of architectural paints/coatings, 7 types of printing inks and 6 broad categories of consumer products. In October 2009, the Regulation was amended to cover other high VOC-containing products in Stage II control (effective in phases from 1 January 2010 to 1 April 2012), which covers 14 types of vehicle refinishing paints/coatings, 36 types of vessel paints/coatings and pleasure craft paints/coatings, and 47 types of adhesives and sealants. For specific information about the definitions, VOC content limits and effective implementation dates for respective regulated products, i.e. architectural paints, printing inks, consumer products, vehicle refinishing paints, vessel paints and pleasure craft paints, and adhesives and sealants, please refer to Annexes 1, 2, 3, 4, 5 and 6 respectively.

*Q1.5 What are the rationales to limit the VOC contents of the regulated products?*

In view of the harmful effects of VOCs, some countries, including the United States, Canada and European Union, have started years ago to set VOC content limits on various VOC-containing products, including paints/coatings, adhesives and sealants.



Regulated products generally contain a higher content of VOCs which may be relatively more active in the formation of ozone and smog, particularly when used together with thinning solvents. Controlling emissions of VOCs from these products would help improve our smog problem.

Also, certain regulated products such as architectural paints, adhesives and sealants are used indoors. The use of low-VOC or water-based compliant products would help safeguard occupants and workers from the adverse health effects of exposure to high concentration of VOCs where these products are used.

#### *Q1.6 What are the major requirements under the Regulation?*

Major requirements under the Regulation are tabulated below for easy reference:

#### Stage I -

Requirement	Implementation Date	Architectural Paints (51 types)	Printing Inks (7 types)	Consumer Products (6 categories)	Lithographic Heatset Web Printing Machines
To comply with prescribed VOC content limit	1 April 2007		✓(5 types)	✓ (1 type, i.e. Hairsprays)	
	1 January 2008	✓(25 types)		✓ (9 types)	
	1 January 2009	✓(7 types)	✓(2 types)	✓(5 types plus tightened limit for Hairsprays)	
	1 January 2010	✓(19 types)			
To comply with VOC emission standard	1 January 2009				✓



Requirement	Implementation Date	Architectural Paints (51 types)	Printing Inks (7 types)	Consumer Products (6 categories)	Lithographic Heatset Web Printing Machines
To label non-compliant product before prescribed VOC content limit takes effect	1 April 2007	✓			
To display product information	1 April 2007	✓			
To make notification before product is sold or used	1 April 2007	✓			
To report sales and other information for preceding calendar year	by 31 March 2008		✓	✓	
	by 31 March 2009	✓	✓	✓	
	by 31 March 2010	✓	✓	✓	
	by 31 March 2011 and so on	✓	✓	✓	

## Stage II -

Requirement	Implementation Date	Regulated Vehicle Refinishing Paints (14 types)	Regulated Vessel Paints and Pleasure Craft Paints (36 types)	Regulated Adhesives and Sealants (47 types)
To comply with prescribed VOC content limit and to display product information	1 January 2010		✓(21 vessel paint types)	✓(47 types)
	1 January 2011		✓(9 pleasure craft paint types)	
	1 October 2011	✓( 14 types)		
	1 April 2012		✓(6 types)	✓( tightened limit for Contact Adhesives)
To report sales and other information for preceding calendar year	by 31 March 2011		✓ (vessel paints only)	✓
	by 31 March 2012	✓	✓	✓
	by 31 March 2013 and so on	✓	✓	✓



For more detailed information on the control, please refer to Chapter 2 for regulated architectural paints, Chapter 3 for regulated printing inks and lithographic heatset web printing machines, Chapter 4 for regulated consumer products, Chapter 5 for regulated vehicle refinishing paints, Chapter 6 for regulated vessel paints and regulated pleasure craft paints, and Chapter 7 for regulated adhesives and regulated sealants.

*Q1.7 Am I subject to control under the Regulation?*

You are subject to control under the Regulation if you are:

- (a) an importer introducing any of the regulated products for sale or use in Hong Kong;
- (b) a manufacturer in Hong Kong manufacturing any of the regulated products for sale or use in Hong Kong; or
- (c) an owner of a lithographic heatset web printing machine in Hong Kong.

Retailers of regulated products are not subject to control but they are required to assist the Authority in enforcement work by providing relevant information such as the transaction details or the identity of the importer or local manufacturer responsible for the regulated products. However, a retailer who also imports regulated products for local sales or use will become an importer and is subject to control under the Regulation. Also, any person who imports a regulated product for his own use will also be liable as an importer.



*Q1.8 What are the obligations if I am subject to control under the Regulation?*

Being an importer or local manufacturer of any of the regulated products, you are required to:

- (a) comply with the VOC content limit of the regulated product by the respective effective date;
- (b) for those regulated products imported or manufactured in Hong Kong after the relevant effective dates of the VOC content limits, report to the EPD the annual sales amount and other requested information of the regulated product for the preceding calendar year by 31 March of each year, starting in the year immediately after the year the relevant VOC content limit comes into effect;
- (c) keep records for at least three years of the sales amount and other information reported to the EPD and produce them upon request for inspection by the EPD; and
- (d) display product information in Material Safety Data Sheets, trade catalogues, packaging or containers (except for regulated printing inks and regulated consumer products).

There are additional obligations applying to regulated architectural paints and they can be found in Chapter 2 of this Guidebook. If you are an owner of a lithographic heatset web printing machine, you should refer to Q3.4 of Chapter 3 for the major obligations.

*Q1.9 What are the VOC content limits of regulated products and their effective dates?*

The VOC content limits, effective dates and definitions of regulated architectural paints, printing inks, consumer products, vehicle refinishing paints, vessel and pleasure craft paints, and adhesives and sealants are given in Annexes 1, 2, 3, 4, 5 and 6 respectively.



*Q1.10 If a regulated product is suitable for use as other types of regulated products as recommended by the manufacturer or importer, which VOC content limit would apply to the product?*

Except for substrate specific adhesives to bond dissimilar substrates, the lowest VOC content limit among the respective prescribed VOC content limits of all the related regulated products shall apply to the regulated product that is suitable for more than one regulated product type as stated in the container or accompanying literature (e.g. label, sticker, packaging, etc.) by its manufacturer or importer. For substrate specific adhesives to bond dissimilar substrates of fibreglass, metal, plastic foam, porous material or wood, the highest VOC content limit among all the respective prescribed VOC content limits shall apply.

*Q1.11 How is VOC content defined under the Regulation?*

For the purpose of control, the VOC definitions for different regulated products are slightly different. The definitions of VOC as used in regulated architectural paints, printing inks, consumer products, vehicle refinishing paints, vessel and pleasure craft paints, and adhesives and sealants can be found in Annexes 1, 2, 3, 4, 5 and 6 respectively.

Except for regulated vehicle refinishing paints, the Regulation also exempts certain compounds when determining the VOC content in a regulated product. The list of these exempt compounds can be found in Annexes 7 and 8. For regulated consumer products, please note that the exempt compounds are different for calculating the VOC content of hairspray and other products (see Annex 8).



*Q1.12 How can distributors and retailers help in the enforcement of the Regulation?*

Enforcement staff from the EPD may from time to time visit the premises of distributors and retailers to check if regulated products on the local market do comply with the statutory requirements including the VOC content limits. When follow-up action is deemed necessary, the EPD may approach the distributor or retailer concerned for information such as the identity of the supplier of the product in question so as to track down the responsible upstream importer or local manufacturer. The EPD is empowered under the Air Pollution Control Ordinance to request for information relevant to the investigation of any suspected offence and as such, proper documentation and record keeping by distributors and retailers would help the EPD tremendously in the enforcement of the Regulation.

Distributors and retailers should report immediately to the EPD if they are aware of any regulated products suspected to have violated the law.

*Q1.13 Is there anything a consumer or a product end-user can do to help reduce VOC emission?*

Everyone in Hong Kong can help by switching to using low or no-VOC products. Sufficient environmentally conscious consumers will eventually encourage manufacturers to provide more environmentally friendly products.

A word of caution though is that some newly formulated products with reduced VOC content may appear to be less satisfactory in



performance than the old products they replace, and would require some adaptation in application or use by the consumers. One example could be that reformulated architectural paints might require longer curing time and offer a less glossy surface finish. This is obviously one small price we all have to pay for a cleaner and healthier living environment. Hopefully, with a greater demand for environmentally friendly products, manufacturers will be more willing to invest in research and development, and the product performance will improve over time.

*Q1.14 How can I, as an importer or local manufacturer, know that my products do comply with the statutory VOC content limits?*

As an importer or local manufacturer, you should be able to get the information of VOC content of the products from the overseas suppliers or ascertain the VOC content of the products by virtue of the product formulations.

Nevertheless, a more definitive way to determine the VOC content of a product is always to have the product tested independently by a competent laboratory. Designated test methods are specified in the Regulation and such commercial testing service is available in Hong Kong. Please note that in the case of dispute, test results provided by a competent laboratory using the designated test methods shall prevail over any other estimation, e.g. the one made by virtue of the product formulation.



*Q1.15 Are there any procedures to follow before I import or locally manufacture any of the regulated products for sale or use in Hong Kong?*

If you are importing or locally manufacturing regulated architectural paints, vehicle refinishing paints, vessel paints, pleasure craft paints, printing inks, consumer products, adhesives or sealants for sale or use in Hong Kong, what you need to do is to ensure the products are in compliance with the respective VOC content limits, and display relevant product information in the Material Safety Data Sheets, trade catalogues, containers or packaging (except for regulated printing inks and consumer products).

For regulated architectural paints, however, in addition to complying with the VOC content limits and displaying of information, you will also need to make prior notifications to the EPD, and/or provide specific labels on architectural paints that exceed the VOC content limits before the architectural paints are allowed to be sold or used in Hong Kong. Please see Chapter 2 for details.

*Q1.16 I am importing regulated products for the purpose of re-export to places outside Hong Kong. So, is the Regulation relevant to me? Are products in transit also controlled?*

The Regulation does not apply to regulated products that are in transit, in the course of transshipment, or solely for the purpose of export or re-export. For example, if you bring in regulated products and keep them at all times in your warehouse solely for re-export purpose but not for sale or use in Hong Kong, then these products would be regarded as goods for re-export and will not be subject to control. Also, products that are brought into Hong Kong solely for the purpose of taking them out of Hong Kong and they remain at all



times on the vessel or aircraft that brought them into Hong Kong are considered as goods in transit and are not subject to control of the Regulation. You will however be required to keep relevant records/documents and provide evidence to prove that when investigated by the Authority. Please refer to Q1.31 below for relevant records/documents to be kept.

