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ENVIRONMENT CANADA PROPOSED REGULATIONS

**VOLATILE ORGANIC COMPOUNDS IN ARCHITECTURAL AND INDUSTRIAL
MAINTENANCE COATINGS**

- CONSIDERATIONS FOR THE DEVELOPMENT OF REGULATIONS

**Chemical Controls Branch
Environment Canada
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1 INTRODUCTION

The purpose of this document is to provide background information and supporting rationale for proposed regulations on *Volatile Organic Compounds (VOCs) in Architectural and Industrial Maintenance (AIM) Coatings* which will be developed under the Canadian Environmental Protection Act, 1999.

2 BACKGROUND

Smog is responsible for many serious health effects for Canadians, including thousands of premature deaths, hospital admissions and emergency room visits each year. As a gaseous precursor, volatile organic compounds (VOCs) contribute to the formation of particulate matter (PM) and ground-level ozone - the main ingredients of smog. Up to two-thirds of fine particulate matter and almost all ground-level ozone is formed in the atmosphere from gaseous precursors. In order to reduce particulate matter and ground-level ozone, it is therefore necessary to reduce emissions of their precursors including VOCs.

Background information on the links between VOCs, ground-level ozone and particulate matter can be found in several Science Assessment Documents published by Environment Canada and Health Canada:

The Particulate Matter Science Assessment Document (SAD) -
http://www.hc-sc.gc.ca/hecs-sesc/air_quality/publications/particule_matter.htm

The Ozone SAD - http://www.hc-sc.gc.ca/hecs-sesc/air_quality/publications/ground-level_ozone.htm

The Priority Substances List (PSL) Assessment Report on PM₁₀ -
<http://www.ec.gc.ca/substances/ese/eng/psap/final/PM-10.cfm>

The Meteorological Survey of Canada (MSC) Precursor Report - <http://www.msc-smc.ec.gc.ca/saib/summary-pm2.5-Eng.pdf>

VOC emissions from the Architectural and Industrial Maintenance (AIM) coatings sector result from the use of solvents (and other organic compounds) in both solvent-based and water-based paint. The solvents in paints and coatings are used as a vehicle to transfer the paint to a substrate and are released to the atmosphere by evaporation following application. Due to the highly-fragmented and widely-distributed nature of painting applications using AIM coatings in small batches, it is usually not feasible to capture and control VOC emissions resulting at the point of use. The best option to reduce VOC emissions from AIM paints is to reformulate products to contain lower levels of VOCs.

CANADA-WIDE STANDARDS

In recognition of the significant adverse human health effects of ground-level ozone and particulate matter, the Government of Canada and the provinces and territories, except Quebec, adopted new Canada-Wide Standards (CWSs) for both of these air pollutants under the Canadian Council of Ministers of the Environment (CCME) in June 2000. These standards establish ambient air concentration target levels to be achieved by 2010: 65 ppb for ozone and 30 µg/m³ for particulate matter less than 2.5 µm in diameter (PM_{2.5}). Achieving these targets will require significant reductions of PM, ozone and their precursors, including VOCs.

VOCS AS A CEPA TOXIC SUBSTANCE

On July 2, 2003, an Order was published in the *Canada Gazette* Part II adding VOCs to Schedule 1 (List of Toxic Substances) of the *Canadian Environmental Protection Act 1999* (CEPA, 1999). Along with gaseous ammonia, nitric oxide, nitrogen dioxide and sulphur dioxide, VOCs were added to Schedule 1 due to their role as precursors in the development of ground-level ozone and particulate matter. This listing of the precursors gives the Government of Canada the legislative authority necessary to control the emissions contributing to PM and ozone.

FEDERAL AGENDA FOR REDUCTION OF EMISSIONS OF VOLATILE ORGANIC COMPOUNDS FROM CONSUMER AND COMMERCIAL PRODUCTS

In March 2004, the Minister of the Environment and the Minister of Health published a Notice of Intent (NOI) in the *Canada Gazette* Part I which outlined Environment Canada's *Federal Agenda for Reduction of Emissions of Volatile Organic Compounds (VOCs) from Consumer and Commercial Products*. The Federal Agenda was developed after a series of technical studies and through consultation with industry, other government departments and environmental non-governmental organizations (ENGOS). The following documents further describe the selection of actions which are included in the Federal Agenda:

Notice of Intent: <http://www.ec.gc.ca/nopp/DOCS/notices/voc/en/index.cfm>

Support Document to the Notice of Intent:

http://www.ec.gc.ca/nopp/DOCS/notices/voc/en/voc_noi_e.pdf.

One of the action items outlined in the Federal Agenda is the development of regulations under CEPA 1999 that would set VOC content limits for AIM coatings. Two other similar (VOC content limit) regulatory initiatives under the Federal Agenda are being prepared for Consumer Products and Auto-Refinish Coatings.

The initiatives contained in the Federal Agenda contribute to fulfilling commitments in the Government of Canada's "Interim Plan 2001 on Particulate Matter and Ozone" to develop an action plan to reduce VOC emissions from consumer and commercial products. The measures outlined in the NOI also respond to a commitment included in the Ozone Annex to the 1991 Canada-US Air Quality Agreement. The Ozone Annex, signed in 2000, commits Canada and the US to take measures to reduce VOC emissions and contains specific commitments to take action to reduce VOC emissions from consumer and commercial products.

PREVIOUS ACTION ON VOCS IN ARCHITECTURAL COATINGS

Memorandum of Understanding

As part of the 1990 CCME Phase I NOx/VOC Management Plan, Initiative V101 set a target for a 20% reduction in emissions from the consumer paints sub-sector (a subset of the larger AIM sector) from 1985 emissions. A task force was established to analyse VOC emissions from this sector and the results were published in a document titled "A

Plan to Reduce VOC Emissions by 20% from Consumer Surface Coatings", CCME, March 1994.

The task force concluded that the 20% reduction had been achieved and recommended a voluntary approach to encourage further VOC reductions in this sub-sector. As a result, a Memorandum of Understanding (MOU) was signed in 1995 by the Canadian Paint and Coatings Association (CPCA), Environment Canada and the National Air Issue Coordinating Committee (NAICC) of the CCME. The MOU acknowledged that the 20% reduction in VOC emissions from the consumer paints sector outlined in Initiative V101 had already been achieved between 1985 and 1991. The objectives of the MOU were to establish a sound and reliable data base for the consumer paint sub-sector, provide the NAICC with adequate information for the development of subsequent phases of the NOx/VOC Management Plan and to document the actual trend of VOC emissions from this sub-sector.

CCME Standards and Guidelines for the Reduction of VOC Emissions from Canadian Industrial Maintenance Coatings

The CCME published *Recommended Standards and Guidelines for the Reduction of VOC Emissions from Canadian Industrial Maintenance Coatings* in 2002. These standards and guidelines were developed as a part of the Phase 2 Federal Smog Management Plan (1997) which called for a multi-stakeholder review of the industrial maintenance coating and traffic marking sector to verify VOC emission estimates, assess the potential for reductions and develop measures to ensure VOC emission reductions from this sector. A working group called the *Technical Sub Group for the Reduction of VOCs from Canadian Industrial Maintenance Coatings for the CCME Working Group for Surface Coating Initiatives* was formed and participated in the development of the guidelines and standards.

The standards and guidelines recommend VOC content limits for traffic marking coatings, industrial maintenance coatings and four sub-categories of industrial maintenance coatings - pre-treatment wash primers, extreme high durability coatings, high temperature coatings and metallic pigmented coatings. There is also a "Code of Good Practice" included in the CCME publication which is intended to apply to users of industrial maintenance and traffic marking coatings. The VOC content limits specified in the standards are intended to be implemented by manufacturers and importers of industrial maintenance coatings by January 1, 2003 and by January 1, 2005, the limits apply to users of these coatings. For traffic marking coatings, the effective date for both manufacturers and users is January 1, 2005. There is also a requirement for users of traffic marking coatings to use only water-based coatings from May 15th to September 30th - the main period of the year when smog formation is likely.

The CCME standards and guidelines may be obtained at: www.ccme.ca.

3 ARCHITECTURAL AND INDUSTRIAL MAINTENANCE COATINGS BACKGROUND

INDUSTRY BACKGROUND

Architectural and Industrial Maintenance (AIM) coatings are comprised of coatings which are purchased and applied by both consumers and contractors. Products include paints, stains, varnishes and many other types of coating and sealing products which are intended for in-situ application to buildings, furniture, pavement, concrete, metal and a wide variety of surfaces present in residential, commercial, institutional and industrial settings. AIM coatings have been addressed by several names in the past including: trade paints and consumer paints - both segments of architectural coatings as defined in the proposed regulation. Other important segments of AIM paints that have been addressed in the past include industrial maintenance and traffic/zone marking paints.

Based on industry information and the results of an Environment Canada survey, it is estimated that approximately 293 million litres of AIM coatings were sold in Canada in 2002. This represents a total sale value of \$1.4 billion. Approximately 80% of these coatings were manufactured in Canada by an estimated 120 Canadian manufacturers. Approximately 20% of the total volume was imported - primarily from the United States.

Canadian manufacturing facilities are concentrated mainly in Ontario (61% of Canadian manufactured market consumption) with Quebec and British Columbia facilities fulfilling 26% of Canadian market consumption. Approximately 7,200 Canadians are employed in companies manufacturing AIM coatings. For most categories of AIM coatings, there is a high degree of supplier concentration, where fewer than 10 firms account for the majority of the total Canadian market share. An exception to this rule is the industrial maintenance coatings segment, where the supply is much more fragmented among many companies compared to other categories of AIM coatings. Overall, the Canadian paints and coatings industry is a mature industry and most of its companies have been in operation for many years.

The demand for architectural coatings tends to be closely correlated with general population levels and the performance of the residential and commercial construction market. For industrial maintenance coatings, demand is more closely tied to growth rates in the manufacturing industry. Based on an estimated 2% growth rate from 2002 levels, demand for architectural paints in 2010 is forecast to be 17% higher than in 2002.

Source: Cheminfo, 2005.

VOC EMISSIONS FROM AIM COATINGS

The solvents contained in AIM coatings constitute a significant source of VOC emissions from consumer and commercial products. Based on results of the Environment Canada survey and Cheminfo estimates, emissions of VOCs from AIM coatings were estimated to be approximately 59 kt in 2002. Based on total estimated VOC emissions from the use of solvents and solvent containing products of 438 kt (Cheminfo, 2004b), this represents 13% of all VOC emissions from this sub-sector, which is the largest of the solvent-use

sub-sector emission sources. The 2000 National Criteria Air Contaminant (CAC) inventory identifies a total of 1,892 kt of VOC emissions for Canada (excluding upstream oil & gas, oil sands development and forest fires, which are primarily regional sources). As shown in Figure 1, VOC emissions from the use of solvents and solvent containing products comprised 24% of the total VOC emissions.

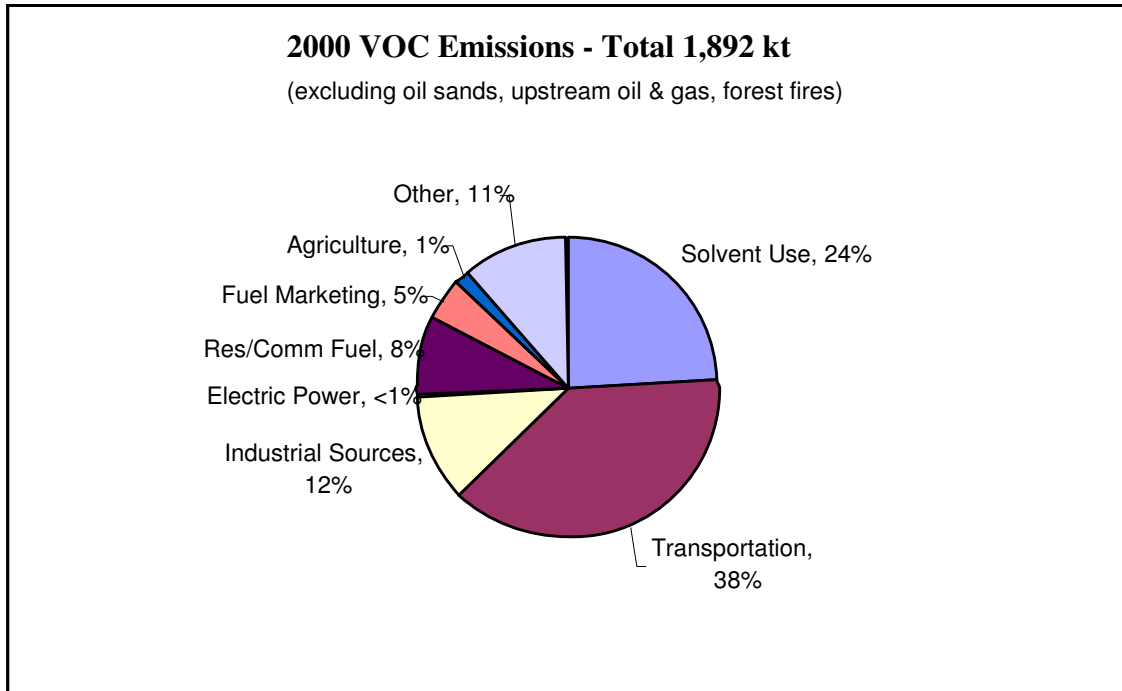


Figure 1 - 2000 VOC Emissions

Implementation of measures under the "*Federal Agenda on Cleaner Vehicles, Engines and Fuels*" will achieve substantial reductions of VOCs from the transportation sector by 2010. Estimates of VOC emissions for 2010 indicate that the solvent use sector will have replaced the transportation sector as the largest emitter of VOCs. Forecasts for the AIM coatings subsector indicate that sales may grow by 17% by 2010 (from 2002 volume estimates). Assuming no change in the VOC content of coatings, this translates to a 17% increase in emissions to 69.1 kt.