*Q1.17 I have already imported a large quantity of regulated products into Hong Kong before the effective date of the VOC content limit. Will I be caught for selling such products?*

The Regulation does not apply to you if your products are imported or locally manufactured before the relevant VOC content limits become effective. However, you should keep relevant records/documents and provide evidence to substantiate that when investigated by the Authority. Please refer to Q1.31 below for relevant records/documents to be kept.

*Q1.18 What are the designated test methods for determining the VOC content of regulated products? Are there any commercial laboratories in Hong Kong that can provide quality service for these tests?*

Please refer to Q2.7, Q3.2, Q4.6, Q5.5, Q6.4 and Q7.5 for the designated test methods for determining the VOC content of regulated architectural paints, printing inks, consumer products, vehicle refinishing paints, vessel and pleasure craft paints, and adhesives and sealants, respectively.

You may solicit testing service from reputable laboratories, such as those accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS). Particulars of the HOKLAS accredited laboratories can be found at <http://www.itc.gov.hk>.



*Q1.19 What are the maximum penalties under the Regulation?*

The maximum penalties for various offences are as follows:

<b>Offences</b>	<b>Maximum Penalty</b>
Import into Hong Kong or manufacture in Hong Kong regulated products in excess of the statutory VOC content limits for local sale or use	\$200,000 and 6 months' imprisonment
Failure to comply with any of the requirements to limit VOC emissions from lithographic heatset web printing machines (other than failure to display the latest test certificate on the printing machine)	\$200,000 and 6 months' imprisonment
Failure to display the latest test certificate on a lithographic heatset web printing machine	\$50,000
Failure to carry a label during the transitional period or failure to meet the specifications for label for regulated architectural paints imported into or manufactured in Hong Kong for local sale or use	\$100,000 and 3 months' imprisonment
Failure to display product information for regulated architectural paints, vehicle refinishing paints, vessel paints, pleasure craft paints, adhesives and sealants imported into or manufactured in Hong Kong for local sale or use	\$50,000 and 3 months' imprisonment
Failure to make product notification for regulated architectural paints imported into or manufactured in Hong Kong for local sale or use	\$50,000 and 3 months' imprisonment
Failure to submit an annual report with specific information for regulated products imported into or manufactured in Hong Kong for local sale or use	\$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 into or manufactured in Hong Kong for local sale or use	\$50,000 and 3 months' imprisonment
Failure to produce upon request any record of regulated products imported into or manufactured in Hong Kong for local sale or use for inspection by the Authority	\$50,000 and 3 months' imprisonment
For the purpose of the Regulation knowingly or recklessly display, give, report or record any information that is misleading, false or incomplete in a material particular	\$50,000 and 3 months' imprisonment



*Q1.20 What product information are required to be disclosed? Do I need to display all the required product information in each of all the four media types, i.e. Material Safety Data Sheet, trade catalogue, container and packaging?*

A local manufacturer or an importer of a regulated product except for regulated printing inks and regulated consumer products shall disclose the below listed information. You can choose to display the required product information, in part or in whole, in any one of the four media types according to your needs but you have to make sure all the required information are displayed to satisfy the minimum requirement of the Regulation.

	<b>Regulated Architectural Paints</b>	<b>Regulated Vehicle Refinishing Paints, Vessel Paints and Pleasure Craft Paints</b>	<b>Regulated Adhesives and Sealants</b>
Type of regulated product to which the product belongs	✓	✓	✓
Date of its manufacture	✓	✓	✓
Density/specific gravity in which the product is sold		✓	✓
VOC content of the product in 'ready to use' condition	✓	✓	✓
Curing procedure if the product contains any reactive diluent and the presence of the diluent has been taken into account in determining the VOC content of the product			✓
Name of the added compound if the compound belongs to a chemical group of exempt compounds and has been added as a product ingredient in manufacturing the product and the weight of the added compound has been included in the weight of exempt compounds in determining the VOC content of the product		✓ (except regulated vehicle refinishing paints)	✓
Manufacturer's recommendation on dilution with solvent or thinner, and mixing of components, and the recommended dilution and mixing ratios		✓	✓



*Q1.21 Is there any other information that I should also provide with my products?*

For regulated products requiring dilution with solvent or thinner, or mixing with components, it is advisable for the local manufacturers or importers of these products to provide also information about the recommended dilution or mixing ratio if it is not yet required in the Regulation, and specifications (e.g. brand name and specific gravity) of the solvent or thinner, or components to be used, which can help the users ensure the VOC content of the product would be in compliance with the prescribed VOC content limit after dilution or mixing.

*Q1.22 Is there any particular requirement on the wordings to describe the type of regulated product a product belongs to?*

Example for a regulated architectural paint, the following text in English and Chinese will do:

“Type of Regulated Architectural Paint under the Air Pollution Control (Volatile Organic Compounds) Regulation of Hong Kong: [xxxx]

香港空氣污染管制(揮發性有機化合物)規例下受規管建築漆料的類別: [xxxx]”

where [xxxx] stands for the applicable type of regulated architectural paint listed in Schedule 1 of the Regulation (Annex 1 is also relevant).



*Q1.23 Where should the manufacturing date of product be displayed in the four media types, i.e. Material Safety Data Sheet, trade catalogue, container and packaging?*

The manufacturing date of product is required to appear in at least one of the four media types. A reasonable choice and as a common trade practice would probably be to display the manufacturing date on the container or packaging of the product.

*Q1.24 What format should be used for the manufacturing date?*

Any conventional date format in number or text in English or Chinese would be accepted. Date codes that require deciphering and are known only to the suppliers are however not acceptable. For example, batch number or product code would not be regarded or accepted as manufacturing date.

*Q1.25 What is the format for displaying the VOC content of product?*

The VOC content in 'ready to use' condition should be displayed and expressed in either one of the formats below. For portable sealants or caulking compounds, the unit of the VOC content should however be expressed in "% by weight" instead of in "grams/litre". There is no specific requirement on the number of significant figures to be given for the VOC content.

For products not requiring dilution with solvent or thinner, or mixing with components before application so that they can be used as supplied in the packaging or containers:

- (a) "VOC content (ready to use) = xx g/litre", or
- (b) "VOC content (ready to use) not exceeding xx g/litre"



For products requiring dilution with solvent or thinner, or mixing of components before application:

- (c) “VOC content (after dilution/mixing) = xx g/litre”, or
- (d) “VOC content (after dilution/mixing) not exceeding xx g/litre”

Chinese translation for the above formats:

- (a) “揮發性有機化合物含量(即用狀態) = xx 克/公升”
- (b) “揮發性有機化合物含量(即用狀態)不超過 xx 克/公升”
- (c) “揮發性有機化合物含量(稀釋/混合後) = xx 克/公升”
- (d) “揮發性有機化合物含量(稀釋/混合後)不超過 xx 克/公升”

*Q1.26 What does ‘ready to use’ condition or VOC content in ‘ready to use’ condition mean?*

If dilution with solvent or thinner, or mixing of components is recommended on a regulated product, the product in ‘ready to use’ condition is when it is diluted or mixed according to the recommended dilution or mixing ratio on the product that gives the maximum VOC content. Otherwise, it is the condition of the product in which it is supplied in the packaging or container. For example, when a range of ratios is recommended for dilution with organic solvent (containing 100% VOCs) for the product, the highest dilution ratio should be used to give the maximum VOC content or the so-called the VOC content in ‘ready to use’ condition. However, if the diluent is water or solvent of exempt compounds, the lowest dilution ratio should be used to give the maximum VOC content.



*Q1.27 How do I comply with the annual reporting requirement?*

For any regulated products that are imported or locally manufactured after the relevant effective dates of VOC content limits, a report with the sales amount and specific information of these regulated products which are sold or used in Hong Kong in the preceding calendar year has to be submitted to the EPD by 31 March of the following year (starting in the year immediately after the year the relevant VOC content limit comes into effect), in a format which is available for download at the EPD website: <http://www.epd.gov.hk>.

Regarding the submitted information, they will be treated confidentially and processed with great care such that no individual submission would be identifiable. According to section 41 of the Air Pollution Control Ordinance, any public officer who releases any information concerning a trade, business or manufactory secret obtained officially, commits an offence.

*Q1.28 In disclosing and reporting the VOC content of a product, can it be in a range of VOC contents?*

Yes. You can disclose and report the VOC content of a regulated product as a range of VOC contents, other than its maximum content.

*Q1.29 Does the Regulation provide any exemption from compliance with the VOC content limits?*

Under the Regulation, the EPD may grant an exemption, with conditions where appropriate, if it is in the public interest OR the non-compliant product is irreplaceable in serving a vital public



health or security function OR the product is imported as a trade sample not meant for sale in Hong Kong. Application for exemption should be made in writing to the EPD at the address shown in Q1.32.

*Q1.30 Will regulated products imported or manufactured before the effective dates of the statutory requirements be affected?*

Regulated products imported or manufactured before the respective effective dates will not be affected by the Regulation. However, any regulated products found in Hong Kong after the effective dates would be presumed, in the absence of evidence to the contrary, to have been imported or manufactured after the prohibition or requirement came into effect. You are therefore strongly advised to keep the relevant documents and records of the regulated products that are imported or manufactured before the effective dates for possible inspection by the Authority.

*Q1.31 According to the Regulation, what records and documents do I, as a local manufacturer or importer, need to keep?*

As an importer or a local manufacturer, you are required to keep the relevant documents and records containing particulars of the regulated products imported or locally manufactured, such as invoices, delivery notes, waybills, purchase orders and custom declaration records, etc. and other documents considered relevant as far as practicable, which can help the EPD to verify the following:

- (a) When certain batches of regulated products were imported or locally manufactured and their quantities;



- (b) When certain batches of regulated products were stored, sold, used, exported, re-exported and their quantities; and
- (c) Which parties were involved for the regulated products sold, exported, re-exported and their quantities.

*Q1.32 Where can I obtain further information about the Regulation?*

For further information, you are welcome to approach the EPD at the following address:

Environmental Protection Department  
Territorial Control Office  
24/F, Southorn Centre  
130 Hennessy Road  
Wan Chai, Hong Kong

Enquiry Hotline: 2838 3111 Fax: 2838 3111

Email: [enquiry@epd.gov.hk](mailto:enquiry@epd.gov.hk)

For a copy of the Air Pollution Control (Volatile Organic Compounds) Regulation, please visit the Bilingual Law Information System at <http://www.elegislation.gov.hk> and look under 'Chapter 311, Air Pollution Control Ordinance'.

## *Chapter 2 - Regulated Architectural Paints*

This Chapter gives additional requirements specifically applicable to regulated architectural paints. For information on those requirements common to all regulated products, please refer to Chapter 1.

*Q2.1 Are there any procedures to follow before one imports or locally manufactures regulated architectural paints for sale or use in Hong Kong?*

Importers or local manufacturers should make notifications to the Authority prior to the local sale or use of the regulated architectural paints. They are required to display relevant product information in the Material Safety Data Sheets, trade catalogues, packaging or containers, or to carry a specific label as appropriate (see Q2.4) before they are allowed to be sold or used in Hong Kong.

*Q2.2 How do I make notification to the EPD?*

In making a notification to the EPD, an importer or local manufacturer of regulated architectural paints shall give the following particulars:

- (a) the name of the importer or local manufacturer of the product;
- (b) the type of regulated architectural paint in Schedule 1 of the Regulation to which the product belongs;
- (c) the brand and full name of the product;
- (d) the volume or weight in which the product is sold;
- (e) when dilution of the product with solvent or thinner is necessary before application, the brand and full name of the diluent to be used and its specific gravity;



- (f) the VOC content of any colourant added to the tint base of the product, expressed in grams per litre of coating or material less water and less exempt compounds; and
- (g) the VOC content in 'ready to use' condition (see Q1.26).

*[The importer or local manufacturer may wish to estimate the VOC content of their products by virtue of the product formulations or they may determine the VOC content by means of the designated test methods as described in Q2.7. In case of dispute, however, the test results by a competent laboratory using the designated test methods shall prevail.]*

The notification form is available for download at the EPD website:  
<http://www.epd.gov.hk>.

**Q2.3** *Is the notification a one-off exercise for the same regulated product? When would I need to make another notification again?*

Notification is normally a one-off exercise for the same regulated architectural paint until there is a change in the product formulation or packaging that affects the VOC content of the product and then, another notification will become necessary.

**Q2.4** *What should be the wordings in the label for regulated architectural paints?*

A regulated architectural paint imported into or manufactured in Hong Kong during the transitional period from 1 April 2007 till the respective prescribed VOC content limit takes effect and the paint contains VOCs in excess of the relevant content limit is required to bear a label with the following messages in English and Chinese before local sale or use:



- (a) “The content of volatile organic compounds in this product exceeds the prescribed limit that is to be implemented with effect from 1 January [ ]\*. Volatile organic compounds cause air pollution.”; and
- (b) “本產品的揮發性有機化合物含量，超逾將於[ ]\* 年1月1日實施的訂明限制。揮發性有機化合物引致空氣污染。”

*[\* Space in brackets for filling in the calendar year when the respective VOC content limit becomes effective; it should be 2008, 2009 or 2010.]*

**Q2.5** *How and where should the label be fixed to the product?*

The label can be affixed to, formed, molded into or simply appeared upon the exterior other than on the bottom of the container and the packaging of the product. For sticker labels, they must be designed to last and must not peel off easily.

**Q2.6** *Is there a specific size for the label? What if the surface area of the container or packaging of the product is too small?*

The size of the label must be at least:

- (a) 100 mm x 60 mm, with the English letters at least 3 mm high and the Chinese characters at least 5 mm high; or
- (b) one-fifth of the area of the largest surface of the product’s container or packaging, with the size of the English letters and Chinese characters adjusted in proportion to the label described in (a) above.

Also, the English letters/Chinese characters and the background of the label should be in good contrasting colours to make the text legible and conspicuous.



*Q2.7 What are the designated test methods and how is the VOC content of product determined using the laboratory analysis results?*

The designated test method for determining the VOC content of regulated architectural paints is Method 24, “*Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings*”, as adopted by the United States Environmental Protection Agency. This test method can be downloaded at <http://www.epa.gov>.

For determining the exempt compounds of regulated architectural paints, the designated test method is Method 303, “*Determination of Exempt Compounds*”, as adopted by the California South Coast Air Quality Management District of the United States, which is available for download at <http://www.aqmd.gov>.

The VOC content of regulated architectural paints in a ‘ready to use’ condition shall be calculated with the laboratory analysis results using the formula described in Annex 1.

*Q2.8 Do other stakeholders such as the developers, architects or paint workers have a role to play in the Regulation?*

Other stakeholders such as property developers, architects or paint workers do not have a legal role to play under the Regulation. However, they can contribute to this endeavour to reduce VOC emissions by choosing low- or no-VOC architectural paints/coatings and related products for their building and construction works, or by adopting good practices for the purchase, use, handling, storage and eventual disposal of VOC-containing paint products. Further advice is given in the EPD pamphlet “*A Simple Guide for Architects, Home Owners and Painters to Reduce Paint VOC Emission*” which is available for download at the EPD website: <http://www.epd.gov.hk>.

## ***Chapter 3 - Regulated Printing Inks and Emission Control Device for Lithographic Heatset Web Printing Machines***

This Chapter gives additional requirements specifically applicable to regulated printing inks and lithographic heatset web printing machines. For information on those requirements common to all regulated products, please refer to Chapter 1.

### ***Regulated Printing Inks***

*Q3.1 How would the VOC content limits of printing inks affect me as an end-user in a printing factory? How is the Regulation relevant to me?*

The Regulation only requires importers and local manufacturers to import or locally manufacture regulated printing inks with VOC content not exceeding the prescribed VOC content limits. End-users in printing factories would not be affected by the Regulation other than that they would have to keep proper records of purchases for the inks used. They would also have to switch to using compliant printing inks or adopt good housekeeping practices for the purchase and use of VOC compliant printing inks. Further advice is given in the EPD pamphlet “*A Simple Guide for Publishers and Printers to Reduce VOC Emission*” which is available for download at the EPD website: <http://www.epd.gov.hk>.



As part of the enforcement effort, the EPD staff would randomly visit printing factories to look for any non-compliant products. As such, proper records of purchases kept by the end-users would help the EPD tremendously in tracing the importer or local manufacturer responsible.

*Q3.2 What are the designated test methods and how is the VOC content of printing inks determined using the laboratory analysis results?*

The designated test method for determining VOC content of regulated printing inks (except gravure inks) is Method 24, “*Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings*” as adopted by the United States Environmental Protection Agency. For gravure inks, the designated method is Method 24A, “*Determination of Volatile Matter Content and Density of Publication Rotogravure Inks and Related Publication Rotogravure Coatings*”, as adopted by the United States Environmental Protection Agency. These two test methods can be downloaded at <http://www.epa.gov>.

For determining the exempt compounds of regulated printing inks, the designated test method is Method 303, “*Determination of Exempt Compounds*”, as adopted by the California South Coast Air Quality Management District of the United States. The method can be downloaded at <http://www.aqmd.gov>.

The VOC content of regulated printing inks in a ‘ready to use’ condition should be calculated with the laboratory analysis results using the formula described in Annex 2.



**Q3.3** *What is the type of screen printing ink that is subject to control under the Regulation?*

The screen printing ink used for screen printing on paper substrates is subject to control under the Regulation.

### ***Lithographic Heatset Web Printing Machines***

**Q3.4** *What are the statutory requirements for an owner of a lithographic heatset web printing machine?*

There is no statutory VOC content limit set for lithographic heatset printing inks and instead, the owner of a lithographic heatset web printing machine is required to:

- (a) install on the machine an emission control device to limit VOC in the waste gases to no more than 100 mg Carbon/m<sup>3</sup>, without dilution, at reference conditions of 0°C and 101.325 kilopascals as certified by a competent person using Method 18 “*Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*”, as adopted by the United States Environmental Protection Agency;
- (b) design and operate the emission control device to capture and control VOC emission from all printing work of the machine;
- (c) display the certificate in (a) at a conspicuous place on the machine; and
- (d) have the emission control device re-certified by a competent person within 24 months from the previous certification.

The ‘competent person’ means a registered professional engineer in the building services, gas, chemical, environmental, marine and



naval architecture or mechanical discipline under the Engineers Registration Ordinance (Cap. 409). Particulars of the registered professional engineers can be found at <http://www.erb.org.hk>.

*Q3.5 Do the requirements in Q3.4 apply to all existing lithographic heatset web printing machines?*

Yes. All lithographic heatset web printing machines will have to comply with the requirements in Q3.4 by 1 January 2009.

*Q3.6 Is prior approval from the EPD required for installation, alteration or modification of the VOC emission control devices in the lithographic heatset web printing machines?*

If the installation, alteration or modification of the VOC emission control devices involves installation, alteration or modification of chimney, furnace, oven or flue, you are required to submit detailed plan to the EPD for prior approval not less than 28 days before commencement of the work as stipulated under the Air Pollution Control (Furnaces, Ovens and Chimneys) (Installation and Alteration) Regulations. Applications should be submitted to any one of the Regional Control Offices. Their addresses and the responsible areas can be found at the EPD website: <http://www.epd.gov.hk>.

Approval from Buildings Department may also be required for building alteration works such as the erection of a chimney. Please contact relevant government departments for further information as necessary.

## ***Chapter 4 - Regulated Consumer Products***

This Chapter gives additional requirements specifically applicable to regulated consumer products. For information on those requirements common to all regulated products, please refer to Chapter 1.

### *Q4.1 What consumer products are controlled under the Regulation?*

The Regulation imposes maximum limits in phases between 1 April 2007 and 1 January 2009 on the VOC content of six categories of consumer products - air fresheners, hairsprays, multi-purpose lubricants, floor wax strippers, insecticides and insect repellents. No person shall import into or manufacture in Hong Kong for local sale or use any of the regulated consumer products containing VOCs in excess of the limits shown in Annex 3 after the specified effective dates.

### *Q4.2 What is the definition of VOC for regulated consumer products in the Regulation? What compounds are exempted when determining the VOC content?*

The definition of VOC and the exempt compounds at different implementation stages of the Regulation are given in Annex 3. LVP-VOC (low vapour pressure VOC) and fragrances up to 2% by weight of the product are also excluded in determining the VOC content of product.

### *Q4.3 The Regulation allows exemption of fragrance components that have a combined vapour pressure of less than 2 mm Hg and exemption of LVP-VOC with vapour pressure of less than 0.1 mm Hg. How can I claim exemption for these components?*



While the fragrance exemption applies to fragrance mixture as a whole, the exemption for LVP-VOC applies to individual compounds. You can claim the exemption of individual compound in the fragrance mixture if it meets the definition of LVP-VOC. The thumb rule under the Regulation is that one should first look at the entire fragrance mixture less 2 percent for the fragrance exemption and then exempt any LVP-VOC in the product formulation from the remaining fragrance portion. For example, a product is composed of fragrance mixture at 5% by weight and one of the components in the fragrance is geraniol, a LVP-VOC, which represents one third of the fragrance mixture. In this case, you can first claim a maximum of 2% exemption for the fragrance, leaving the remaining portion of the fragrance (i.e. 3% of the product formulation) subject to the VOC content limit. You may then apply the LVP-VOC exemption for geraniol to the remaining one third of the fragrance mixture (i.e. one third of the 3% of the product), which is equivalent to 1% of the product. Therefore, the entire amount of the fragrance that could be exempted is 3% of the product.