Source: 2000 CAC Inventory, Cheminfo 2004b, Cheminfo 2005

4 ACTION IN OTHER JURISDICTIONS

In North America, the first regulatory efforts to reduce VOC emissions from the AIM coatings sub-sector originated almost twenty years ago in Southern California. The severity of smog problems in the Los Angeles County Air basin prompted the California South Coast Air Quality Management District (SCAQMD) to develop VOC content limits for a variety of AIM coating categories. Over the years, these limits have been gradually lowered, such that they are now the most stringent of any jurisdiction in the United States. The development of VOC content limits for use state-wide by California's Air Resources Board (CARB) started in the mid-1980's, a few years after the efforts of the SCAQMD. The most recent set of limits recommended for use in California were released in 2000, when CARB published its *Suggested Control Measure* (SCM) for reducing VOC emissions from the AIM coatings sub-sector. For the most part, the categories used by CARB are similar to those of SCAQMD, but in many cases, the actual VOC content limits are less stringent.

In the early 1990's, the United States Environmental Protection Agency (EPA) began efforts to develop a national set of VOC content limits for the AIM coatings sector. In September 1998, it promulgated (brought into force) the *National Emission Standards for Architectural Coatings* (also referred to as the "National Rule"). The regulation sets VOC content limits for 61 categories of AIM coatings. The National Rule contains additional categories that were not created in either the SCAQMD or CARB measures and, in general, VOC content limits are less stringent than these measures. The National Rule is probably best characterized as a regulatory backstop, since State regulatory authorities still have the ability to implement more stringent limits, as in California.

In 2000, the Ozone Transport Commission (OTC), which represents 12 north-eastern States and the District of Columbia, developed a *Model Rule* for state regulations based on the CARB SCM. Currently the model rule has been adopted (with some variations) by six states and is under development in another three states. This model rule is particularly relevant to Canada since many of the application conditions found in the northeastern states (e.g. temperature, humidity) are similar to Canada.

It should be noted that in various U.S. regulations, Architectural and Industrial Maintenance coatings are usually referred to as the more generic, "Architectural" coatings. Despite the name, these regulations include categories that are clearly industrial maintenance in nature. A summary of the VOC content limits contained in the EPA National Rule and the OTC Model Rule are included in Annex 1.

Source: Cheminfo, 2004b.

In April 2004 the European Union finalized a directive that intends to reduce VOC emissions from architectural coatings. The directive sets VOC content limits for 12 categories of coatings. Content limits exist for water-based and solvent-based coatings within each category and are calculated with "water in" - that is, the VOC content limits

are the actual VOC content in the coatings. The first set of limits will be in effect January 1, 2007, with a more stringent set of limits set for January 1, 2010.

5 WHY A REGULATION?

LEVEL PLAYING FIELD

Above all, the proposed regulations will act to provide a "level playing field" for manufacturers and importers of AIM coatings. Voluntary actions which have been used in the past to encourage VOC reductions from AIM coatings give an unfair advantage to those companies who choose not to participate in the initiatives and continue to market their products without having to put resources towards the research and development necessary to create lower VOC coatings. The regulatory approach provides assurance for purposes of business decision-making that all manufacturers and importers must meet the same requirement for the VOC content of their coatings.

NATIONAL APPROACH

Although smog is a regional issue, with areas of concern including the Windsor-Quebec corridor in Ontario and Quebec, the lower mainland of British Columbia and the Atlantic Provinces, it would be extremely difficult to implement and enforce regulations on product content developed on a regional or provincial basis. Such an approach could result in different VOC content requirements for paint used in different regions. Since paint is generally formulated and marketed on a national (or international) basis, a patchwork of regulations would considerably complicate the manufacture of coatings.

HARMONIZE WITH UNITED STATES

One of the intentions of the proposed regulations is to harmonize the requirements for VOC content in AIM paints with those existing in the US. Clean air is a transboundary issue, and as such, efforts must be made on both sides of the border to ensure a reduction in smog precursors such as VOCs. The US has a history of regulatory limits on the VOC content of AIM coatings, and Canadian regulations are needed to harmonize our efforts. The AIM coatings market is highly integrated on a North American basis. Aligning the proposed Canadian regulation with existing measures in the US will facilitate consistency in product requirements in the North American market and allow Canada to benefit from the US experience in implementing VOC emissions reduction strategies.

CERTAINTY IN REDUCTIONS

Given the large reduction in VOC emissions that are required to meet the CWS for ozone and PM, it is necessary to guarantee significant reductions in important sectors with large emissions of VOCs. Due to their nature, voluntary actions cannot provide this level of assurance. As opposed to a voluntary measure, where the level of compliance can be uncertain, the proposed regulation will result in a certain reduction in VOC emissions when implemented.

6 CONSIDERATIONS FOR THE PROPOSED REGULATIONS

INTENT

The proposed regulations will mandate VOC content limits for 50 categories of AIM coatings. The regulations would apply to manufacturers and importers of AIM coatings sold in Canada.

COATING CATEGORIZATION

The regulations would apply to any coating that meets the definition of an AIM coating. Each AIM coating may be categorized into one or more of the 50 categories. Except for coatings classified in seventeen specific categories (as discussed below), coatings that may fall into more than one category must meet the most restrictive VOC content limit of any applicable categories. For example, if a floor coating (VOC content limit of 250 g/L) is also marketed as a flat coating used on surfaces other than floors (VOC content limit of 100 g/L), it must meet the VOC content limit for the flat coating category. Consistent with the *OTC Model Rule*, for seventeen specific categories indicated in the proposed regulation, the VOC content limits for those categories would apply to products even if they are marketed for a use described by another category with a lower VOC content limit. This exemption was included to recognize that even though certain products may be used for one purpose, they may not be able to be formulated to meet the VOC content limits for all intended purposes. The categories which are exempt from the most restrictive limit requirement are: antenna coatings, bituminous roof primers, calcimine recoaters, fire-retardant coatings, flow coatings, high temperature coatings, impacted immersion coatings, industrial maintenance coatings, lacquer (including lacquer sanding sealers); low-solids coatings, metallic pigmented coatings, nuclear coatings, pre-treatment wash primers, shellacs, specialty primers, sealers and undercoaters, temperature indicator safety coatings and thermoplastic rubber coatings and mastics.

The categories chosen for inclusion in the proposed regulations are based mainly on the *OTC Model Rule*, with several modifications to consider the Canadian market. Further information on the category definitions, choice of categories and content limits is provided in the category tables appearing in Annex 2.

The US EPA and OTC AIM regulations include categories for anti-fouling coatings and wood preservatives. In Canada, these products are regulated as pesticides by Health Canada's Pest Management Regulatory Agency (PMRA) under the authority of the *Pest Control Products Act* (PCPA). The VOC standards for anti-fouling paints and wood preservatives (including low solids) listed in the US EPA Rule will be managed by PMRA under the PCPA. The requirements of other jurisdictions will be considered and the timeframe to develop a strategy will be consistent with the proposed CEPA regulations.

VOC CONTENT LIMITS

The proposed VOC content limits were chosen based on the results of the Environment Canada survey on AIM coatings, a report completed for Environment Canada by Cheminfo Services Inc. titled *Technical Assessment of Categorization and VOC Content*

Limits for Architectural and Industrial Maintenance Coatings in Canada and on available background information which has been developed by jurisdictions in the US including the US Environmental Protection Agency, Ozone Transport Commission, California Air Resources Board and various US states. Of the fifty categories, 48 of the proposed limits are consistent with OTC limits and two are consistent with EPA limits (used where a higher content limit was required).

The *OTC Model Rule* VOC content limits, upon which the proposed Environment Canada regulation is based, were originally based on the CARB Suggested Control Measure, which was published in 2000. These limits have subsequently been adopted in regulations developed in several OTC states including Delaware, the District of Columbia, Maine, New Jersey, New York and Pennsylvania. The VOC content limits in many of these regulations were effective on January 1, 2005. Since these limits have been extensively reviewed by both CARB during their SCM development process, and by each of the OTC states during their regulatory development, these limits could be considered to be the Best Available Control Technology (BACT) for reducing VOC emissions from AIM coatings in Canada. A significant portion of the US AIM coatings market must now comply with the CARB and OTC Model Rule VOC content limits, indicating that in order to harmonize requirements between the US and Canada these limits are the most appropriate to consider for the proposed regulation.

Lower VOC content limits have been developed for use in the South Coast Air Quality Management District (SCAQMD) which includes Los Angeles, California. However, these limits were not considered for use in Canada. These limits have been set in a region where the smog issue is extreme and where regulations limiting the VOC content of AIM coatings have been in place for over 20 years. Several of these limits are currently considered to be technology forcing.

A survey of the AIM coatings industry was initiated by Environment Canada in October 2003 to collect information on the 2002 sales volumes and VOC contents of AIM coatings sold in Canada. The results of the survey were used to estimate the impact of the proposed regulations on manufacturers of AIM coatings. The survey indicated that for most categories and VOC contents in the proposed regulation, there is a significant existing complying marketshare. For all categories where sales were reported, there are existing products that comply with the proposed limit. Details on complying marketshare and results of the survey are presented for each category in Annex 2.

EFFECTIVE DATE

The effective date for the regulation will be determined through the consultation process. The proposed regulation may also contain a sell through provision where products manufactured prior to the effective date of the regulation may be sold for up to three years following the effective date.

SMALL CONTAINER EXEMPTION

Consideration will be given to a small container exemption, such that the regulation would apply only to AIM coatings sold in containers larger than 1 US quart (0.946 L).

This exemption for small containers has been included in all existing US AIM rules and regulations. The purpose for the exemption is to allow the continued use of potentially high VOC content niche market coatings which would fall under the AIM definition, but whose volume of sales is too small to address with a specific category description and VOC content limit. The exemption affects several categories included in the AIM regulation such as faux finishing coatings, lacquers, clear/semitransparent stains and clear varnishes. Coatings sold in these categories have a significant portion of sales in small containers.

VOC CONTENT LIMIT CALCULATION

The VOC content limits apply at the time of application of the coating (e.g. after any thinning of the coating has been accomplished). The VOC content limits in the regulation are calculated on a "less water and exempt compounds" basis. This VOC content is typically referred to as the VOC_{Regulatory} for a coating and has been used in all US jurisdictions in their AIM coating regulations. VOC contents in the regulation are calculated as follows:

$$\text{VOC Content} = \frac{(W_s - W_w - W_{ec})}{(V_m - V_w - V_{ec})} \quad (1)$$

Where:

VOC Content = grams of VOC per litre of coating

W_s = weight of volatiles, in grams

W_w = weight of water, in grams

W_{ec} = weight of exempt compounds, in grams

V_m = volume of coating, in litres

V_w = volume of water, in litres

V_{ec} = volume of exempt compounds, in litres

For a solvent-based coating containing no water or exempt solvents, this equation calculates the actual VOC content of a coating - the weight of VOC solvents divided by the volume of the entire product. For either a water-based or solvent-based coating containing either water or exempt solvents, this equation removes the weight and volume of the water and exempt solvents from both the numerator and denominator, effectively removing them from consideration. The equation thus links the weight of VOC solvents in the coating to the combined volume of VOC solvents and solids. In theory, the volume of solids contained in a coating is related to the coverage, therefore, the equation generally describes the mass of VOCs released per area of surface coated.

Two important points about compliance with the VOC content limits should be noted. First, since the VOC limits in the proposed regulation are intended for AIM coatings at the point of application, any VOCs contained in thinners added to the coating at the point of application up to the manufacturer's maximum recommendation for thinning must be included in the calculation. In other words, the VOC content limits apply to the VOC content that would result after thinning a coating according to the manufacturer's

maximum thinning recommendations. Second, the VOCs contained in colourants added to a tint base (an un-tinted coating) at a store are not included in this regulation. In other words, the VOC content of a tint base is to be calculated without the colourant that is added after the tint base is manufactured or imported.

One exception to the use of $VOC_{Regulatory}$ is when calculating the VOC content of a low solids coating. For this type of coating, the volume of solids is not related to coating coverage, so the VOC content is on the basis of the entire volume of the coating. The equation used to determine the VOC content of a low solids coating is:

$$VOC\ Content_{ls} = \frac{(W_s - W_w - W_{ec})}{(V_m)} \quad (2)$$

Where:

$VOC\ Content_{ls}$ = the VOC content of a low solids coating in grams of VOC per litre of coating

W_s = weight of volatiles, in grams

W_w = weight of water, in grams

W_{ec} = weight of exempt compounds, in grams

V_m = volume of coating, in litres

TEST METHODS

The reference method included in the proposed regulations to determine the composition of a coating is US EPA Method 24, US 40 Code of Federal Register, Part 60. This method may be used for all coatings except for methacrylate multicomponent coatings used as traffic marking coatings and on a case-by-case basis where an alternative method may be approved by Environment Canada. The proposed method which would be used to determine the VOC content of methacrylate multicomponent coatings used as traffic markings is described in the US Code of Federal Register, Part 59, Subpart D, Appendix A. Manufacturers or importers may use Method 24, formulation data or any reasonable means for predicting that the coating has been formulated as intended, however, if there are any inconsistencies between the results of a Method 24 test and any other means for determining VOC content, the Method 24 test results would be considered correct.