Annex 9 gives another example on how the above results using the product formulation data could help estimate the VOC content of a hypothetical aerosol product.

*Q4.4 Under the Regulation, insecticides for agricultural, industrial or institutional use are exempted. What are the details on this exemption?*

Insecticides designated for use in commercial operation relevant to animal or plant crops, manufacturing or industrial facility operation, or operation of buildings such as hospitals, schools, libraries, auditoriums and office complexes are exempted.



*Q4.5 Are air fresheners comprising entirely of fragrance exempted from the Regulation?*

Yes. Products not comprising entirely of fragrance but containing only exempt compounds in the remaining portion are exempted as well. Some examples of products to which this exemption may apply are fragrance candles and fragrance-soaked cardboard substrates.

*Q4.6 How do I determine the VOC content of regulated consumer products by analytical testing methods?*

To determine the VOC content of regulated consumer products, the test methods referred to in Part 7 of Schedule 3 to the Regulation are relevant. The quoted Method 310, “*Determination of Volatile Organic Compounds in Consumer Products and Reactive Organic Compounds in Aerosol Coating Products*”, as adopted by the California Air Resources Board of the United States, can be downloaded at <http://www.arb.ca.gov>.

The VOC content of regulated consumer products shall be calculated with the laboratory analysis results using the formula described in Annex 3.

*Q4.7 What should I do if I have doubt about the VOC content of my product?*

When you have doubt about the VOC content of your product, you are advised to engage a competent laboratory to conduct the testing using the designated test methods. For enforcement purpose, the EPD will conduct surveillance on the local market and use testing results as the basis to establish any violation of the legal requirements.

## ***Chapter 5 - Regulated Vehicle Refinishing Paints***

This Chapter gives additional requirements specifically applicable to regulated vehicle refinishing paints. For information on those requirements common to all regulated products, please refer to Chapter 1.

*Q5.1 What types of vehicle refinishing paints are controlled under the Regulation?*

The Regulation imposes maximum limits on the VOC content of 14 types of paints intended for use in refinishing motor vehicles and mobile equipment which includes trains, railcars, truck trailers, mobile cranes, bulldozers, street cleaners, trams, cable cars, and implements of husbandry or agriculture. No person shall import into or manufacture in Hong Kong for local sale or use any of the regulated vehicle refinishing paints containing VOCs in excess of the limits shown in Annex 4 after 1 October 2011.

*Q5.2 Are exempt compounds allowed for when determining the VOC content of regulated vehicle refinishing paints?*

No. The Regulation exempts certain compounds when determining the VOC content in other regulated products but not for vehicle refinishing paints.



*Q5.3 Are the vehicle refinishing paints sold in small containers exempted from control under the Regulation?*

Yes. Vehicle refinishing paints sold in small containers of not more than 15 millilitres are exempted from control. This includes the touch up pens that are sold in retail shops.

*Q5.4 Are aerosol paints exempted from control under the Regulation?*

Yes. Aerosol paints are exempted from control. However, importers and local manufacturers are advised not to supply paints in aerosol spray cans, if products are available in larger containers or bulk supply, as using products in aerosol spray cans would generate more wastes and is environmentally unfriendly.

*Q5.5 What are the designated test methods and how is the VOC content of product determined using the laboratory analysis results?*

The designated test method for determining VOC content of regulated vehicle refinishing paints is Method 24, “*Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings*”, as adopted by the United States Environmental Protection Agency. This test method can be downloaded at <http://www.epa.gov>.

The VOC content of regulated vehicle refinishing paints in a ‘ready to use’ condition shall be calculated with the laboratory analysis results using the formula described in Annex 4.

## ***Chapter 6 - Regulated Vessel Paints and Regulated Pleasure Craft Paints***

This Chapter gives additional requirements specifically applicable to regulated vessel paints and regulated pleasure craft paints. For information on those requirements common to all regulated products, please refer to Chapter 1.

*Q6.1 What types of vessel and pleasure craft paints are controlled under the Regulation?*

The Regulation imposes maximum limits in phases between 1 January 2010 and 1 April 2012 on the VOC content of 23 types of vessel paints intended for use on ships, boats, buoys or oil drilling rigs and their appurtenances; and 13 types of pleasure craft paints intended for use on marine vessels primarily for the purpose of sport or recreation, and their appurtenances. No person shall import into or manufacture in Hong Kong for local sale or use any of the regulated vessel paints and regulated pleasure craft paints containing VOCs in excess of the limits shown in Annex 5 after the specified effective dates.

*Q6.2 Are the sea-stocking products subject to control under the Regulation?*

Ocean-going vessels may stock up certain types of paints intended for routine maintenance during voyage. Such products, if non-compliant, should not be used after entering Hong Kong waters and remain intact before departure, which could then be regarded as “goods in transit” and are not subject to control. Proper keeping of



relevant documents to prove that these paints are for sea-stocking should be kept for inspection by the Authority.

*Q6.3 If a paint product can be classified according to its intended application as a regulated vessel paint, regulated pleasure craft paint, regulated architectural paint, or regulated vehicle refinishing paint, which VOC content limit would apply to this product?*

In case a paint product may fall into different regulated paint types according to the manufacturers' recommendation or instructions for application, the lowest of the respective VOC content limits should apply in accordance with section 2A of the Regulation.

*Q6.4 What are the designated test methods and how is the VOC content of product determined using the laboratory analysis results?*

The designated test method for determining VOC content of regulated vessel paints and regulated pleasure craft paints is Method 24, "*Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings*", as adopted by the United States Environmental Protection Agency. This test method can be downloaded at <http://www.epa.gov>.

For determining the exempt compounds of regulated vessel paints and regulated pleasure craft paints, the designated test method is Method 303, "*Determination of Exempt Compounds*", as adopted by the California South Coast Air Quality Management District of the United States, which is available for download at <http://www.aqmd.gov>.

The VOC content of regulated vessel paints and regulated pleasure craft paints in a 'ready to use' condition shall be calculated with the laboratory analysis results using the formula described in Annex 5.

## ***Chapter 7 - Regulated Adhesives and Regulated Sealants***

This Chapter gives additional requirements specifically applicable to regulated adhesives and regulated sealants. For information on those requirements common to all regulated products, please refer to Chapter 1.

*Q7.1 Are the glues commonly used in homes and at offices controlled under the Regulation?*

Yes. Similar to the control of VOC content for products adopted in California, glues commonly used in homes and at offices are controlled under the Regulation.

*Q7.2 Under the Regulation, cyanoacrylate adhesive is exempted. What are the details on this exemption?*

Cyanoacrylate adhesives do not contain a solvent carrier. Although the reactive monomers may be volatile, the emissions are very low because polymer reactions occur during the bonding process.

*Q7.3 If a sealant is intended for architectural applications and is in packaging meeting the definition of “portable sealants or caulking compounds” in the Regulation, what is its VOC content limit?*

If a sealant is in packaging meeting the definition of “portable sealants or caulking compounds” in the Regulation, irrespective of whether or not its function is for architectural use or others, it



should be regarded as a portable sealant or caulking compound, and therefore it should meet the prescribed VOC content limit of 4% by weight.

*Q7.4 Do other stakeholders such as the developers and architects or consumers have a role to play in the Regulation?*

Other stakeholders such as property developers and architects or consumers do not have a legal role to play under the Regulation. However, they can contribute to this endeavour to reduce VOC emissions by choosing low-or no-VOC adhesives, sealants and related products for their building and construction, or renovation works, or by adopting good practices for the purchase, use, handling, storage and eventual disposal of VOC-containing products. Further advice is given in the EPD pamphlet “*Reduce VOC Emission from Adhesives and Sealants*” which is available for download at the EPD website: <http://www.epd.gov.hk>.

*Q7.5 What are the designated test methods and how is the VOC content of product determined using the laboratory analysis results?*

The designated test method for determining VOC content of regulated adhesives and regulated sealants (except portable sealants or caulking compounds) is Method 24, “*Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings*”, as adopted by the Environmental Protection Agency of the United States. This test method can be downloaded at <http://www.epa.gov>.

For determining the exempt compounds of regulated adhesives and regulated sealants (except portable sealants or caulking compounds),



the designated test method is Method 303, “*Determination of Exempt Compounds*”, as adopted by the California South Coast Air Quality Management District of the United States, which is available for download at <http://www.aqmd.gov>.

To determine the VOC content of portable sealants or caulking compounds, the test methods referred to in Part 7 of Schedule 3 to the Regulation are relevant. The quoted Method 310, “*Determination of Volatile Organic Compounds in Consumer Products and Reactive Organic Compounds in Aerosol Coating Products*”, as adopted by the California Air Resources Board of the United States, can be downloaded at <http://www.arb.ca.gov>.

The VOC content of regulated adhesives and regulated sealants in a ‘ready to use’ condition shall be calculated with the laboratory analysis results using the formula described in Annex 6.

For determining the VOC content of ABS welding adhesives, adhesive primers for plastic, CPVC welding adhesives and PVC welding adhesives, the designated test method is Method 316A, “*Determination of Volatile Organic Compounds in Materials used for Pipes and Fittings*”, as adopted by the California South Coast Air Quality Management District of the United States, which is available for download at <http://www.aqmd.gov>.

# ***Annex 1 - Definitions, VOC Content Limits and Effective Dates for Regulated Architectural Paints***

## ***Definitions***

“Volatile organic compound” means any volatile compound of carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate and the exempt compounds listed in Annex 7.

## ***VOC Content Limits and Effective Dates***

The following are maximum limits of VOC content, expressed as grams of VOCs per litre of coating or material when in a ‘ready to use’ condition –

<b>Regulated Architectural Paints*</b>		<b>Maximum Limits of VOC Content@</b>		
		<b>Effective from 1 Jan 2008</b>	<b>Effective from 1 Jan 2009</b>	<b>Effective from 1 Jan 2010</b>
1.	Aluminium roof coatings	250	-	-
2.	Below-ground wood preservatives	350	-	-
3.	Bond breakers	350	-	-
4.	Clear brushing lacquers	650	-	-
5.	Clear wood finishes (sanding sealers)	150	-	-
6.	Concrete-curing compounds	350	-	-
7.	Dry-fog coatings	400	-	-
8.	Fire-proofing exterior coatings	350	-	-
9.	Graphic arts (sign) coatings	500	-	-
10.	Interior stains	250	-	-
11.	Magnesite cement coatings	450	-	-
12.	Mastic coatings	300	-	-
13.	Pigmented lacquers	275	-	-



Regulated Architectural Paints*		Maximum Limits of VOC Content@		
		Effective from 1 Jan 2008	Effective from 1 Jan 2009	Effective from 1 Jan 2010
14.	Recycled coatings	250	-	-
15.	Roof coatings (exposed)	50	-	-
16.	Roof coatings (non-exposed)	250	-	-
17.	Shellacs (clear)	730	-	-
18.	Shellacs (pigmented)	550	-	-
19.	Specialty primers	350	-	-
20.	Stains	100	-	-
21.	Swimming pool repair coatings	340	-	-
22.	Swimming pool coatings (other)	340	-	-
23.	Waterproofing concrete or masonry sealers	400	-	-
24.	Wood preservatives (other)	350	-	-
25.	Fire-retardant coatings (clear)	-	650	-
26.	Flat coatings	-	50	-
27.	Granite look-alike coatings or textured undercoaters	-	100	-
28.	Japans or faux finishing coatings	-	350	-
29.	Multi-colour coatings	-	250	-
30.	Non-flat coatings	-	150	-
31.	Roof primers (bituminous)	-	350	-
32.	Clear wood finishes (lacquers)	-	-	550
33.	Clear wood finishes (varnishes)	-	-	150
34.	Extreme high-gloss coatings for metal	-	-	420
35.	Fire-retardant coatings (pigmented)	-	-	350
36.	Floor coatings	-	-	250
37.	High-temperature industrial maintenance coatings	-	-	420
38.	Industrial maintenance coatings	-	-	250
39.	Metallic pigmented coatings	-	-	500
40.	Pre-treatment coatings for metal	-	-	420
41.	Pre-treatment wash primers	-	-	420
42.	Primers, sealers and undercoaters	-	-	200
43.	Quick-dry enamels	-	-	250
44.	Quick-dry primers, sealers and undercoaters	-	-	200



Regulated Architectural Paints*		Maximum Limits of VOC Content@		
		Effective from 1 Jan 2008	Effective from 1 Jan 2009	Effective from 1 Jan 2010
45.	Rust preventative coatings	-	-	400
46.	Superior durability solvent-borne coatings for metal	-	-	420
47.	Traffic coatings	-	-	150
48.	Waterproofing sealers	-	-	250
49.	Zinc-rich industrial maintenance primers	-	-	250
50.	Low-solids coatings	-	-	120#
51.	Other architectural coatings**	250	-	-

\* For specific definitions of the 51 types of regulated architectural paints, please refer to Schedule 1 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website <http://www.elegislation.gov.hk>.

\*\* Any architectural coating not listed as Type (1) to Type (50) shall comply with the limit of Type (51).

@ With the exception of low-solids coatings, the VOC content of regulated architectural paints in a 'ready to use' condition shall be calculated by the following formula –

$$\frac{W_a - W_b - W_c - W_d}{V_e - V_f - V_g}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24

W<sub>b</sub> = weight of water in grams as determined by Method 24

W<sub>c</sub> = weight of exempt compounds in grams as determined by Method 303

W<sub>d</sub> = weight of VOCs in grams of any colourant added to tint base per litre of material, as provided by the paint manufacturer or importer



- Ve = volume of material in litres as determined by Method 24
- Vf = volume of water in litres as determined by Method 24
- Vg = volume of exempt compounds in litres as determined by Method 303

For Vf and Vg, they represent respectively the volume of water and exempted compounds as part of the architectural paint in a ‘ready to use’ condition after thinning. They can be discarded if the respective methods mentioned above do not set out any procedures for determination. It should be noted that for Ve, the total volume of the architectural paint in a ‘ready to use’ condition after thinning should be used.

# For low-solids coatings in a ‘ready to use’ condition, the VOC content shall be calculated by the following formula –

$$\frac{W_a - W_b - W_c - W_d}{V_e}$$

where –

- Wa = weight of volatile matters in grams as determined by Method 24
- Wb = weight of water in grams as determined by Method 24
- Wc = weight of exempt compounds in grams as determined by Method 303
- Wd = weight of VOCs in grams of any colourant added to tint base per litre of material, as provided by the paint manufacturer or importer
- Ve = volume of the material in litres as determined by Method 24

For Ve, the total volume of the coating in a ‘ready to use’ condition after thinning should be used.

## ***Annex 2 - Definitions, VOC Content Limits and Effective Dates for Regulated Printing Inks and Limit on VOC Emissions and Effective Date for Lithographic Heatset Web Printing Machines***

### ***Definitions***

“Volatile organic compound” means any volatile compound of carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate and the exempt compounds listed in Annex 7.

### ***VOC Content Limits and Effective Dates for Regulated Printing Inks***

The following are maximum limits of VOC content, expressed as grams of VOCs per litre of printing ink when in a ‘ready to use’ condition –

Regulated Printing Inks*		Maximum Limits of VOC Content@	
		Effective from 1 April 2007	Effective from 1 January 2009
1.	Flexographic fluorescent ink	300	-
2.	Flexographic ink non-porous substrate	300	-
3.	Flexographic ink porous substrate	225	-
4.	Letterpress ink	300	-
5.	Lithographic ink (except heatset ink)	300	-
6.	Gravure ink	-	300#
7.	Screen printing ink**	-	400



- \* For specific definitions of the 7 types of regulated printing inks, please refer to Schedule 2 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website <http://www.elegislation.gov.hk>.
- \*\* For application on paper substrate only.

@ Except for gravure inks, the VOC content of all regulated printing inks in a ‘ready to use’ condition shall be calculated by the following formula –

$$\frac{W_a - W_b - W_c}{V_d - V_e - V_f}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24

W<sub>b</sub> = weight of water in grams as determined by Method 24

W<sub>c</sub> = weight of exempt compounds in grams as determined by Method 303

V<sub>d</sub> = volume of material in litres as determined by Method 24

V<sub>e</sub> = volume of water in litres as determined by Method 24

V<sub>f</sub> = volume of exempt compounds in litres as determined by Method 303

For V<sub>e</sub> and V<sub>f</sub>, they represent respectively the volume of water and exempt compounds as part of the printing ink in a ‘ready to use’ condition after thinning. They can be discarded if the respective methods mentioned above do not set out any procedures for determination. It should be noted that for V<sub>d</sub>, the total volume of the printing ink in a ‘ready to use’ condition after thinning should be used.



# The VOC content of all gravure inks in a ‘ready to use’ condition shall be calculated by the following formula –

$$\frac{W_a - W_b - W_c}{V_d - V_e - V_f}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24A

W<sub>b</sub> = weight of water in grams as determined by Method 24A

W<sub>c</sub> = weight of exempt compounds in grams as determined by Method 303

V<sub>d</sub> = volume of material in litres as determined by Method 24A

V<sub>e</sub> = volume of water in litres as determined by Method 24A

V<sub>f</sub> = volume of exempt compounds in litres as determined by Method 303

For V<sub>e</sub> and V<sub>f</sub>, they represent respectively the volume of water and exempt compounds as part of the printing ink in a ‘ready to use’ condition after thinning. They can be discarded if the respective methods mentioned above do not set out any procedures for determination. It should be noted that for V<sub>d</sub>, the total volume of the printing ink in a ‘ready to use’ condition after thinning should be used.

### ***Limit on VOC Emissions and Effective Date for Lithographic Heatset Web Printing Machines***

With effect from 1 January 2009, an owner of a lithographic heatset web printing machine shall install on the machine an emission control device with an emission limit on VOCs of no more than 100 mg Carbon/m<sup>3</sup> on the waste gases, without dilution, at reference conditions of 0°C and 101.325 kilopascals.

## ***Annex 3 - Definitions, VOC Content Limits and Effective Dates for Regulated Consumer Products***

### ***Definitions***

For hairspray products from 1 April 2007 till 31 December 2008, “volatile organic compound” means any volatile compound of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate and exempt compounds listed in Annex 8.

For other regulated consumer products from 1 January 2008 onwards and for hairspray products from 1 January 2009 onwards, “volatile organic compound” means any volatile compound containing at least one atom of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate and exempt compounds listed in Annex 8.



## VOC Content Limits and Effective Dates

The following are maximum limits of VOC content, expressed as percent by weight –

Regulated Consumer Products <sup>[1] *</sup>	Maximum Limits of VOC Content@		
	Effective from 1 Apr 2007	Effective from 1 Jan 2008	Effective from 1 Jan 2009
<b>Air Freshener <sup>[2]</sup></b>			
Air freshener in the form of liquid or pump spray	-	-	18
Air freshener in the form of solid or gel	-	-	3
Double phase aerosol air freshener	-	25	-
Dual purpose aerosol air freshener and disinfectant	-	60	-
Single phase aerosol air freshener	-	30	-
<b>Floor Wax Stripper <sup>[3]</sup></b>			
For heavy build-up of polish	-	12	-
For light or medium build-up of polish	-	3	-
<b>Hairspray</b>	80	-	55
<b>Insect Repellent</b>			
Aerosol insect repellent	-	-	65
<b>Insecticide <sup>[4]</sup></b>			
Aerosol crawling bug insecticide	-	-	15
Aerosol flying bug insecticide	-	-	25
Aerosol lawn and garden insecticide	-	20	-
Flea and tick insecticide	-	25	-
Insecticide fogger	-	45	-
<b>Multi-purpose Lubricant</b> (excluding product in the form of solid or semi-solid)	-	50	-



- \* For specific definitions of the 15 types of regulated consumer products, please refer to Schedule 3 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website <http://www.elegislation.gov.hk>.
- <sup>[1]</sup> Fragrances incorporated into a regulated consumer product, up to a combined level of 2% by weight of the product, shall be excluded in calculating the VOC content of the product.
  - <sup>[2]</sup> Air fresheners, less exempt compounds, if comprising entirely of fragrance are exempted from the Regulation and the VOC content limits shall not apply.
  - <sup>[3]</sup> For floor wax strippers, the limits refer to the VOC content after dilution as calculated according to the dilution ratio recommended on the products.
  - <sup>[4]</sup> Insecticides containing at least 98% paradichlorobenzene and bait station insecticides are exempted from the Regulation and the VOC content limits shall not apply. Bait station insecticides are containers enclosing an insecticidal bait that is not more than 14.2 grams by weight, where the bait is designed to be ingested by insects and is composed of solid material feeding stimulants with less than 5% by weight of active ingredients.