LABELLING REQUIREMENTS

Consideration will be given to a requirement in the proposed regulation that manufacturers and importers of architectural coatings would have to provide specified information on the labels of their coatings. The labels would have to contain information on the date of manufacture, any specific thinning recommendations and the VOC content of the coating. For manufacturers and importers of industrial maintenance coatings, the proposed regulation would require that coatings meeting the definition of "industrial maintenance coating" carry specific descriptions on the label indicating that the coating is to be used as an industrial maintenance coating only.

Other specific labelling requirements may be considered for clear brushing lacquers, rust preventative coatings, specialty primers, sealers and undercoaters, quick dry enamels and non-flat high gloss coatings where clarification of intended use or of coating characteristics may be necessary to identify the coating with the intended category.

REPORTING REQUIREMENTS

Consideration will be given to reporting requirements for manufacturers and importers. These considerations include reporting of VOC product content to Environment Canada and record keeping provisions.

TABLE 1 - PROPOSED VOC CONTENT LIMITS

Coating Category	Proposed VOC Content Limit (grams/litre)
Antenna coatings	530
Bituminous roof coatings	300
Bituminous roof primers	350
Bond breakers	350
Calcimine recoater	475
Clear brushing lacquers	680
Concrete curing compounds	350
Concrete surface retarder	780
Conversion varnish	725
Dry fog coatings	400
Extreme high durability coatings	800
Faux finishing/glazing	350
Fire resistive coatings	350
Fire retardant coatings - clear	650
Fire retardant coatings - opaque	350
Flat coatings	100
Floor coatings	250
Flow coatings	650
Form release compounds	250
Graphic arts coatings	500
High temperature coatings	420
Impacted immersion coatings	780
Industrial maintenance coatings	340
Lacquers (including lacquer sanding sealers)	550
Low solids coatings	120
Mastic texture coatings	300
Metallic pigment coatings	500
Multi-colored coatings	250
Nonflat coatings	150
Nonflat coatings - high gloss	250
Nuclear coatings	450
Pretreatment wash primers	420
Primers, sealers and undercoaters	200
Quick dry enamels	250
Quick dry primers, sealers and undercoaters	200
Recycled coatings	250
Roof coatings (non-bituminous)	250
Rust preventative coatings	400
Sanding sealers (other than lacquer sanding	350

Coating Category	Proposed VOC Content Limit (grams/litre)
sealers)	
Shellacs - clear	730
Shellacs - opaque	550
Specialty primers, sealers and undercoaters	350
Stains	250
Swimming pool coatings	340
Temperature indicator safety coatings	550
Thermoplastic rubber coatings and mastics	550
Traffic and zone marking coatings	150
Varnishes	350
Waterproofing sealers (concrete/masonry)	400
Waterproofing sealers	250

7 BENEFITS AND COSTS

VOC REDUCTIONS

The estimated reduction in VOC emissions due to implementation of the proposed limits would be approximately 41% of total VOC emissions from AIM coatings when fully implemented. (Cheminfo, 2005; Environment Canada Survey Results)

Considering the small container exemption, the reduction in VOC emissions would be approximately 30% of the total VOC emissions from AIM coatings when fully implemented. (Environment Canada Survey Results)

With an estimated 17% growth in AIM coatings sales predicted by 2010 (from 2002 amounts), and the 30% reduction in emissions expected from the proposed regulations, it is expected that the overall impact of the regulations in 2010 will be to reduce VOC emissions by 48.3 kt (an 18% reduction from 2002 emission levels).

COSTS

Cheminfo Services Inc. completed an estimate of the cost of compliance with the proposed regulation in the report titled *Background Economic Study of the AIM Coatings Sector*. The methodology for the cost estimate followed the analysis conducted by CARB to support the June 2000 *Suggested Control Measure*. The inputs for the analysis were derived from CARB and EPA economic analyses, industry estimates and Environment Canada survey information. Overall the proposed regulation is estimated to cost manufacturers of coatings sold in Canada \$74 million dollars per year over the next ten years assuming the lump sum cost of reformulation (R&D, equipment, etc.) is spread over ten years. When compared to the gross margin for the sector (total revenues less operating expenses), a \$74 million dollar increase in operating expenses results in an overall decrease in gross margin of approximately 15%. On a volume basis, this equates to an estimated cost increase of approximately \$0.43 per litre of coating (assuming costs are passed through entirely to end users). (Cheminfo, 2005)

BENEFITS

The proposed regulations generate environmental and health benefits that could be translated into economic terms. For example health benefits could be translated into avoided costs to the health care system as well as improved individual well-being. However, the links between emission reductions, atmospheric concentration of pollutants, and health and environmental improvements are difficult to establish in quantitative terms, given the currently available information.

The VOC emission reductions to be achieved through this regulation are one of many required across a wide variety of sectors to meet the Canada Wide Standards for ozone and particulate matter.

8 PATH FORWARD

Since the focus of this proposed regulation is on AIM paints, stakeholders in the consultation process may include Canadian manufacturers of architectural coatings, associations representing manufacturers, importers and applicators of coatings including: Canadian Paints and Coatings Associations (CPCA), The Society for Protective Coatings (SSPC), Roof Coatings Manufacturers Association (RCMA). Other stakeholders may include government departments and environmental non-governmental organizations (ENGOS).

A multi-stakeholder consultation on this proposed regulation will be held on April 5, 2005 in Toronto. Environment Canada will provide background information on the development of the proposed regulation, describe the elements of the proposed regulation and solicit feedback. The need for more focused working groups to address specific segments of the architectural coatings market will be evaluated following the consultation.

Stakeholders will be encouraged to provide written comments on the proposed regulation following the consultation. After reviewing the comments a draft regulation and the *Regulatory Impact Analysis Statement* (RIAS) will be published in *Canada Gazette*, Part I. The RIAS provides a clear explanation of the regulation, its purpose, the analysis substantiating it and its expected impacts. This publication is followed by a sixty day public comment period during which stakeholders will have an opportunity to provide comment on the proposed regulation. Publication of the final regulation in *Canada Gazette*, Part II will follow the receipt of stakeholder comments.

Contact Information

For further information on this discussion document or to find out how to get involved in the public consultation activities for the proposed regulation please contact:

Susan Fraser
Chemical Controls Branch
Environment Canada
351 St. Joseph Blvd.
Gatineau, QC
K1A 0H3

Phone: 819.994.2235
Fax: 819.994.0007
Email: susan.fraser@ec.gc.ca

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Environment Canada, 2004b. 2000 National Criteria Air Contaminants Inventory, Pollution Data Branch, Environment Canada. November 2004.

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ANNEX 1 - COMPARISON OF US EPA, OTC AND PROPOSED VOC CONTENT LIMITS

Category	US EPA limit	OTC limit	Proposed limit
Antenna coatings	530	530	530
Bituminous roof coatings	500	300	300
Bituminous roof primers	500	350	350
Bond breakers	600	350	350
Calcimine recoater	475	475	475
Clear brushing lacquers	680	680	680
Concrete curing compounds	350	350	350
Concrete surface retarders	780	780	780
Conversion varnish	725	725	725
Dry fog coatings	400	400	400
Extreme high durability coatings	800	[340]	800
Faux finishing/glazing	700	350	350
Fire resistive coatings	[850/450]	350	350
Fire retardant coatings - clear	[850]	650	650
Fire retardant coatings - opaque	[450]	350	350
Flat coatings	250	100	100
Floor coatings	400	250	250
Flow coatings	650	420	650
Form release compounds	450	250	250
Graphic arts coatings	500	500	500
High temperature coatings	650	420	420
Impacted immersion coatings	780	780	780
Industrial maintenance coatings	450	340	340
Lacquers (including lacquer sanding sealers)	680	550	550
Low solids coatings	[120]	120	120
Mastic texture coatings	300	300	300
Metallic pigment coatings	500	500	500
Multi-colored coatings	580	250	250
Nonflat coatings	380	150	150
Nonflat coatings - high gloss	[380]	250	250
Nuclear coatings	450	450	450
Pretreatment wash primers	780	420	420
Primers, sealers and undercoaters	[350/400]	200	200
Quick-dry enamels	450	250	250
Quick-dry primers, sealers, undercoaters	450	200	200
Recycled coatings	na	250	250
Roof coatings (non-bituminous)	250	250	250

Category	US EPA limit	OTC limit	Proposed limit
Rust preventative coatings	400	400	400
Sanding sealers (other than lacquer sanding sealers)	550	350	350
Shellacs - clear	730	730	730
Shellacs - opaque	550	550	550
Specialty primers, sealers and undercoaters	[350/400]	350	350
Stains	550/350	250	250
Swimming pool coatings	600	340	340
Temperature indicator safety coatings	[650]	550	550
Thermoplastic rubber coatings and mastics	550	550	550
Traffic and zone marking coatings	450/150	150	150
Varnishes	450	350	350
Waterproofing sealers (concrete/masonry)	[400]	400	400
Waterproofing sealers	600	250	250

Note:

Where a category was not included in the EPA National Rule or OTC Model Rule, the most applicable VOC content limit(s) is provided in square brackets.

ANNEX 2 - BACKGROUND INFORMATION

The following section includes background information compiled from various sources. The purpose of providing this information is to describe the proposed coatings categories, to provide results of the Environment Canada survey and to describe a rationale for the selection of the proposed VOC content limits.

Sources of Information

VOC Content Limits

The background information includes a comparison of VOC content limits from the US EPA AIM Rule, the CARB Suggested Control Measure (SCM), the OTC Model Rule and the proposed regulation. Where a category was not included in a rule or regulation the most applicable VOC content limit(s) is provided in square brackets.

Definition

The definition provided is generally consistent with either the OTC Model Rule or the EPA AIM Rule. The definitions are the same as those that will be included in the proposed regulation. This section also identifies if a category is exempt from the most restrictive limit provision in the proposed regulation.

Technical Assessment Results

Information from this section is taken from the 2004 report titled *Technical Assessment of Categorization and VOC Content Limits for Architectural and Industrial Maintenance Coatings in Canada*. The report was completed by Cheminfo Services Inc. for Environment Canada in March 2004.

Survey Results

The survey results provided in the summary sheets are from the 2002 Environment Canada survey of manufacturers and importers of AIM coatings in Canada. The number of products and volume of sales includes information from survey responses where a VOC_{regulatory} value was provided. The WB/SB breakdown and VOC content range values are from all available survey responses.

MPI Information

Master Painters Institute (MPI) is a Canadian organization that oversees a specification system for various types of architectural coatings. They publish a list of approved products twice per year which meet their criteria for aspects such as durability and performance. Information on the VOC content of their approved products can be found on their website. Available information from MPI is included as an indication of the range of VOC contents for a given category for acceptable products. Not all manufacturers of AIM coatings have their products approved by MPI, so the results should not be considered representative of the entire market.

Technical Data/Manufacturer Info

Where relevant, information obtained from manufacturer interviews, websites or published technical product data sheets is included.

Information from Other Jurisdictions

Where relevant, published information from jurisdictions in the US related to AIM regulation/model rule development was included. This information is intended to present the rationale used by jurisdictions in selecting their limits.