@ The VOC content of regulated consumer products listed shall be determined by Appendices A and B of Method 310 and using the following equations as may be applicable –

1. If the regulated consumer product is –

(a) an aerosol product that does not contain LVP-VOC, the VOC content shall be calculated using the following equation –

$$\text{Percent by weight of VOCs} = \frac{\text{WL}(\text{TV} - \text{A} - \text{H} - \text{EL}) + \text{WP} - \text{EP}}{\text{WL} + \text{WP}} \times 100$$



where –

- WL represents the weight of the non-propellant portion in grams, excluding packaging and container
- TV represents the weight fraction of total volatile material in the non-propellant portion, as determined by Method 24 or Method 24A, ASTM D2369
- A represents the weight fraction of ammonium in the non-propellant portion, as determined by ASTM D1426 or Method 300.7
- H represents the weight fraction of water in the non-propellant portion, as determined by ASTM D3792 or ASTM D4017
- EL represents the weight fraction of exempt compounds in the non-propellant portion, as determined by Method 8260B, Method 18, ASTM D859, Method 1400
- WP represents the weight of propellant in grams, as determined by ASTM D3074 as modified in Appendix A of Method 310 for metal aerosol container or ASTM D3063 as modified in Appendix A of Method 310 for glass aerosol container
- EP represents the weight of exempt compounds in propellant in grams, as determined by Method 18

(b) an aerosol product that contains LVP-VOC, the VOC content shall be calculated using the following equation –

$$\text{Percent by weight of VOCs} = \frac{\text{WL} [(1 - H)(1 - \text{LVP}) - \text{EL}] + (\text{WP} - \text{EP})}{\text{WL} + \text{WP}} \times 100$$

where –

- WL represents the weight of the non-propellant portion in grams, excluding packaging and container
- H represents the weight fraction of water in the non-propellant portion, as determined by ASTM D3792 or ASTM D4017



- LVP represents the weight fraction of LVP-VOC compounds and/or mixtures in the non-propellant, non-aqueous portion, as determined by ASTM D86, ASTM D850, ASTM D1078, ASTM D2879 as modified in Appendix B of Method 310, ASTM D2887, ASTM E1719, paragraph 3 of this Annex
- WP represents the weight of propellant in grams, as determined by ASTM D3074 as modified in Appendix A of Method 310 for metal aerosol container or ASTM D3063 as modified in Appendix A of Method 310 for glass aerosol container
- EL represents the weight fraction of exempt compounds in the non-propellant portion, as determined by Method 8260B, Method 18, ASTM D859, Method 1400
- EP represents the weight of exempt compounds in propellant in grams, as determined by Method 18

2. If the regulated consumer product is –

- (a) a non-aerosol product that does not contain LVP-VOC, the VOC content shall be calculated using the following equation –

$$\text{Percent by weight of VOCs} = (\text{TV} - \text{A} - \text{H} - \text{EL}) \times 100$$

where –

- TV represents the weight fraction of total volatile material in the non-propellant portion, as determined by Method 24 or Method 24A, ASTM D2369
- A represents the weight fraction of ammonium in the non-propellant portion, as determined by ASTM D1426 or Method 300.7
- H represents the weight fraction of water in the non-propellant portion, as determined by ASTM D3792 or ASTM D4017



EL represents the weight fraction of exempt compounds in the non-propellant portion, as determined by Method 8260B, Method 18, ASTM D859, Method 1400

- (b) a non-aerosol product that contains LVP-VOC, the VOC content shall be calculated using the following equation –

$$\text{Percent by weight of VOCs} = [(1 - H)(1 - LVP) - EL] \times 100$$

where –

H represents the weight fraction of water in the non-propellant portion, as determined by ASTM D3792 or ASTM D4017

LVP represents the weight fraction of LVP-VOC compounds and/or mixtures in the non-propellant, non-aqueous portion, as determined by ASTM D86, ASTM D850, ASTM D1078, ASTM D2879 as modified in Appendix B of Method 310, ASTM D2887, ASTM E1719, paragraph 3 of this Annex

EL represents the weight fraction of exempt compounds in the non-propellant portion, as determined by Method 8260B, Method 18, ASTM D859, Method 1400

3. If the regulated consumer product is an aerosol product or a non-aerosol product containing LVP-VOC under paragraph 1(b) and 2(b) above, LVP-VOC shall be determined according to the following steps –

- (a) if the vapour pressure of a compound or mixture from product's formulation data is unknown, ASTM D86, ASTM D850, ASTM D1078, ASTM D2879 as modified in Appendix B of Method 310, ASTM D2887 and ASTM E1719 may be used to determine the LVP-VOC of the compound or mixture;



- (b) a sample of the LVP-VOC used in the product's formulation shall be tested to determine the boiling point for a compound or for a mixture, and –
- (i) if the boiling point exceeds 216°C, the compound or mixture is a LVP-VOC;
  - (ii) if the boiling point is equal to or less than 216°C, then the percent by weight of the mixture that boils above 216°C is a LVP-VOC;
  - (iii) the nearest 5% distillation cut that is greater than 216°C as determined under paragraph (a) shall be used to determine the percentage of the mixture qualifying as a LVP-VOC;
- (c) if a product does not qualify as a LVP-VOC under paragraph (b), a sample of the compound or mixture used in a product's formulation shall be tested utilizing one or both of the following methods for identification of LVP-VOC compounds and mixtures: ASTM D2879 as modified in Appendix B of Method 310, and ASTM E1719, to determine if the compound or mixture meets the definition of LVP-VOC.

## ***Annex 4 - Definitions, VOC Content Limits and Effective Dates for Regulated Vehicle Refinishing Paints***

### ***Definitions***

“Volatile organic compound” means any volatile compound of carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates and ammonium carbonate.

### ***VOC Content Limits and Effective Dates***

The following are maximum limits of VOC content, expressed as grams of VOCs per litre of coating when in a ‘ready to use’ condition –

<b>Regulated Vehicle Refinishing Paints*</b>		<b>Maximum Limits of VOC Content@</b>
		<b>Effective from 1 October 2011</b>
1.	Adhesion promoters	840
2.	Clear coatings (non-matt finish)	420
3.	Clear coatings (matt finish)	840
4.	Colour coatings	420
5.	Multi-colour coatings	680
6.	Pre-treatment coatings	780
7.	Primers	540
8.	Single-stage coatings	420
9.	Temporary protective coatings	60
10.	Textured and flexibilized coatings	840
11.	Truck bed liner coatings	310
12.	Underbody coatings	430



Regulated Vehicle Refinishing Paints*		Maximum Limits of VOC Content@
		Effective from 1 October 2011
13.	Uniform finish coatings	840
14.	Other vehicle refining coatings**	250

\* For specific definitions of the 14 types of regulated vehicle refinishing paints, please refer to Schedule 5 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap 311W) which can be found at the website <http://www.elegislation.gov.hk>.

\*\* Any vehicle refinishing coating not listed as Type (1) to Type (13) shall comply with the limit of Type (14).

@ The VOC content of regulated vehicle refinishing paints in a 'ready to use' condition shall be calculated by the following formula –

$$\frac{W_a - W_b}{V_d - V_e}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24

W<sub>b</sub> = weight of water in grams as determined by Method 24

V<sub>d</sub> = volume of material in litres as determined by Method 24

V<sub>e</sub> = volume of water in litres, calculated by dividing the weight of water as determined by Method 24 by the density of water

## ***Annex 5 - Definitions, VOC Content Limits and Effective Dates for Regulated Vessel Paints and Regulated Pleasure Craft Paints***

### ***Definitions***

“Volatile organic compound” means any volatile compound of carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate and the exempt compounds listed in Annex 7.

### ***VOC Content Limits and Effective Dates for Regulated Vessel Paints***

The following are maximum limits of VOC content, expressed as grams of VOCs per litre of coating when in a ‘ready to use’ condition –

Regulated Vessel Paints *		Maximum Limits of VOC Content@	
		Effective from 1 January 2010	Effective from 1 April 2012
1.	Antenna coatings	530	-
2.	Elastomeric adhesives	730	-
3.	Extreme high gloss coatings	490	-
4.	Heat resistant coatings	420	-
5.	High gloss coatings	340	-
6.	High temperature coatings	500	-
7.	Inorganic zinc coatings	650	-
8.	Low activation interior coatings	420	-



Regulated Vessel Paints *		Maximum Limits of VOC Content@	
		Effective from 1 January 2010	Effective from 1 April 2012
9.	Marine maintenance coatings	450	-
10.	Metallic heat resistant coatings	530	-
11.	Navigational aids coatings	340	-
12.	Pre-treatment primers	550	-
13.	Pre-treatment wash primers	780	-
14.	Repair and maintenance thermoplastic coatings	550	-
15.	Sealant coatings for wire-sprayed aluminium	610	-
16.	Shop primers	700	-
17.	Special marking coatings	490	-
18.	Tack coatings	610	-
19.	Tank lining coatings	500	-
20.	Undersea weapons system coatings	340	-
21.	Antifouling coatings	-	400
22.	Antifouling sealer coatings	-	420
23.	Other vessel coatings**	340	-

\* For specific definitions of the 23 types of regulated vessel paints, please refer to Schedule 6 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website <http://www.elegislation.gov.hk>.

\*\* Any vessel coating not listed as Type (1) to Type (22) shall comply with the limit of Type (23).



## ***VOC Content Limits and Effective Dates for Regulated Pleasure Craft Paints***

The following are maximum limits of VOC content, expressed as grams of VOCs per litre of coating when in a ‘ready to use’ condition –

Regulated Pleasure Craft Paints *		Maximum Limits of VOC Content@	
		Effective from 1 January 2011	Effective from 1 April 2012
1.	Clear wood finishes: sealers	550	-
2.	Clear wood finishes: varnishes	490	-
3.	Finish primers and surfacers	600	-
4.	High build primers and surfacers	340	-
5.	Pre-treatment wash primers	780	-
6.	Teak primers	775	-
7.	Topcoats: extreme high gloss coatings	600	-
8.	Topcoats: high gloss coatings	420	-
9.	Antifouling coatings for aluminium substrates	-	560
10.	Antifouling coatings for other substrates	-	330
11.	Antifouling sealer coatings	-	420
12.	Self-polishing copolymer antifouling coatings	-	400
13.	Other pleasure craft coatings**	420	-

\* For specific definitions of the 13 types of regulated vessel paints, please refer to Schedule 6 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website <http://www.elegislation.gov.hk>.

\*\* Any pleasure craft coating not listed as Type (1) to Type (12) shall comply with the limit of Type (13).