Antenna Coatings											
US EPA - 530 g/L	CARB - 530 g/L	OTC - 530 g/L	Proposed - 530 g/L								
<p>Definition: A coating formulated and recommended exclusively for application to equipment and associated structural appurtenances that are used to receive or transmit electromagnetic signals.</p> <p>Antenna coatings are exempt from the most restrictive limit provision in the proposed regulation. (This means the coating could be labelled for an additional use as an Industrial Maintenance coating, for example, but would only have to meet the Antenna coatings limit.)</p>											
<p>Technical Assessment Results: Antenna coatings are highly specialized and applied mainly by contractors. The coatings are required to have a dry film thickness as thin as possible while still providing corrosion protection. Solvent-based coatings are the only alternative since water-based coatings would likely be too viscous for proper application. ¹</p>											
<p>Survey Results:</p> <table> <tr> <td>Number of products: 6</td> <td>Products complying with Proposed Limit: 100%</td> </tr> <tr> <td>Volume of sales: Protected Data</td> <td>Sales complying with Proposed Limit: Protected Data</td> </tr> <tr> <td>WB products: 0%</td> <td>SB products: 100%</td> </tr> <tr> <td>VOC content range: 300-400 g/L ²</td> <td></td> </tr> </table>				Number of products: 6	Products complying with Proposed Limit: 100%	Volume of sales: Protected Data	Sales complying with Proposed Limit: Protected Data	WB products: 0%	SB products: 100%	VOC content range: 300-400 g/L ²	
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Volume of sales: Protected Data	Sales complying with Proposed Limit: Protected Data										
WB products: 0%	SB products: 100%										
VOC content range: 300-400 g/L ²											
<p>MPI Information: There is no MPI category for antenna coatings.</p>											
<p>Information from Other Jurisdictions: CA - The CARB limit was intended to set a cap on existing VOC content of products (similar to EPA). The Staff Report indicated that lower VOC products were not available. The limit was set as an alternative to the industrial maintenance limit. ⁵</p>											
<p>Summary: This category was created to recognize the limitation of formulating water-based/low VOC coatings for this purpose. The proposed limit is the same as the EPA and OTC rules. This limit exists to exempt antenna coatings from the limit for industrial maintenance coatings (250 g/L).</p>											

Bituminous Roof Primers											
US EPA - 500 g/L	CARB - 350 g/L	OTC - 350 g/L	Proposed - 350g/L								
<p>Definition: A primer which incorporates bitumens that is formulated and recommended exclusively for roofing.</p> <p>These products are exempted from the most restrictive limit provision in proposed regulation.</p>											
<p>Technical Assessment Results: Bituminous roof primers are used to fill small irregularities in the roof substrate and to provide an adequate base for application of bituminous roof coatings. The assessment indicated that if water-based bituminous primers are applied and cured under proper climatic conditions, their performance is the same as that of solvent-based coatings. The main issue with water-based coatings would be cold weather application. With compliant solvent based products, there may be an issue with high viscosity of coatings. ¹</p>											
<p>Survey Results:</p> <table> <tr> <td>Number of products: 8</td> <td>Products complying with Proposed limit: 4 (50%)</td> </tr> <tr> <td>Volume of sales: 200,564 L</td> <td>Sales complying with Proposed limit: 14,590 (7%)</td> </tr> <tr> <td>WB products: 12%</td> <td>SB products: 88%</td> </tr> <tr> <td colspan="2">VOC content range: 2 g/L (WB), 190-789 g/L (SB) ²</td> </tr> </table>				Number of products: 8	Products complying with Proposed limit: 4 (50%)	Volume of sales: 200,564 L	Sales complying with Proposed limit: 14,590 (7%)	WB products: 12%	SB products: 88%	VOC content range: 2 g/L (WB), 190-789 g/L (SB) ²	
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Volume of sales: 200,564 L	Sales complying with Proposed limit: 14,590 (7%)										
WB products: 12%	SB products: 88%										
VOC content range: 2 g/L (WB), 190-789 g/L (SB) ²											
<p>MPI Information: There is no MPI category for bituminous roof primers.</p>											
<p>Technical Data/Manufacturer Info: According to technical data sheets for existing products, the recommended application temperature/precipitation requirements are the same for both solvent-based and water-based products. Several water-based primers meeting the proposed limit exist in the marketplace.</p>											
<p>Information from Other Jurisdictions: CA - CARB included a 350g/L limit (instead of the 250 g/L in SCAQMD) for their most recent SCM revision based on application and performance requirements outside of South Coast area. ^{4,5}</p>											
<p>Summary: This category describes a primer that incorporates bitumen and is used exclusively for roofing. The proposed limit is consistent with the OTC model rule. There is a low compliance rate (by sales) in the survey, but 50% of products in survey comply with the proposed limit. The main technical issue is with cold weather application.</p>											

Bond Breakers			
US EPA - 600 g/L	CARB - 350 g/L	OTC - 350 g/L	Proposed - 350 g/L
<p>Definition: A coating formulated and recommended for application between layers of concrete to prevent a freshly poured top layer of concrete from bonding to the layer over which it is poured.</p>			
<p>Technical Assessment Results: These coatings are used during tilt-up construction where large slabs of concrete are poured into forms on an existing concrete floor and are then lifted using cranes to be placed as walls. Solvent-based bond breakers can be formulated with exempt solvents to meet the proposed limit. It is possible to formulate water-based emulsions to meet the proposed limit, however, they may present cold weather application issues. One supplier reported that water-based formulations can perform comparably to solvent-based under ideal conditions. ¹</p>			
<p>Survey Results: One bond breaker was reported in the survey. The product is a solvent-based product with a maximum VOC content of 600 g/L. ²</p>			
<p>MPI Information: There is no MPI category for bond breakers.</p>			
<p>Technical Data/Manufacturer Info: Several companies market water-based bond breakers in the US which meet 350g/L and can be applied at temperatures as low as 4°C. According to suppliers of the product, both solvent-based and water-based products have been used in Canada.</p>			
<p>Information from Other Jurisdictions: CA - CARB noted that EPA limit 600g/L was at upper range of VOC contents in existing state rules, no issues were raised with the proposed 350g/L limit (it had been in place in several CA districts for many years). ^{4,5}</p>			
<p>Summary: This category recognizes bond breakers as coatings which are applied between layers of concrete to prevent the freshly poured top layer from bonding to the layer over which it is poured. The category was created by the EPA as a "low volume" category and set their limit near the upper range of existing limits in the US. The proposed limit is consistent with OTC. There are water-based, complying products available in the marketplace.</p>			

Calcimine recoater			
US EPA - 475 g/L	CARB - [100 g/L] (considered a flat coating)	OTC - 475 g/L	Proposed - 475 g/L
<p>Definition: A flat solventborne coating formulated and recommended specifically for recoating calcimine-painted ceilings and other calcimine-painted surfaces.</p> <p>These products are exempted from most restrictive limit provision in proposed regulation.</p>			
<p>Technical Assessment Results: Canadian companies market alkyd coatings that can be used to paint calcimine ceilings and other surfaces, but they are not labelled specifically as "calcimine recoaters". According to one manufacturer, it is critical that the formulation be solvent-based since a water-based paint could dissolve the original calcimine coating. A limit of 475 g/L would not present a technical challenge to manufacturers formulating a coating used as a calcimine recoater.¹</p>			
<p>Survey Results: None reported in survey.</p>			
<p>MPI Information: There is no MPI category for calcimine recoaters.</p>			
<p>Technical Data/Manufacturer Info: Only one product was identified - Benjamin Moore, Moorcraft Super Spec Alkyd Calcimine Recoater. The technical data sheet for this product indicates that it does not exceed 475 g/L VOC.</p>			
<p>Information from Other Jurisdictions: OTC - The OTC Model Rule included calcimine recoaters at the EPA VOC content limit in recognition that use of water-based coatings on calcimine-coated ceilings could cause a failure of the surface.</p>			
<p>Summary: The proposed limit is consistent with the OTC Model Rule limit. It allows flat coatings formulated for use as calcimine recoaters to be formulated as solvent-based coatings. There were no products reported in the survey, however it is included for consistency.</p>			

Clear Brushing Lacquers			
US EPA - 680 g/L	CARB - 680 g/L	OTC - 680 g/L	Proposed - 680 g/L
<p>Definition: Clear wood finishes, excluding clear lacquer sanding sealers, formulated with nitrocellulose or synthetic resins to dry by solvent evaporation without chemical reaction and to provide a solid, protective film, which are intended exclusively for application by brush, and which are labelled as such.</p>			
<p>Technical Assessment Results: Clear brushing lacquers are all solvent-based formulations that use nitro-cellulose as the resin and lacquer thinners as the carrier solvent. They are clear wood finishes which dry by solvent evaporation and are applied exclusively by brush. Existing VOC limits in most jurisdictions (in US) are 680 g/L and most formulations are already compliant. There are no technical issues with meeting the limit. ¹</p>			
<p>Survey Results: No products reported in survey.</p>			
<p>MPI Information: No MPI category for clear brushing lacquers.</p>			
<p>Information from Other Jurisdictions: CA - The CARB limit was set to encourage a shift away from spraying lacquer which has a much lower transfer efficiency (and higher overall VOC emissions) than brushing lacquers. The category exists to exempt brushing lacquers from the lower VOC content limit for lacquers of 550 g/L. ⁵</p>			
<p>Summary: This category was created to allow for higher VOC content lacquers that are clear brushing. The proposed limit is consistent with all rules. There were no products reported in the survey, however it is included for consistency.</p>			

Conversion Varnish											
US EPA - 725 g/L	CARB - [350g/L] (considered varnishes)	OTC - 725 g/L	Proposed - 725 g/L								
<p>Definition: A clear acid curing coating with an alkyd (or other resin) blended with amino resins and supplied as a single component or two-component product. Conversion varnishes produce a hard, durable, clear finish designed for professional application to wood flooring. The film formation is the result of an acid-catalyzed condensation reaction, affecting a transesterification at the reactive ethers of the amino resins.</p>											
<p>Technical Assessment Results: Conversion varnishes are specialty cross-linking finish varnishes that behave like lacquers but produce a more durable film once they cure. They are used principally by professional flooring contractors for hardwood floor finishes. They are sold as two-part mixtures which require mixing with an acid based catalyst prior to spraying. There are no water-based conversion varnishes in the market. For solvent-based conversion varnishes, there are no technical issues with proposed limit since existing products are compliant. ¹</p>											
<p>Survey Results:</p> <table border="0"> <tr> <td>Number of products: 20</td> <td>Products complying with Proposed limit: 20 (100%)</td> </tr> <tr> <td>Volume of sales: 566,951 L</td> <td>Sales complying with Proposed limit: 566,951 (100%)</td> </tr> <tr> <td>WB products: 0%</td> <td>SB products: 100%</td> </tr> <tr> <td>VOC content range: 491-719 g/L</td> <td></td> </tr> </table>				Number of products: 20	Products complying with Proposed limit: 20 (100%)	Volume of sales: 566,951 L	Sales complying with Proposed limit: 566,951 (100%)	WB products: 0%	SB products: 100%	VOC content range: 491-719 g/L	
Number of products: 20	Products complying with Proposed limit: 20 (100%)										
Volume of sales: 566,951 L	Sales complying with Proposed limit: 566,951 (100%)										
WB products: 0%	SB products: 100%										
VOC content range: 491-719 g/L											
<p>MPI Information: There is no MPI category for conversion varnish.</p>											
<p>Information from Other Jurisdictions: CA - CARB did not include this category in their most recent revision to the SCM. They indicated that complying varnishes were available to meet 350 g/L limit. ⁴ NY - The NY Consolidated Impact Statement for the AIM regulation indicated that conversion varnishes have different performance characteristics than waterborne or oil-base polyurethanes. They cannot be formulated to meet 350 g/L, are used only by professionals and represent a small percentage of hardwood floor market. ⁸</p>											
<p>Summary: This category was created by EPA to provide a higher limit for conversion varnishes which are unable to meet the limit for varnishes. The proposed limit is consistent with EPA and OTC Model Rule and all products reported in the survey met the proposed limit.</p>											

Extreme High Durability Coatings				
US EPA - 800 g/L	CARB - [250 g/L - considered industrial maintenance]	OTC - [250 g/L - considered industrial maintenance]	CCME - 800 g/L	Proposed - 800 g/L
<p>Definition: An air dry coating, including a fluoropolymer-based coating, that is formulated and recommended for touch-up of precoated architectural aluminum extrusions and panels.</p>				
<p>Technical Assessment Results: Fluoropolymer-based extreme high durability coatings are only available in solvent-based formulations. These products are considered to have superior performance and longer durability than regular protective coatings. There are no technical issues with manufacturing a fluoropolymer-based extreme high durability coating below 800 g/L. Existing products in the marketplace are already in the 700 to 750 g/L range.¹</p>				
<p>Survey Results: None reported in survey.</p>				
<p>MPI Information: There is no MPI category for extreme high durability coatings.</p>				
<p>Information from Other Jurisdictions: CA - CARB didn't identify any sales of these types of coatings in California. The Staff Report indicated that products are usually used for touch up, and are likely sold in exempt one quart or smaller size containers.^{4,5} Northeastern US States - None of the OTC states have included a category for extreme high durability coatings in their rules/regulations.</p>				
<p>Summary: This category was created to recognize that coatings which are able to provide extreme high durability properties would not be able to meet the content limit for Industrial Maintenance coatings. The definition and content limit is consistent with the EPA AIM rule and existing CCME standard. These products are extremely durable and the VOC content is performance limited.</p>				

Faux Finishing Coatings

US EPA - 700 g/L

CARB - 350 g/L

OTC - 350 g/L

Proposed - 350 g/L

Definition:

A coating formulated and recommended as a stain or glaze to create artistic effects including, but not limited to, dirt, old age, smoke damage, and simulated marble and wood grain.

Technical Assessment Results:

These coatings are formulated as clear glazes that are either tinted or mixed with latex or solvent-based coatings to produce coloured glazes. The faux finishes category includes many specialty finishes and a variety of different products. One manufacturer reported that meeting a 350 g/L limit could present a significant technical challenge since high glycol content is required to achieve a sufficiently long drying time.¹

Survey Results:

Number of products: 104

Volume of sales: 527,166 L

WB products: 87%

VOC content range: 260-465 g/L (SB), 0-873 g/L (WB)²

A significant portion (44%) of faux finishing coatings are sold in small containers. Considering the small container exemption, 91% of faux finishing coatings would comply with the proposed EC limit.

Products complying with Proposed limit: 94 (90%)

Sales complying with Proposed limit: 476,684 (90%)

SB products: 13%

MPI Information:

There is no MPI category for faux finishes.

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated that products complying with their proposed limit (350 g/L) existed. They identified various reformulation options including switching to water-based coatings, use of exempt solvents and use of different solvent/resin systems.^{4,5}

Summary:

This category was created to recognize that faux finishing coatings would not be able to meet the content limit for non-flat coatings. The proposed limit is consistent with the OTC Model Rule. Many water-based products are available and there was a high rate of compliance in the Environment Canada survey (90%).