@ The VOC content of regulated vessel paints and regulated pleasure craft paints in a 'ready to use' condition shall be calculated by the following formula –

$$\frac{W_a - W_b - W_c}{V_d - V_e - V_f}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24

W<sub>b</sub> = weight of water in grams as determined by Method 24

W<sub>c</sub> = weight of exempt compounds in grams as determined by Method 303

V<sub>d</sub> = volume of material in litres as determined by Method 24

V<sub>e</sub> = volume of water in litres, calculated by dividing the weight of water as determined by Method 24 by the density of water

V<sub>f</sub> = sum of volumes of all individual exempt compounds in litres, where the volume of each individual exempt compound is calculated by dividing the weight of the compound as determined by Method 303 by the density of the compound

# *Annex 6 - Definitions, VOC Content Limits and Effective Dates for Regulated Adhesives and Regulated Sealants*

## *Definitions*

“Volatile organic compound” means any volatile compound of carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate and the exempt compounds listed in Annex 7 for regulated adhesives and regulated sealants (except portable sealants or caulking compounds) and Annex 8 for portable sealants or caulking compounds.

## *VOC Content Limits and Effective Dates for Regulated Adhesives*

The following are maximum limits of VOC content, expressed as grams of VOCs per litre of adhesive when in a ‘ready to use’ condition –

Regulated Adhesives*		Maximum Limits of VOC Content@@	
		Effective from 1 January 2010	Effective from 1 April 2012
<b>(I) Architectural Applications</b>			
1.	Carpet pad adhesives	50	-
2.	Ceramic tile adhesives	65	-
3.	Cove base adhesives	50	-
4.	Dry wall and panel adhesives	50	-
5.	Indoor carpet adhesives	50	-
6.	Multi-purpose construction adhesives	70	-
7.	Outdoor carpet adhesives	150	-
8.	Rubber flooring adhesives	60	-
9.	Single-ply roof membrane adhesives	250	-



Regulated Adhesives*		Maximum Limits of VOC Content@@	
		Effective from 1 January 2010	Effective from 1 April 2012
10.	Structural glazing adhesives	100	-
11.	Subfloor adhesives	50	-
12.	VCT and asphalt tile adhesives	50	-
13.	Wood flooring adhesives	100	-
<b>(II) Specialty Applications</b>			
14.	ABS welding adhesives	325	-
15.	Adhesive primers for plastic	550	-
16.	Adhesive primers for traffic marking tape	150	-
17.	Contact Adhesives	250	80
18.	Computer diskette manufacturing adhesives	350	-
19.	CPVC welding adhesives	490	-
20.	Graphic arts adhesives	150	-
21.	Paper, fabric and film coating adhesives	265	-
22.	Plastic cement welding adhesives	250	-
23.	PVC welding adhesives	510	-
24.	Sheet-applied rubber lining operation adhesives	850	-
25.	Special purpose contact adhesives	250	-
26.	Structural wood member adhesives	140	-
27.	Top and trim adhesives	250	-
28.	Tyre retread adhesives	100	-
29.	Wood flat stock adhesives	250	-
<b>(III) Adhesive Substrate Specific Applications**</b>			
For adhesives not listed in Category (I) and (II) above and applied to the following substrates, the following limits shall apply:			
30.	Adhesives for fibreglass	80	-
31.	Adhesives for metal	30	-
32.	Adhesives for plastic foams	50	-
33.	Adhesives for porous material	50	-
34.	Adhesives for wood	30	-
<b>(IV) Other Adhesives</b>			
Any adhesives not falling within Category (I) to (III) above.			
35.	Other adhesives***	250	-



\* For specific definitions of the 35 types of regulated adhesives, please refer to Schedule 7 to the Air pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website <http://www.elegislation.gov.hk>.

\*\* If an adhesive is used to bond dissimilar substrates together, the applicable substrate type with the highest VOC content limit shall apply.

\*\*\* Any adhesive not listed as Type (1) to Type (34) shall comply with the limit of Type (35).

### ***VOC Content Limits and Effective Dates for Regulated Sealants***

1. The following are maximum limits of VOC content, expressed as percent by weight in a ‘ready to use’ condition –

Regulated Sealants*		Maximum Limits of VOC Content@
		Effective from 1 January 2010
1.	Portable sealants or caulking compounds*	4

\* “portable sealant or caulking compound” means a portable sealant, but does not include any of the following products –

- (a) a product that is incorporated into or used exclusively in manufacture or construction of goods or commodities at the site of the establishment;
- (b) a unit of product, less packaging, which weighs more than 453 g or consists of more than 473 mL;
- (c) a roof cement and roof sealant;
- (d) an insulating foam;
- (e) a removable caulking compound;
- (f) a clear paintable water resistant caulking compound;
- (g) a floor seam sealer;



- (h) a sealant primer;
- (i) a product designed exclusively for vehicle uses.

2. For sealants that are not portable sealants or caulking compounds, the following maximum limits of VOC content will apply and are expressed as grams of VOCs per litre of sealant when in a ‘ready to use’ condition –

Regulated Sealants*		Maximum Limits of VOC Content@@
		Effective from 1 January 2010
1.	Architectural sealants (except sealant primers)	250
2.	Architectural (non-porous) sealant primers	250
3.	Architectural (porous) sealant primers	775
4.	Marine deck sealants (except sealant primers)	760
5.	Marine deck sealant primers	760
6.	Modified bituminous sealant primers	500
7.	Non-membrane roof sealants (except sealant primers)	300
8.	Roadway sealants (except sealant primers)	250
9.	Single-ply roof membrane sealants (except sealant primers)	450
10.	Other sealants**	420
11.	Other sealant primers**	750

\* For specific definitions of the 11 types of regulated sealants, please refer to Schedule 7 to the Air Pollution Control (Volatile Organic Compounds) Regulation (Cap 311W) which can be found at the website <http://www.elegislation.gov.hk>.

\*\* Any sealant not listed as Type (1) to Type (9) shall comply with the limit of Type (10) or Type (11).



@ The VOC content of portable sealants or caulking compounds in a 'ready to use' condition shall be determined by Appendices A and B of Method 310 and using the equations set out in sections 3 and 4 of Part 7 of Schedule 3 to the a Air Pollution Control (Volatile Organic Compounds) Regulation (Cap. 311W) which can be found at the website: <http://www.elegislation.gov.hk>.

@@ The following are the methods for calculating the VOC content of regulated adhesives and regulated sealants other than portable sealants or caulking compounds –

1. With the exception of ABS welding adhesives, adhesive primers for plastic, CPVC welding adhesives, low-solids adhesives<sup>1</sup>, low-solids sealants<sup>1</sup>, and PVC welding adhesives, the VOC content of regulated adhesives and regulated sealants in a 'ready to use' condition must be calculated by the following formula –

(a) for regulated adhesives and regulated sealants that do not contain reactive diluents<sup>2</sup> –

$$\frac{W_a - W_b - W_c}{V_d - V_e - V_f}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24

W<sub>b</sub> = weight of water in grams as determined by Method 24

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1 Low-solids adhesive or low-solids sealant is an adhesive or a sealant which contains less than 120 grams of solids per litre of material.

2 Reactive diluent is a liquid that is a VOC during application; and in which, through chemical or physical reaction, such as polymerization, 20% or more of the VOC becomes an integral part of the finished material as determined by Method 316A, "Determination of Volatile Organic Compounds in Materials used for Pipes and Fittings", as adopted by the California South Coast Air Quality Management District of the United States. For the purpose of compliance check, the relevant equation will be used, if applicable, for calculating the VOC content only for a product which is represented on the container or in the accompanying literature (e.g. label, sticker, packaging, etc.) to contain reactive diluents and indicate the curing procedures.



$W_c$  = weight of exempt compounds in grams as determined by Method 303

$V_d$  = volume of material in litres as determined by Method 24

$V_e$  = volume of water in litres, calculated by dividing the weight of water as determined by Method 24 by the density of water

$V_f$  = sum of volumes of all individual exempt compounds in litres, where the volume of each individual exempt compound is calculated by dividing the weight of the compound as determined by Method 303 by the density of the compound

(b) for regulated adhesives and regulated sealants that contain reactive diluents<sup>2</sup> –

$$\frac{W_g - W_h - W_i}{V_j - V_k - V_l}$$

where –

$W_g$  = weight of volatile matters not consumed during curing in grams as determined by Method 24

$W_h$  = weight of water not consumed during curing in grams as determined by Method 24

$W_i$  = weight of exempt compounds not consumed during curing in grams as determined by Method 303

$V_j$  = volume of material prior to curing in litres as determined by Method 24

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<sup>2</sup> Reactive diluent is a liquid that is a VOC during application; and in which, through chemical or physical reaction, such as polymerization, 20% or more of the VOC becomes an integral part of the finished material as determined by Method 316A, “*Determination of Volatile Organic Compounds in Materials used for Pipes and Fittings*”, as adopted by the California South Coast Air Quality Management District of the United States. For the purpose of compliance check, the relevant equation will be used, if applicable, for calculating the VOC content only for a product which is represented on the container or in the accompanying literature (e.g. label, sticker, packaging, etc.) to contain reactive diluents and indicate the curing procedures.



V<sub>k</sub> = volume of water not consumed during curing in litres, calculated by dividing the weight of water as determined by Method 24 by the density of water

V<sub>l</sub> = sum of volumes of all individual exempt compounds not consumed during curing in litres, where the volume of each individual exempt compound is calculated by dividing the weight of the compound as determined by Method 303 by the density of the compound

2. With the exception of ABS welding adhesives, adhesive primers for plastic, CPVC welding adhesives and PVC welding adhesives, the VOC content of low-solids adhesives and low-solids sealants in a 'ready to use' condition must be calculated by the following formula –

$$\frac{W_a - W_b - W_c}{V_d}$$

where –

W<sub>a</sub> = weight of volatile matters in grams as determined by Method 24

W<sub>b</sub> = weight of water in grams as determined by Method 24

W<sub>c</sub> = weight of exempt compounds in grams as determined by Method 303

V<sub>d</sub> = volume of material in litres as determined by Method 24

3. The VOC content of ABS welding adhesives, adhesive primers for plastic, CPVC welding adhesives and PVC welding adhesives in a 'ready to use' condition must be determined by Method 316A, "*Determination of Volatile Organic Compounds in Materials used for Pipes and Fittings*", as adopted by the California South Coast Air Quality Management District of the United States.