Fire-Resistive Coatings

US EPA - 850 (clear) /450 (opaque) g/L (includes both fire-retardant/resistive coatings)	CARB - 350 g/L	OTC - 350 g/L	Proposed - 350 g/L
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Definition:

An opaque coating formulated and recommended to protect the structural integrity by increasing the fire endurance of interior or exterior steel and other structural materials, and that has been fire tested and rated by a testing agency and approved by building code officials for use in bringing assemblies of structural materials into compliance with all applicable building code requirements. The fire-resistive coating and the testing agency must be approved by building code officials. The fire resistive coating shall be tested in accordance with ASTM Designation E 119-98.

Technical Assessment Results:

There are three types of fire resistive coating - gypsum-based cementitious coatings, fibrous coatings and water-based intumescent coatings. Gypsum-based cementitious and fibrous coatings do not contain any VOCs. Water-based and two-component epoxy intumescent coatings are able to achieve the proposed 350 g/L limit.¹

Survey Results:

Number of products: 19	Products complying with Proposed limit: 19 (100%)
Volume of sales: 14,273 L	Sales complying with Proposed limit: 14,273 (100%)
WB products: 50%	SB products: 50%
VOC content range: 0-32 g/L (WB), 350 g/L (SB) ²	

MPI Information:

There is no MPI category for fire resistive coatings.

Information from Other Jurisdictions:

CA - The CARB limit reflects current formulation technology. The CARB Staff Report indicated reformulation of products would not be required to meet their proposed limit. The report also noted that some manufacturers indicated solvent-based coatings needed to be available to use outdoors, but did not provide any test data, product literature or VOC content data to support this.⁵

Summary:

This coating category was created to describe coatings which are formulated to increase the fire endurance of interior or exterior steel or other structural materials. The proposed limit is consistent with the OTC model rule. The survey indicates a high rate of compliance (100%) and water-based and solvent-based products are available which can meet the VOC limit.

Fire Retardant Coatings - clear

US EPA - 850 g/L (includes both fire-retardant and resistive coatings)

CARB - 650 g/L

OTC - 650 g/L

Proposed - 650 g/L

Definition:

A coating formulated and recommended to retard ignition and flame spread, that has been fire tested and rated by a testing agency and approved by building code officials for use in bringing building and construction materials into compliance with all applicable building code requirements. The fire-retardant coating and the testing agency must be approved by building code officials. The fire-retardant coating shall be tested in accordance with ASTM Designation E 84-99.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Clear fire retardants are only available in solvent-based formulations that use alkyd resins. Because fire retardant coatings are complicated to formulate and there are testing and approval requirements to meet fire safety regulations, reformulation of these coatings can be potentially costly. ¹

Survey Results:

All products reported are solvent based and approximately 80% of products meet the proposed VOC content limit. ²

MPI Information:

MPI has categories for Interior Alkyd Fire Retardant Clear Coating, Interior Alkyd Fire Retardant Clear Sealer, Interior Alkyd Fire Retardant Clear Topcoat, Exterior Fire Resistant Clear Sealer (most products listed are fire retardants) and Exterior Alkyd Fire Retardant Varnish. Overall, 19 of 30 products (63%) meet proposed VOC content limit. ³

Information from Other Jurisdictions:

CA - CARB indicated their proposed limit (650g/L) was technologically feasible and that a high complying marketshare existed. ^{4,5}

Summary:

This coating category was created to describe clear coatings which retard ignition and flame spread. The proposed limit is consistent with the OTC model rule. There were a significant portion of complying products identified in the Environment Canada survey.

Fire Retardant Coatings - Opaque

US EPA - 450 g/L (includes both fire-retardant and resistive coatings)

CARB - 350 g/L

OTC - 350 g/L

Proposed - 350 g/L

Definition:

A coating formulated and recommended to retard ignition and flame spread, that has been fire tested and rated by a testing agency and approved by building code officials for use in bringing building and construction materials into compliance with all applicable building code requirements. The fire-retardant coating and the testing agency must be approved by building code officials. The fire-retardant coating shall be tested in accordance with ASTM Designation E 84-99.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Opaque fire retardant coatings are available in water and solvent-based formulations. For water-based fire retardant coatings, there are no technical issues with meeting the proposed 350 g/L limit. Solvent-based coatings would likely require reformulation to meet the proposed limit. As with clear fire retardant coatings, reformulations costs could potentially be quite high. ¹

Survey Results:

Of the 15 products reported in the survey, seven are water-based and eight are solvent-based. No VOC regulatory limits were provided for these products. ²

MPI Information:

MPI has categories for Interior Latex Fire Retardant Flat Coating, Interior Latex Fire Retardant - Topcoat, Interior Alkyd Fire Retardant Flat Coating, Exterior Fire Retardant Top Coat. Overall, of 21 of 30 products (70%) meet proposed VOC content limit. ³

Information from Other Jurisdictions:

CA - CARB found a high complying marketshare and based their limit on existing limits already in place in the state. ^{4,5}

Summary:

This coating category was created to describe opaque coatings which retard ignition and flame spread. The proposed limit is consistent with the OTC model rule. The MPI approved products list includes 21 products that meet the proposed limit and many water based products that are <100g/L.

Flat Coatings

US EPA - 250 g/L

CARB - 100 g/L

OTC - 100 g/L

Proposed - 100 g/L

Definition:

A coating that is not defined under any other definition in this section and that registers gloss less than 15 on an 85-degree meter or less than 5 on a 60-degree meter according to ASTM Method D 523-89 (1999).

Technical Assessment Results:

Flat architectural paints are mostly water-based, acrylic, vinyl-acrylic or polyvinyl acetate products. Alkyd solvent-based paints make up the remainder of flat paints. Manufacturers indicate that it is technically feasible to formulate water-based flat paints that meet a VOC content limit of 100g/L. It would not be possible to reformulate a solvent-based paint to meet the 100 g/L limit. The main VOCs in water-based flat paints are glycols (used for freeze/thaw resistance) and coalescing agents. ¹

Survey Results:

Number of products: 1,541	Products complying with Proposed limit: 674 (44%)
Volume of sales: 34,446,370 L	Sales complying with Proposed limit: 14,566,913 (42%)
WB products: 92%	SB products: 8%
VOC content range: 344-582 g/L (SB), 0-231 g/L (WB) ²	

Approximately 50% of sales volume falls in VOC content range of 100-150 g/L.

MPI Information:

Of MPI certified flat paints, 62% meet the proposed limit of 100 g/L. A further 16% of products are within the 100-150 g/L range. All solvent based products (17% of total) exceed proposed limit and 75% of water based products meet proposed limit. ³

Information from Other Jurisdictions:

CA - Prior to setting their 100 g/L limit for flat paint, CARB found a high complying marketshare. The report indicated many products meeting the limit had manufacturer's information indicating high quality. ^{4,5}

Summary:

This category is the largest architectural coating category and the definition is based on gloss characteristics. The proposed limit is consistent with OTC model rule. No technical difficulties were identified in the technical assessment and 40% of flat paint sales in the survey complied with the proposed limit. A further 50% of flat paint sales are in the 100-150 g/L range.

Floor Coatings

US EPA - 400 g/L

CARB - 250 g/L

OTC - 250 g/L

Proposed - 250 g/L

Definition:

An opaque coating that is formulated and recommended for application to flooring, including, but not limited to, decks, porches, steps and other horizontal surfaces, which may be subject to foot traffic.

Technical Assessment Results:

Floor coatings are available in water-based, solvent-based and 100% solid reactive formulations. There are no technical issues with manufacturing water-based or 100% solids coatings with VOC contents below 250 g/L. Reformulating solvent-based coatings to meet the proposed limit may present some technical issues related to dissolving the high molecular weight resins used to give floor coatings their abrasion, impact and chemical resistance. ¹

Survey Results:

Number of products: 416

Products complying with Proposed limit: 214 (51%)

Volume of sales: 4,149,406 L

Sales complying with Proposed limit: 2,262,913 (55%)

WB products: 43%

SB products: 57%

VOC content range: 0-274 g/L (WB), 0-585 g/L (SB) ²

MPI Information:

The MPI approved products list includes categories for Interior/Exterior Latex Floor Paint-Low Gloss, Epoxy Non-Slip Coating, Exterior/Interior Alkyd Floor Enamel-Gloss, Exterior Latex Deck Coating, Interior/Exterior Latex Floor Enamel-Gloss and Epoxy Floor Paint (water-based). Overall: 56% are water-based, 44% are solvent-based. Of the 34 water-based floor coatings, 21 were below 200 g/L and all were below 300 g/L. For solvent-based floor coatings, 23 of 27 were below 350 g/L. ³

Information from Other Jurisdictions:

CA -The CARB Staff Report indicates that their limit is considered technologically and commercially feasible. ⁵

Summary:

This category was created to recognize the higher degree of abrasion resistance required for a floor coating that is not required in a flat or non-flat coating. The proposed limit is consistent with the OTC Model Rule. The MPI approved products list indicates that there are complying water-based products that have the required durability and 55% of sales in the Environment Canada survey met the proposed limit.

Flow Coatings

US EPA - 650 g/L

CARB - 420 g/L

OTC - 420 g/L

Proposed - 650 g/L

Definition:

A coating that is used by electric power companies or their subcontractors to maintain the protective coating systems present on utility transformer units.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Flow coatings are available in water-based and solvent-based formulations. These coatings are extensively thinned with solvent prior to application, allowing the coatings to run down into electric utilities' transformer radiator fins to create an evenly thin film that will not interfere with heat exchange. Existing solvent-based products meet 420 g/L at the point of sale, but are usually thinned in field, so would not likely meet 420 g/L at the time of application. Water-based products which meet 420 g/L exist, but are not used in Canada. There was only one applicator of flow coatings identified in Canada and they only use solvent-based coatings mainly due to cold weather application issues.¹

Survey Results:

None reported in survey.

MPI Information:

There is no MPI category for flow coatings.

Information from Other Jurisdictions:

CA - CARB set their limit at 420g/L to place a cap on an existing product. This was a water-based coating which is thinned extensively with 2-butoxyethanol.⁵

Summary:

This category was created to recognize that a higher VOC content would be required to allow for proper application of the coatings. The proposed limit is consistent with the EPA rule. Existing products may meet 420 g/L at point of sale, but solvents are usually added before application, therefore it may be more realistic to consider a 650 g/L content.

Form Release Compounds

US EPA - 450 g/L

CARB - 250 g/L

OTC - 250 g/L

Proposed - 250 g/L

Definition:

A coating formulated and recommended for application to a concrete form to prevent the freshly placed concrete from bonding to the form. The form may consist of wood, metal, or some material other than concrete.

Technical Assessment Results:

Solvent-based form release compounds are generally two-component mixtures of oil and solvent. Water-based form release compounds use a hydrocarbon oil emulsified in water. These coatings do not solidify like conventional resins, but remain instead on the surface of the form as a lubricant. According to one supplier, it would be difficult to reformulate solvent-based products to meet the proposed limit of 250 g/L. It is possible that exempt solvents could be used to reformulate these products. Water-based emulsions can be prepared with minimal or zero VOCs, but may be too costly and could leave a residue on surfaces after separation. ¹

Survey Results:

Number of products: 10	Products complying with Proposed limit: 4 (40%)
Volume of sales: 417,031 L	Sales complying with Proposed limit: 24,779 (6%)
WB products: 20%	SB products: 80%
VOC content range: 0-210 g/L (WB), 272-821 g/L (SB) ²	

MPI Information:

There is no MPI category for form release compounds.

Technical Data/Manufacturer Info:

A search of form release compounds available in Canada and the US identified several complying products from companies such as Cresset, ChemMasters, Euclid, Unitex and Vexcon. Manufacturer's information indicated that these products can generally be applied at temperatures as low as 10°C.

Information from Other Jurisdictions:

CA - CARB determined there was a high complying marketshare when they proposed their limit of 250 g/L. The proposed limit had existed in district rules for several years and there were no adverse comments received on the limit. ⁵

Summary:

This category was created to recognize a low volume coating that is applied to a concrete form (wood, metal, other) to prevent the freshly placed concrete from bonding to the form. The proposed limit is consistent with the OTC limit. Although the Environment Canada survey found only a 6% compliance in terms of sales, there were 40% of products identified which complied with the proposed limit.

Graphic Arts Coatings

US EPA - 500 g/L

CARB - 500 g/L

OTC - 500 g/L

Proposed - 500 g/L

Definition:

A coating formulated and recommended for hand-application by artists using brush or roller techniques to indoor or outdoor signs (excluding structural components) and murals including lettering enamels, poster colours, copy blockers, and bulletin enamels.

Technical Assessment Results:

The majority of sign coating volume is applied in manufacturing facilities by sign manufacturers,. This category applies to the smaller portion of sign coating volume which is applied in field settings to pre-installed signs by contractors and maintenance personnel. Sign coatings are available in water-based, solvent-based and reactive formulations. There were no technical issues identified concerning manufacturing graphic arts coatings to meet the proposed limit. ¹

Survey Results:

Number of products: 40	Products complying with Proposed limit: 33 (82%)
Volume of sales: Protected Data	Sales complying with Proposed limit: Protected Data
WB products: 80%	SB products: 20%
VOC content range: 55 g/L (WB), 450-562 g/L (SB) ²	

MPI Information:

There is no MPI category for graphic arts coatings.

Information from Other Jurisdictions:

CA - California found a high compliance rate among products. CARB originally considered a limit of 150 g/L which would force a switch to water-based or 100% solids formulations, but revised their proposed limit upon comment from manufacturers. ⁵

Summary:

This category recognizes that a higher VOC content is required for coatings which are formulated for hand-application to indoor or outdoor signs. The proposed limit is consistent with EPA and OTC rule limits and a significant complying marketshare was identified in the Environment Canada survey.

High Temperature Coatings

US EPA - 650 g/L	CARB - 420 g/L	OTC - 420 g/L	CCME - 650 g/L	Proposed - 420 g/L
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Definition:

A high performance coating formulated and recommended for application to substrates exposed continuously or intermittently to temperatures above 202°C.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

High temperature coatings are typically used on metal surfaces exposed to high temperatures such as furnaces, combustion stacks, power plants, etc. Most high temperature coatings are solvent-based and formulated with resins containing silicon and organic compounds. Water-based coatings exist, but are recommended for indoor use only. There were no problems identified with formulating 100% solid reactive systems to meet the proposed VOC content limit. Similarly, existing solvent-based coatings are able to meet the proposed limit. ¹

Survey Results:

Number of products: 10	Products complying with Proposed limit: 4 (40%)
Volume of sales: 11,750 L	Sales complying with Proposed limit: 1,449 L (12%)
WB products: 0%	SB products: 100%
VOC content range: 281-750 g/L (SB)	

Note: A significant volume of sales reported in the survey in this category did not provide VOC_{regulatory} information, so estimates of complying products and sales may not be representative of the entire market.

MPI Information:

Of the 20 products listed in the MPI category "Aluminum Paint, High Heat", 25% are below 550 g/L and 95% are below 650 g/L.

Information from Other Jurisdictions:

CA - The Staff Report indicated the proposed limit was technologically feasible and that use of exempt compounds is an option for reformulation. ^{4,5}

Summary:

This category provides a higher VOC content for coatings which are able to withstand continuous or intermittent exposure to temperatures above 202 °C. The proposed limit is consistent with the OTC Model Rule.

Impacted Immersion Coatings

US EPA - 780 g/L

CARB - [250 g/L]
(considered industrial
maintenance coatings)

OTC - 780 g/L

Proposed - 780 g/L

Definition:

A high performance maintenance coating formulated and recommended for application to steel structures subject to immersion in turbulent, debris-laden water. These coatings are specifically resistant to high-energy impact damage caused by floating ice or debris.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Impacted immersion coatings are generally formulated as single or two-component epoxy formulations. They tend to have high solids content and lower solvent content. The VOC content of existing impacted immersion coatings ranges from 40 to 389 g/L. There were no technical issues identified with the ability to formulate impacted immersion coatings to meet the OTC limit of 780 g/L.¹

Survey Results:

None reported. Likely these coatings would have been classified as Industrial Maintenance.²

MPI Information:

One MPI category, High Build Vinyl, is intended to be applied to primed steel structures exposed to marine and fresh water in splash and immersion zones. There are two products in this category and both have VOC contents between 150 and 300 g/L.

Information from Other Jurisdictions:

CA - CARB indicated impacted immersion coatings could be formulated to meet the 250 g/L industrial maintenance limit. The Staff Report indicated solvent-free epoxies have characteristics which make them ideal for maintenance of pitted steel and eroded concrete.⁵

NY - This category is included since there are locks and dams in the State where these types of coatings would be required. They indicated that vinyl paints as opposed to epoxy paints are generally used on the locks and dams and that these are extremely low volume coatings which are applied exclusively outside of ozone season.⁸

Summary:

This category provides a higher VOC content limit for coatings which would otherwise be classified as Industrial Maintenance. These coatings are applied to steel structures subject to immersion in turbulent, debris-laden water. The proposed limit is consistent with the OTC Model Rule

Industrial Maintenance Coatings

US EPA - 450 g/L	CARB - 250 g/L	OTC - 340 g/L	CCME - 340 g/L	Proposed - 340 g/L
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Definition:

A high performance architectural coating, including primers, sealers, undercoaters, intermediate coats, and topcoats formulated and recommended for application to substrates exposed to one or more of the following extreme environmental conditions;

- (1) Immersion in water, wastewater, or chemical solutions (aqueous and nonaqueous solutions), or chronic exposure of interior surfaces to moisture condensation;
- (2) Acute or chronic exposure to corrosive, caustic, or acidic agents, or to chemicals, chemical fumes, or chemical mixtures or solutions;
- (3) Repeated exposure to temperatures above 121°C;
- (4) Repeated (frequent) heavy abrasion, including mechanical wear and repeated (frequent) scrubbing with industrial solvents, cleansers, or scouring agents; or,
- (5) Exterior exposure of metal structures and structural components.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Industrial maintenance coatings are used for various functions including rust protection on steel bridges, chemical protection inside petroleum storage tanks, corrosion prevention inside potable water and sewage tanks and providing protection of industrial concrete surfaces. They are generally applied by professional contractors. Industrial maintenance coatings can be either water-based or solvent-based coatings using alkyd, polyurethane, epoxy, silicone, vinyl or some acrylic resins. There are no technical issues associated with meeting the proposed 340 g/L VOC content limit. There are many coatings on the market that have performed well at lower VOC levels. The main issue with a 250 g/L limit is cold weather application. Water-based coatings with 250 g/L have much longer drying times in cold weather than solvent-based coatings at 340 g/L.¹

Survey Results:

Number of products: 2,777	Products complying with Proposed limit: 1,027 (37%)
Volume of sales: 11,287,395 L	Sales complying with Proposed limit: 3,314,025 (29%)
WB products: 17%	SB products: 83%
VOC content range: 0-966 g/L (SB), 1-415 g/L (WB) ²	

MPI Information:

There are 292 coatings in MPI categories which would be considered Industrial Maintenance, both solvent-based (64%) and water-based (36%). Approximately 52% of products are below 300 g/L and 67% of products are below 350 g/L.³

Information from Other Jurisdictions:

OTC - When the OTC Model Rule Preamble for AIM coatings was issued on March 6, 2001, it identified as an implementation option for states a VOC content limit of 340 g/L for industrial maintenance coatings. This option recognizes the limitations of climate conditions in the Northeastern US. This limit has been used subsequent regulations proposed or developed in New York, Maine, Delaware, New Jersey, Pennsylvania, Maryland and DC.

Summary:

This category describes primers, sealers, undercoaters intermediate coats or topcoats formulated and recommended for application to substrates exposed to five specific extreme environmental conditions.

The definition and VOC content limit are consistent with the existing CCME limit and 39% of products in the Environment Canada survey complied with the proposed limit.

Lacquers (including lacquer sanding sealers)

US EPA - 680 g/L

CARB - 550 g/L

OTC - 550 g/L

Proposed - 550 g/L

Definition:

A clear or pigmented wood finish, including clear lacquer sanding sealers, formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction and to provide a solid, protective films. Lacquer stains are considered stains, not lacquers.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Lacquers are a relatively small volume category of wood coatings and are used mainly as interior wood finishes. Traditionally, lacquers have been formulated as solvent-based coatings using nitrocellulose or cellulose acetate butyrate as the resin in a lacquer thinner solvent. There are some water-based lacquers on the market prepared with acrylic and styrene-acrylic latex resins. Lacquers have been successfully reformulated with exempt solvents to meet 550 g/L and do not appear to have any technical issues. Water-based lacquers can also be formulated to meet the proposed limit, however, they may have longer dry times.¹

Survey Results:

Number of products: 100

Products complying with Proposed limit: 34 (34%)

Volume of sales: 1,030,354 L

Sales complying with Proposed limit: 422,432 (41%)

WB products: 25%

SB products: 75%

VOC content range: 436-765 g/L (SB), 283-319 g/L (WB)²

A significant portion (40%) of lacquers are sold in small containers. Considering the small container exemption, 51% of sales of lacquers would comply with the proposed EC limit.

MPI Information:

Most lacquers on the MPI approved products list are solvent based and approximately 30% comply with the proposed 550 g/L limit.³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated that their proposed limit (550 g/L) was technically and commercially feasible. The use of acetone was identified as the primary method formulators would use to comply with the limit.⁵

Summary:

This category describes a clear or pigmented wood finish that is formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction. The proposed limit is consistent with the OTC Model Rule and complying coatings can be formulated with acetone (an exempt VOC). Considering the small container exemption, there were approximately 51% complying sales identified in the Environment Canada survey.

Low Solids Coatings

US EPA - 120 g/L

CARB - 120 g/L

OTC - 120 g/L

Proposed - 120 g/L

Definition:

Containing 0.12 kg or less of solids per litre of coating material. **Note:** The VOC calculation for low solids coatings is made based on the total mass of VOCs divided by the total volume of the coating (VOC_{actual}).

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

This category contains two main types of coatings - low solids stains and low solids wood preservatives. These coatings are either water-based or solvent-based using exempt solvents. The only technical issues identified with meeting the proposed limit is with water-based coatings due to the low level of solvents in their formulations which limits their ability to provide resin coalescing properties and protection against freeze/thaw. The study did not identify any manufacturers of low solids coatings.¹

Survey Results:

Number of products: 15	Products complying with Proposed limit: 14 (93%)
Volume of sales: 229,524 L	Sales complying with Proposed limit: 226,927 (99%)
WB products: 93%	SB products: 7%
VOC content range: 5-80 g/L (WB), 504 g/L (SB) ²	

MPI Information:

There is no MPI category for low solids coatings.

Information from Other Jurisdictions:

US EPA - The rationale for creating a low solids category is that at very low solids content, coating coverage is controlled by volume and not by solids content. The VOC content calculation reflects this.⁹

Summary:

This category describes coatings which contain 0.12 kg or less of solids per litre of coating material. The category is generally comprised of low solids stains and stain controllers. The proposed limit is consistent with all rules and there is a high compliance rate in survey. Any low solids coatings which are wood preservatives would not be included in the proposed regulation as VOC emissions from these products are being addressed by PMRA.

Mastic Texture Coatings

US EPA - 300 g/L

CARB - 300 g/L

OTC - 300 g/L

Proposed - 300 g/L

Definition:

A coating formulated and recommended to cover holes and minor cracks and to conceal surface irregularities, and is applied in a single coat of at least 10 mm dry film thickness.

Technical Assessment Results:

Mastic texture coatings are highly-viscous solvent or water-based coatings typically applied to masonry surfaces to seal cracks, fill holes and cover surface irregularities. They are often applied to foundations and brick-work using spray applicators, brushes or rollers. For water-based coatings, there were no technical issues identified with formulating a mastic texture coating to meet the proposed limit. There is a potential vulnerability with continuous exposure to water and also an issue with cold weather application. Solvent-based coatings may be formulated to comply with the proposed limit, however, they may have an increased viscosity to non-complying formulations. It is not possible to use exempt solvents (mainly acetone) since there is an asphalt component of the resin which is not soluble in these solvents.¹

Survey Results:

Number of products: 26	Products complying with Proposed limit: 25 (96%)
Volume of sales: 301,785 L	Sales complying with Proposed limit: 298,256 (99%)
WB products: 8%	SB products: 92%
VOC content range: 13-143 g/L (WB), 196-314 g/L (SB) ²	

MPI Information:

MPI has several categories of mastic texture coatings. Approximately 99% of products are listed below 300 g/L.³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated that their 300 g/L limit was technologically and commercially feasible.⁵

Summary:

This category describes coatings which cover holes and minor cracks in masonry surfaces. The proposed limit is consistent with all rules and there is a high compliance rate (99% sales) in the Environment Canada survey.

Metallic Pigmented Coatings

US EPA - 500 g/L	CARB - 500 g/L	OTC - 500 g/L	CCME - 500 g/L	Proposed - 500 g/L
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Definition:

A nonbituminous coating containing at least 48g of elemental metallic pigment per litre of coating as applied, when tested in accordance with SCAQMD Method 318-95.

These products are exempted from the most restrictive limit provision in the proposed regulation.

Technical Assessment Results:

The main purpose of metallic pigmented coatings is to have the metal contained in the coating fuse to the substrate. They are not considered industrial maintenance coatings. Aluminum, bronze, zinc and other metals are used and both alkyd solvent-based and acrylic water-based coatings are available. Both types of coatings are able to meet the proposed VOC content limit without any technical issues. ¹

Survey Results:

Number of products: 104	Products complying with Proposed limit: 70 (67%)
Volume of sales: 260,045 L	Sales complying with Proposed limit: 221,533 (85%)
WB products: 13%	SB products: 87%
VOC content range: 0-480 g/L (WB), 175-759 g/L (SB) ²	

MPI Information:

In the MPI approved products listing 84% of aluminum paints are below 500 g/L. ³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated there was a high complying marketshare in California and that their proposed limit had been previously implemented in several districts. ⁵

Summary:

This category was created to recognize a unique formulation different from flat/non-flat coatings which contains at least 48g/L of metallic pigment. The content limit is consistent with all rules (and CCME) and there was a high rate of compliance in the Environment Canada survey.

Multi-coloured Coatings

US EPA - 580 g/L

CARB - 250 g/L

OTC - 250 g/L

Proposed - 250 g/L

Definition:

A coating that is packaged in a single container and exhibits more than one colour when applied in a single coat.