***Annex 7 - Exempt Compounds for Regulated Architectural Paints, Regulated Printing Inks, Lithographic Heatset Web Printing Machines, Regulated Vessel Paints, Regulated Pleasure Craft Paints, Regulated Adhesives and Regulated Sealants (Except for Portable Sealants or Caulking Compounds)***

- (a) acetone
- (b) ethane
- (c) methyl acetate
- (d) parachlorobenzotrifluoride (PCBTF)
- (e) perchloroethylene (tetrachloroethylene)
- (f) 1,1,1-trichloroethane (methyl chloroform)
- (g) trichlorofluoromethane (CFC-11)
- (h) dichlorodifluoromethane (CFC-12)
- (i) 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
- (j) 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114)
- (k) chloropentafluoroethane (CFC-115)
- (l) chlorodifluoromethane (HCFC-22)
- (m) chlorofluoromethane (HCFC-31)
- (n) 2,2-dichloro-1,1,1-trifluoroethane (HCFC-123)
- (o) 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a)
- (p) 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)



- (q) 1,1-dichloro-1-fluoroethane (HCFC-141b)
- (r) 1-chloro-1,1-difluoroethane (HCFC-142b)
- (s) 1-chloro-1-fluoroethane (HCFC-151a)
- (t) 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)
- (u) 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)
- (v) methylene chloride (dichloromethane)
- (w) trifluoromethane (HFC-23)
- (x) difluoromethane (HFC-32)
- (y) 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC-43-10mee)
- (z) pentafluoroethane (HFC-125)
- (za) 1,1,2,2-tetrafluoroethane (HFC-134)
- (zb) 1,1,1,2-tetrafluoroethane (HFC-134a)
- (zc) 1,1,1-trifluoroethane (HFC-143a)
- (zd) 1,1-difluoroethane (HFC-152a)
- (ze) ethylfluoride (HFC-161)
- (zf) 1,1,1,2,3,3-hexafluoropropane (HFC-236ea)
- (zg) 1,1,1,3,3,3-hexafluoropropane (HFC-236fa)
- (zh) 1,1,2,2,3-pentafluoropropane (HFC-245ca)
- (zi) 1,1,2,3,3-pentafluoropropane (HFC-245ea)
- (zj) 1,1,1,3,3-pentafluoropropane (HFC-245fa)
- (zk) 1,1,1,2,3-pentafluoropropane (HFC-245eb)
- (zl) 1,1,1,3,3-pentafluorobutane (HFC-365mfc)
- (zm) cyclic, branched, or linear, completely methylated siloxanes (VMS)
- (zn) cyclic, branched, or linear, completely fluorinated alkanes
- (zo) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations
- (zp) cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations



- (zq) sulphur-containing perfluorocarbons with no unsaturations and with sulphur bonds only to carbon and fluorine
- (zr) 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane ( $C_4F_9OCH_3$  or HFE-7100)
- (zs) 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane ( $C_4F_9OC_2H_5$  or HFE-7200)
- (zt) 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane [( $CF_3$ )<sub>2</sub>CFCH<sub>2</sub>OCH<sub>3</sub>]
- (zu) 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane [( $CF_3$ )<sub>2</sub>CFCH<sub>2</sub>OC<sub>2</sub>H<sub>5</sub>]

## *Annex 8 - Exempt Compounds for Regulated Consumer Products and Portable Sealants or Caulking Compounds*

Exempt Compounds <sup>[1]</sup>	For Hairspray Products from 1 April 2007 to 31 December 2008	For Hairspray Products from 1 January 2009 Onwards and for Other Regulated Consumer Products from 1 January 2008 Onwards	Portable Sealants or Caulking Compounds
Acetone	✓	✓	✓
1-chloro-1,1-difluoroethane (HCFC-142b)	✓	✓	✓
chlorodifluoromethane (HCFC-22)	✓	✓	✓
1-chloro-1-fluoroethane (HCFC-151a)	✓		
chlorofluoromethane (HCFC-31)	✓		
chloropentafluoroethane (CFC-115)	✓	✓	✓
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)	✓	✓	✓
cyclic, branched, or linear, completely fluorinated alkanes	✓	✓	✓
cyclic, branched, or linear, completely fluorinated ethers with no unsaturations	✓	✓	✓
cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations	✓	✓	✓
cyclic, branched, or linear, completely methylated siloxanes (VMS)	✓	✓	✓
1,1,1,2,3,4,4,5,5-decafluoropentane (HFC-43-10mee)	✓		
Dichlorodifluoromethane (CFC-12)	✓	✓	✓
1,1-dichloro-1-fluoroethane (HCFC-141b)	✓	✓	✓



Exempt Compounds <sup>[1]</sup>	For Hairspray Products from 1 April 2007 to 31 December 2008	For Hairspray Products from 1 January 2009 Onwards and for Other Regulated Consumer Products from 1 January 2008 Onwards	Portable Sealants or Caulking Compounds
3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	✓		
1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	✓		
1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114)	✓	✓	✓
2,2-dichloro-1,1,1-trifluoroethane (HCFC-123)	✓	✓	✓
1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a)	✓		
1,1-difluoroethane (HFC-152a)	✓	✓	✓
difluoromethane (HFC-32)	✓		
2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF <sub>3</sub> ) <sub>2</sub> CFCF <sub>2</sub> OCH <sub>3</sub> )	✓		
Ethane	✓	✓	✓
2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF <sub>3</sub> ) <sub>2</sub> CFCF <sub>2</sub> OC <sub>2</sub> H <sub>5</sub> )	✓		
3-ethoxy-1,1,1,2,3,4,4,5,5,6,6-dodecafluoro-2-(trifluoromethyl)-hexane (HFE-7500)	✓		
1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (C <sub>4</sub> F <sub>9</sub> OC <sub>2</sub> H <sub>5</sub> or HFE-7200)	✓		
ethylfluoride (HFC-161)	✓		
1,1,1,2,2,3,3-heptafluoro-3-methoxy-propane(n-C <sub>3</sub> F <sub>7</sub> OCH <sub>3</sub> or HFE-7000)	✓		
1,1,1,2,3,3,3-heptafluoropropane (HFC-227ea)	✓		
1,1,1,2,3,3,3-hexafluoropropane (HFC-236ea)	✓		
1,1,1,3,3,3-hexafluoropropane (HFC-236fa)	✓		



Exempt Compounds <sup>[1]</sup>	For Hairspray Products from 1 April 2007 to 31 December 2008	For Hairspray Products from 1 January 2009 Onwards and for Other Regulated Consumer Products from 1 January 2008 Onwards	Portable Sealants or Caulking Compounds
LVP-VOC <sup>[2]</sup>	✓	✓	✓
Methane	✓	✓	✓
methyl acetate	✓	✓	✓
methyl formate (HCOOCH <sub>3</sub> )	✓		
methylene chloride (dichloromethane)	✓	✓	✓
1,1,1,2,2,3,3,4,4-nonfluoro-4-methoxy-butane (C <sub>4</sub> F <sub>9</sub> OCH <sub>3</sub> or HFE-7100)	✓		
parachlorobenzotrifluoride (PCBTF)	✓	✓	✓
1,1,1,3,3-pentafluorobutane (HFC-365mfc)	✓		
pentafluoroethane (HFC-125)	✓	✓	✓
1,1,2,2,3-pentafluoropropane (HFC-245ca)	✓		
1,1,2,3,3-pentafluoropropane (HFC-245ea)	✓		
1,1,1,2,3-pentafluoropropane (HFC-245eb)	✓		
1,1,1,3,3-pentafluoropropane (HFC-245fa)	✓		
perchloroethylene (tetrachloroethylene)	✓	✓	✓
sulphur-containing perfluorocarbons with no unsaturations and with sulphur bonds only to carbon and fluorine	✓	✓	✓
1,1,2,2-tetrafluoroethane (HFC-134)	✓	✓	✓
1,1,1,2-tetrafluoroethane (HFC-134a)	✓	✓	✓
1,1,1-trichloroethane (methyl chloroform)	✓	✓	✓
trichlorofluoromethane (CFC-11)	✓	✓	✓



Exempt Compounds <sup>[1]</sup>	For Hairspray Products from 1 April 2007 to 31 December 2008	For Hairspray Products from 1 January 2009 Onwards and for Other Regulated Consumer Products from 1 January 2008 Onwards	Portable Sealants or Caulking Compounds
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)	✓	✓	✓
1,1,1-trifluoroethane (HFC-143a)	✓	✓	✓
trifluoromethane (HFC-23)	✓	✓	✓

- [1] The use of chlorofluorocarbons (CFCs) and hydrofluorocarbons (HCFCs) in aerosol products may be subject to control under the Ozone Layer Protection Ordinance (Cap. 403). Please refer to the Ordinance, which can be found at the website <http://www.elegislation.gov.hk>, for details.
- [2] LVP-VOC means low vapour pressure VOCs, which is a chemical compound or chemical mixture containing at least one carbon atom and meeting one of the following criteria:
- a) has a vapour pressure less than 0.1 mm Hg at 20°C;
  - b) is a chemical compound with more than 12 carbon atoms, or a chemical mixture consisting solely of chemical compounds with more than 12 carbon atoms as verified by formulation data and the vapour pressure and boiling point are unknown;
  - c) is a chemical compound with a boiling point greater than 216°C; or
  - d) is the percent by weight of a chemical mixture that boils above 216°C.

## *Annex 9 - Example for Determining the VOC Content of an Aerosol Product by Formulation Data*

Ingredient	Vapour Pressure at 20°C (mm Hg)	Mass Used per Batch of Production (tonnes)	Regulated VOC Content (tonnes)	Explanation
Propellant 1, e.g. butane	> 0.1	2.0	2.0	
Propellant 2, e.g. propane	> 0.1	30.0	30.0	
Solvent 1, e.g. ethanol	> 0.1	32.5	32.5	
Solvent 2, e.g. acetone	-	15.0	0	Not counted as VOC as it is an exempt compound
Solvent 3, e.g. water	-	15.0	0	Not VOC
Corrosion inhibitor	Unknown, solid, does not sublime	0.5	0	Not VOC
Fragrance	< 2 mm Hg (1/3 of fragrance mixture is geraniol of vapour pressure at 0.02 mm Hg)	5.0	2.0	Fragrance can be exempted up to 2% by weight and geraniol, a LVP-VOC, can be exempted for another 1% based on 1/3 of the unclaimed fragrance portion (please see Q4.3)
Total		100.0	66.5	

$$\begin{aligned}
 \text{VOC content} &= (\text{Regulated VOC content} / \text{Mass used per batch}) \times 100\% \\
 &= (66.5 / 100) \times 100\% \\
 &= 66.5\% \text{ by weight}
 \end{aligned}$$