Technical Assessment Results:

Multi-coloured decorative paints are typically applied to the interior walls and ceiling of hotels, restaurants, banks, and many other commercial buildings. These coatings must be applied by professional contractors using spray equipment. The market demand for multi-coloured coatings has been declining over the last 10 years. The coatings are two-phased, containing a hydrocarbon solvent phase and a water phase. According to one manufacturer, it is not possible to reformulate a solvent-based coating to meet the OTC limit of 250 g/L. The main problem is with colours combining in the can. Exempt VOCs cannot be used because they dry too fast. Water-based coatings are available but may have stability and application problems.¹

Survey Results:

Number of products: 3

Products complying with Proposed limit: 3 (100%)

Volume of sales: Protected Data

Sales complying with Proposed limit: Protected Data

WB products: 100%

SB products: 0%²

MPI Information:

There is one MPI category for multi-coloured coatings. Three of eight products (38%) would meet the proposed limit.³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicates that their limit is technologically and commercially feasible. The report notes that water-based technology is available and is accepted as an alternative to solvent-based multi-colour coatings.⁵

Summary:

This category recognizes a unique type of coating formulation that is distinct from flat and non-flat paint. The limit is consistent with the OTC rule. All products reported in the Environment Canada survey meet the proposed limit.

Non-Flat Coatings

US EPA - 380 g/L	CARB - 150 g/L	OTC - 150 g/L	Proposed - 150 g/L
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Definition: A coating that is not defined under any other definition in this section and that registers a gloss of 15 or greater on an 85-degree meter or a 5 or greater on a 60-degree meter according to ASTM Method D 523-89 (1999).

Technical Assessment Results:

Water-based non-flat coatings are formulated with acrylic and vinyl-acrylic resins. Solvent-based coatings are generally formulated using alkyd resins as binders. The largest contributors of VOCs in water-based latex non-flat coatings are glycols which are added mainly to provide freeze/thaw resistance and appropriate drying time. Manufacturers state that it is technically feasible to formulate a water-based non-flat coating to meet the 150 g/L limit, which would not compromise application or product performance. Freeze/thaw is a potential limitation below this VOC content limit. ¹

Survey Results:

Number of products: 4,567	Products complying with Proposed limit: 1,802 (39%)
Volume of sales: 84,363,495 L	Sales complying with Proposed limit: 48,627,812 (58%)
WB products: 73%	SB products: 27%
VOC content range: 0-319 g/L (WB), 205-758 g/L (SB)	

Approximately 36% of sales volume falls in VOC content range of 150-250 g/L. ²

MPI Information:

There are 318 products listed in non-flat categories on the MPI website. Approximately 78% of non-flat products listed are water-based and 60% meet the proposed EC limit. A further 10% have VOC contents between 150 and 200 g/L. ³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicates that their limit is technologically and commercially feasible. ⁵

Summary:

This category is defined based on gloss characteristics. The proposed limit is consistent with the OTC model rule. According to the technical assessment, there are no technical issues with the proposed limit. There were 58% complying sales documented in the Environment Canada survey.

Non-Flat - High Gloss Coatings

US EPA - 380 g/L	CARB - 250 g/L	OTC - 250 g/L	Proposed - 250 g/L
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Definition: A nonflat coating that registers a gloss of 70 or above on a 60-degree meter according to ASTM Designation D523-89(1999).

Technical Assessment Results:

Latex water-based non-flat, high gloss paints are formulated with acrylic, vinyl-acrylic and polyvinyl acetate resin systems. Most solvent-based paints are alkyds. Manufacturers commented that it is possible to formulate a water-based product that will meet 250 g/L. It would not be possible to formulate a solvent-based product to meet the proposed limit. An extreme low limit identified is 50 g/L which would require eliminating glycol and require the use of a self cross linking acrylic resin which is used in "no VOC" products. The main issue with lowering the VOC content below 250 g/L would be freeze-thaw. ¹

Survey Results:

Number of products: 638	Products complying with Proposed limit: 97 (15%)
Volume of sales: 3,337,063 L	Sales complying with Proposed limit: 247,609 (7%)
WB products: 15%	SB products: 85%
VOC content range: 97-334 g/L (WB), 115-758 g/L (SB)	

Approximately 30% of sales are in the 400-450 g/L range. Approximately 88% of water-based products and 0.5% of solvent-based products comply with the proposed limit. ²

MPI Information:

Of the 91 products listed in non-flat, high gloss MPI categories, 41% are water-based and 36% meet proposed limit. ³

Information from Other Jurisdictions:

CA - In the most recent Suggested Control Measure revision, CARB kept the same VOC content limit of 250 g/L which had been in place in districts for years. ⁵

Summary:

The category definition is based on gloss characteristics and the proposed limit of 250 g/L is consistent with OTC model rule. According to the technical assessment and the MPI approved products list, there are existing, complying products. There was a 7% complying marketshare documented in the 2002 survey.

Nuclear Coatings

US EPA - 450 g/L

CARB - [250g/L]
(considered industrial
maintenance coatings)

OTC - 450 g/L

Proposed - 450 g/L

Definition:

A protective coating formulated and recommended to seal porous surfaces such as steel (or concrete) that otherwise would be subject to intrusion by radioactive materials. These coatings must be resistant to long-term (service life) cumulative radiation exposure (ASTM Method D 4082-89), relatively easy to decontaminate, and resistant to various chemicals to which the coatings are likely to be exposed (ASTM Method D 3912-80).

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Coatings applied at nuclear power generating facilities are available in water-based acrylic, epoxy, polyurethane and many other resin bases. Reactive epoxy, polyurethane and other polymer systems offer performance characteristics that can meet the ASTM standards quoted in the definition. Achieving the EPA limit with 100% solids reactive coatings, water-based products and some 2-part reactive solvent based coatings is possible (all have VOC content levels between 200 and 300 g/L). There may be possible technical issues with formulating solvent-based coatings to meet the EPA limit as some have VOC contents as high as 750 g/L. ¹

Survey Results:

There was only one product reported in the survey and it meets the OTC content limit. ²

MPI Information:

There is no MPI category for nuclear coatings.

Technical Data/Manufacturer Info:

Information provided by Ontario Power Generation regarding the types of coatings they use in their Pickering facility indicate that virtually all coatings used are below the 250 g/L VOC content limit. They do not use the ASTM methods referenced in the EPA definition to test their coatings.

Information from Other Jurisdictions:

CA - The CARB SCM classifies nuclear coatings as industrial maintenance and indicates that there are available coatings for use in nuclear facilities that meet the IM content limit.
OTC States - Several OTC states that have proposed or finalized AIM regulations have included this category with a limit of 450 g/L. Background information indicates that the category was included due to the potential high cost of reformulating non-complying coatings, potentially high re-qualification costs, low volume of sales and since the coatings are generally applied where capture and control technology would be present. ^{6,7,8}

Summary:

This category describes coatings which are resistant to long-term cumulative radiation exposure and to various chemicals and are relatively easy to decontaminate. The proposed limit is consistent with the OTC model rule.

Pre-treatment Wash Primers

US EPA - 780 g/L	CARB - 420 g/L	OTC - 420 g/L	CCME - 780 g/L	Proposed - 420 g/L
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Definition:

A primer that contains a minimum of 0.5 percent acid, by weight, when tested in accordance with ASTM Designation D 1613-96, that is formulated and recommended for application directly to bare metal surfaces to provide corrosion resistance and to promote adhesion of subsequent topcoats.

These products are exempted from the most restrictive limit provision in the proposed regulation.

Technical Assessment Results:

These primers are often two-component products which are typically applied to metal surfaces. The first component contains the resin and anti-corrosion pigment. The second component includes the acid, which drives the cure reaction. There are no technical issues for water-based coatings to meet the proposed limit. Reducing the VOC content limit from 780 g/L to 420 g/L for solvent-based pre-treatment wash primers could result in too high a solids content which could lead to viscosity and application problems.¹

Survey Results:

Only four water-based products were reported in the survey and all meet OTC VOC content limit.²

MPI Information:

All eighteen MPI approved vinyl wash primers are solvent-based and are below 780 g/L, one product has a VOC content below 650 g/L.³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated that existing and effective pre-treatment wash primers already met their proposed limit of 420 g/L.⁵

Summary:

This category describes primers which contain a minimum of 0.5 percent acid by weight and are applied directly to bare metal. The proposed limit is consistent with the OTC model rule and all products reported in the survey were below 420 g/L.

Primers, Sealers and Undercoaters

US EPA - [350 g/L] (primers and undercoaters) / [400 g/L] (sealers, including interior clear wood sealers)	CARB - 200 g/L	OTC - 200 g/L	Proposed - 200 g/L
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Definition:

Primer: A coating formulated and recommended for application to a substrate to provide a firm bond between the substrate and subsequent coatings.

Sealer: A coating formulated and recommended for application to a substrate for one or more of the following purposes: to prevent subsequent coatings from being absorbed by the substrate; to prevent harm to subsequent coatings by materials in the substrate.

Undercoater: A coating formulated and recommended to provide a smooth surface for subsequent coatings.

Technical Assessment Results:

There are many formulations for these types of coatings. Modified alkyds, oleoresins, epoxies, specialty resins and emulsions may be used as primers, sealers and undercoaters. Latex resins include acrylic, vinyl chloride, vinyl acetate, styrene or a combination of these. There are no significant issues with meeting 200 g/L for water-based products as there are many already existing. It may not be possible to formulate solvent-based products to meet the proposed limit. ¹

Survey Results:

Number of products: 853	Products complying with Proposed limit: 521 (61%)
Volume of sales: 26,356,655 L	Sales complying with Proposed limit: 21,947,726 (83%)
WB products: 63%	SB products: 37%
VOC content range: 3-579 g/L (WB), 0-758 g/L (SB) ²	

MPI Information:

Approximately 70% of MPI approved primers, sealers and undercoaters have VOC contents lower than 350 g/L. Approximately 95% of water-based primers, sealers and undercoaters were below 200 g/L. ³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated that the 200 g/L limit was technically and commercially feasible. The report concluded that significant reductions in VOC emissions could be realized by including the 200 g/L in their SCM. Water-based technologies were identified as a likely reformulation option. ⁵

Summary:

This is a general category to describe coatings which serve as an initial coat to provide a smooth surface for subsequent coats and prevent cracking and flaking that would occur if a coating was applied directly to the substrate. The proposed limit is consistent with the OTC Model Rule, there are MPI listed products which meet the limit and the compliance rate in Environment Canada survey was 83% (sales).

Quick-dry Enamels

US EPA - 450 g/L

CARB - 250 g/L

OTC - 250 g/L

Proposed - 250 g/L

Definition:

A nonflat coating that has the following characteristics:

- (1) Is capable of being applied directly from the container under normal conditions with ambient temperatures between 16 and 27 °C;
- (2) When tested in accordance with ASTM Method D 1640-83, sets to touch in 2 hours or less, is tack free in 4 hours or less, and dries hard in 8 hours or less by the mechanical test method; and,
- (3) Has a dried film gloss of 70 or above on a 60-degree meter.

Technical Assessment Results:

Quick dry enamels are available in water and solvent-based formulations. Water-based enamels typically use acrylic-latex resins, while solvent-based formulations use alkyd resins. Waterborne products are available to consumers and meet the proposed 250 g/L limit (same as non-flat, high gloss). The majority of solvent-based quick dry enamels are typically available only to paint contractors through distributors and cannot be formulated to below 250 g/L and be able to meet the dry-time requirement. ¹

Survey Results:

Number of products: 29	Products complying with Proposed limit: 6 (21%)
Volume of sales: 41,396 L	Sales complying with Proposed limit: 24,812 (60%)
WB products: 7%	SB products: 93%
VOC content range: 76-336 g/L (WB), 444-611 g/L (SB) ²	

A significant portion (38%) of quick-dry enamels are sold in small containers. Considering the small container exemption, 60% of quick-dry enamels would comply with the proposed EC limit.

Note: A significant volume of sales reported in the survey in this category did not provide VOC_{regulatory} information, so estimates of complying products and sales may not be representative of the entire market.

MPI Information:

All MPI approved quick-dry enamels are solvent-based products - 33% are below 400 g/L and 71% are below 450 g/L. ³

Information from Other Jurisdictions:

CA - The CARB Staff report indicated that a limit of 250 g/L is technically and commercially feasible. The report concluded that many non-flat, high gloss products meet dry time criteria and recommended that districts eventually drop the category and then products would be classified as non-flat, high gloss. ⁵

Summary:

Category describes enamel coatings which sets to touch in 2 hours, is tack free in 4 hours, and dries hard in 8 hours. The proposed limit is consistent with the OTC Model Rule and approximately 60% of products in the survey complied.

Quick-dry Primers, Sealers and Undercoaters

US EPA - 450 g/L

CARB - 200 g/L

OTC - 200 g/L

Proposed - 200 g/L

Definition:

A primer, sealer, or undercoater that is dry to the touch in a 1/2 hour and can be recoated in 2 hours when tested in accordance with ASTM Method D 1640-95.

Technical Assessment Results:

Quick-dry primers, sealer and undercoaters are available in water and solvent-based formulations. There are no technical issues with formulating water-based quick-dry primers, sealers and undercoaters to meet the proposed 200 g/L limit. Products identified in the study were below this limit. It would not be possible to formulate a solvent-based primer/sealer/undercoater to below 200 g/L since this could increase the viscosity of the product to an unacceptable level. ¹

Survey Results:

Number of products: 126

Volume of sales: 2,123,259 L

WB products: 43%

VOC content range: 53-184 g/L (WB), 334-726 g/L (SB) ²

Products complying with Proposed limit: 51 (40%)

Sales complying with Proposed limit: 730,557 (34%)

SB products: 57%

MPI Information:

There are 41 quick-dry primers, sealers and undercoaters listed on the MPI list of approved products. They have both interior and exterior uses and 68% are below 450 g/L. MPI does not list any water-based quick-dry primers, sealers or undercoaters. ³

Information from Other Jurisdictions:

CA - The CARB staff report indicates that the limit would be technically and commercially feasible by effective date of the SCM (Jan 2003). ⁵

Summary:

Category describes primers, sealers and undercoaters which dry to touch in 30 min. and can be recoated in 2 hours. The proposed limit is consistent with the OTC model rule and the Environment Canada survey indicates significant complying sales.

Recycled Coatings

US EPA - none

CARB - 250 g/L

OTC - 250 g/L

Proposed - 250 g/L

Definition:

An architectural coating formulated such that not less than 50 percent of the total weight consists of secondary and post-consumer coating, with not less than 10 percent of the total weight consisting of post-consumer coating.

Technical Assessment Results:

The majority of sales (75 to 80%) of recycled coatings are water-based, however, this percentage is expected to increase. The proposed 250 g/L limit would present no technical issues for water-based products since they are already manufactured below that limit (100 to 150 g/L). It would not be possible for recycled solvent-based paints, stains and varnishes to meet the proposed limit since many of the coatings being recycled would exceed the 250 g/L limit. Manufacturers indicated that VOC content limit for recycled coatings could be same as new products, but the requirement should lag for 5 years or more since the typical lag time between new and recycled coatings is 5 to 10 years.¹

Survey Results:

None reported in survey.

MPI Information:

There is no MPI category for recycled paints.

Technical Data/Manufacturer Info:

Based on information gathered from manufacturers of recycled coatings, all recycled paint from Ontario is sold outside of North America. Quebec is the only province with a recycling facility. Approximately 70% of the recycled paint sold from the Quebec facility in Canada is water-based. British Columbia has a program which redistributes waste coatings or blends waste paint into fuel or other non-paint products.

Information from Other Jurisdictions:

CARB - The CARB staff report indicated that all recycled coatings sold in California were water-based and could meet the 250 g/L limit.⁵

EPA - Used a calculation to adjust (downwards) the VOC content of a coating which contained recycled content instead of including a unique category for recycled coatings.

Summary:

This category was created to recognize that recycled coatings may require a higher VOC content limit than flat paint. The proposed limit is consistent with the OTC Model Rule. Information from manufacturers and background technical information indicates that a significant portion of recycled paint sold in Canada is water-based and would likely meet the proposed limit.

Roof Coatings

US EPA - 250 g/L

CARB - 250 g/L

OTC - 250 g/L

Proposed - 250 g/L

Definition:

A non-bituminous coating formulated and recommended for application to roofs for the primary purpose of preventing penetration of the substrate by water or reflecting heat and reflecting ultraviolet radiation. This does not include thermoplastic rubber coatings. Metallic pigmented roof coatings which qualify as metallic pigmented coatings shall not be considered to be in this category, but shall be considered to be in the metallic pigmented category.

Technical Assessment Results:

Roof coatings are coatings containing synthetic polymeric resins. They are generally applied over cold-applied roofing systems. They are applied to the exposed roof surface to protect against ultraviolet and climatic exposure. Roof coatings provide the same function as bituminous roof coatings, but use synthetic polymer resins instead of bitumen. For water-based coatings, there are no technical issues with the proposed limit as existing products are already below 250 g/L. Manufacturers indicated that there could be issues with cold weather application and water-resistance of coatings. Solvent based coatings meeting 250 g/L would have a higher viscosity which would affect application and potentially require heating of the product before spraying.¹

Survey Results:

Number of products: 6	Products complying with Proposed limit: 4 (67%)
Volume of sales: 10,259 L	Sales complying with Proposed limit: 3,209 (31%)
WB products: 70%	SB products: 30%
VOC content range: WB, 225 g/L SB, 202-642 g/L ²	

Note: A significant volume of sales reported in the survey in this category did not provide VOC_{regulatory} information, so estimates of complying products and sales may not be representative of the entire market.

MPI Information:

There is no MPI category for roof coatings.

Technical Data/Manufacturer Info:

Roof coatings are applied following the completion of all roofing activities. It is possible to apply these coatings at any time following the completion of the roof - meaning that if it is not possible to apply the coatings due to inclement weather, the coating work can be rescheduled to be applied in more favourable weather conditions.

Information from Other Jurisdictions:

CA - The CARB Staff Report identified no technical or commercial issues with limit of 250 g/L.⁵

Summary:

This category describes non-bituminous coatings formulated for application to exterior roofs for the primary purpose of preventing penetration of water or reflecting heat and UV radiation. The proposed limit is consistent with both EPA and OTC rules. According to the technical assessment and survey results, there are available water-based and solvent-based products on the market.

Rust Preventative Coatings

US EPA - 400 g/L

CARB - 400 g/L

OTC - 400 g/L

Proposed - 400 g/L

Definition:

A coating formulated and recommended for nonindustrial use to prevent the corrosion of ferrous metal surfaces.

Technical Assessment Results:

Rust preventative coatings are typically used on various metal attachments including gutters, fences and handrails. Product formulations include zinc phosphate or zinc complexes as the active rust preventative agent. Alkyd solvent-based and acrylic water-based coatings are available. Solvent based coatings can be formulated to 400 g/L without technical issues and existing water-based products are already below the proposed limit.¹

Survey Results:

Number of products: 256

Products complying with Proposed limit: 52 (20%)

Volume of sales: 1,879,927 L

Sales complying with Proposed limit: 46,432 (2%)

WB products: 1%

SB products: 99%

VOC content range: WB, 97-439 g/L SB, 288-644g/L

Approximately 46% of products have a VOC_{regulatory} content between 400 and 450 g/L.

Note: A significant volume of sales reported in the survey in this category did not provide VOC_{regulatory} information, so estimates of complying products and sales may not be representative of the entire market.

MPI Information:

There is an MPI category for water-based Rust Inhibitive Primers which contains 36 coatings. All coatings in this category have VOC contents below 250 g/L.³

Summary:

This category was created to describe coatings which are used for preventing corrosion of ferrous metal surfaces in non-industrial situations. The content limit is consistent with all rules. There are existing available products.

Sanding Sealers (other than lacquer sanding sealers)

US EPA - 550 g/L

CARB - 350 g/L

OTC - 350 g/L

Proposed - 350 g/L

Definition:

A clear or semi-transparent wood coating formulated and recommended for application to bare wood to seal the wood and to provide a coat that can be sanded to create a smooth surface for subsequent applications of coatings. A sanding sealer that also meets the definition of a lacquer is not included in this category, but is included in the lacquer category.

Technical Assessment Results:

Sanding sealers are formulated with acrylic or urethane resins and can provide durable finishes with good water and chemical resistance and minimal grain raising. A limit of 350 g/L would force a shift to water-based products. According to one manufacturer, reformulating a solvent-based product to meet 350 g/L would result in high viscosity and difficulties with application. The use of exempt VOCs was not identified as a reformulation option for these types of coatings.¹

Survey Results:

Number of products: 27	Products complying with Proposed limit: 2 (7%)
Volume of sales: 434,945 L	Sales complying with Proposed limit: 160 (<1%)
WB products: 7%	SB products: 93% ²
Range in VOC content: 44-261 g/L (WB), 493-732 g/L (SB)	

Approximately 19% sales and 48% products would meet the EPA limit of 550 g/L.

MPI Information:

The MPI approved products list includes only a category for solvent-based alkyd sanding sealer. Only one product of 35 (3%) is listed at a VOC content below 350 g/L and 86% are below 550 g/L.³

Information from Other Jurisdictions:

CA - CARB set limit in the SCM based on existing complying products and no comments were received on the proposed limit. The 2001 CARB survey reported 45% complying products and 43% complying sales.^{4,5}

NJ - Comments on the NJ regulation included the issue of grain raising and poor penetration of water-based sanding sealers. The response indicated that wood substrates are supposed to be sanded after application of a sanding sealer, so grain raising should not be an issue. The document also notes that grain-raising can also occur with solvent-based products.¹⁰

DE - Comments on the DE regulation indicated panelization is an issue with water-borne sanding sealers. This issue occurs sometimes when water-based coatings are used on maple floors and can also be caused by a variety of conditions related to flooring installation. The response indicated that the Maple Flooring Manufacturers Association (MFMA) 2003 list contains many water-based finishes which would be recommended for use on maple floors.⁶

Summary:

This category describes a clear or semi-transparent wood coating which is applied to bare wood to seal the wood and provide a surface which can be sanded smooth. The proposed limit is consistent with OTC model rule. There do not appear to be many complying products offered in the Canadian marketplace, however, there appears to be a complying marketshare in California, indicating that sanding sealers which meet the 350 g/L limit exist and are effective.

Shellacs - Clear

US EPA - 730 g/L

CARB - 730 g/L

OTC - 730 g/L

Proposed - 730 g/L

Definition:

A clear coating formulated solely with the resinous secretions of the lac beetle (*Lacifer lacca*), thinned with alcohol, and formulated to dry by evaporation without a chemical reaction.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

All shellacs sold in Canadian market are formulated at less than 690 g/L so there are no technical issues with proposed limit. ¹

Survey Results:

Number of products: 5

Products complying with Proposed limit: 5 (100%)

Volume of sales: Protected Data

Sales complying with Proposed limit: 100%

WB products: 0%

SB products: 100%

VOC content range: 566-660 g/L (SB) ²

MPI Information:

All products listed on MPI's list of approved products are less than 750 g/L. ³

Summary:

The proposed limit is consistent with EPA and OTC rules. All Environment Canada survey products meet the proposed limit.

Shellacs - opaque									
US EPA - 550 g/L	CARB - 550 g/L	OTC - 550 g/L	Proposed - 550 g/L						
<p>Definition: An opaque coating formulated solely with the resinous secretions of the lac beetle (<i>Lacifer lacca</i>), thinned with alcohol, and formulated to dry by evaporation without a chemical reaction.</p> <p>These products are exempted from most restrictive limit provision in proposed regulation.</p>									
<p>Technical Assessment Results: All opaque shellacs sold are formulated with VOC contents less than 550 g/L therefore there are no anticipated technical issues with the proposed limit. ¹</p>									
<p>Survey Results:</p> <table border="0"> <tr> <td>Number of products: 1</td> <td>Products complying with Proposed limit: 1 (100%)</td> </tr> <tr> <td>Volume of sales: Protected Data</td> <td>Sales complying with Proposed limit: 100%</td> </tr> <tr> <td>WB products: 0%</td> <td>SB products: 100%²</td> </tr> </table>				Number of products: 1	Products complying with Proposed limit: 1 (100%)	Volume of sales: Protected Data	Sales complying with Proposed limit: 100%	WB products: 0%	SB products: 100% ²
Number of products: 1	Products complying with Proposed limit: 1 (100%)								
Volume of sales: Protected Data	Sales complying with Proposed limit: 100%								
WB products: 0%	SB products: 100% ²								
<p>MPI Information: There is no MPI category for opaque shellacs.</p>									
<p>Information from Other Jurisdictions: CA - There were no technical issues identified in the CARB Staff Report. ^{4,5}</p>									
<p>Summary: This category recognizes that opaque shellacs may be formulated to meet a lower VOC content than clear shellacs due to their higher solids content. The proposed limit is consistent with EPA and OTC rules. All Environment Canada survey products meet the proposed limit.</p>									

Specialty Primers, Sealers and Undercoaters

US EPA - [350 g/L] (primers and undercoaters) or [400 g/L] (sealers, including interior clear wood sealers)

CARB - 350 g/L

OTC - 350 g/L

Proposed - 350 g/L

Definition:

A coating formulated and recommended for application to a substrate to seal fire, smoke or water damage; to condition excessively chalky surfaces, or to block stains. An excessively chalky surface is one that is defined as having a chalk rating of four or less as determined by ASTM Designation D 4214-98.

Technical Assessment Results:

Specialty primers, sealers and undercoaters belong to a niche category that is considered a subset of primers, sealer and undercoaters. Formulations are similar to primers, sealers and undercoaters, with the exception that pigments and extenders can make up a large portion of the product, since the intent of the coating is to hide the damaged surface. Water-based coatings which meet the 350 g/L limit are available. Some manufacturers indicated that more than one coat could be required to achieve the same thickness as with a solvent-based product. ¹

Survey Results:

Number of products: 18
Volume of sales: 174,004
WB products: 52%

Products complying with Proposed limit: 11 (61%)
Sales complying with Proposed limit: 165,440 (95%)
SB products: 48% ²

Note: A significant volume of sales reported in the survey in this category did not provide VOC_{regulatory} information, so estimates of complying products and sales may not be representative of the entire market.

MPI Information:

Of the MPI approved products, 62% of specialty (stain blocking) primers are water-based and 38% are solvent-based. Approximately 92% had VOC contents less than 350 g/L. ³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicated that their proposed limit of 350 g/L was technologically feasible. ⁵

Summary:

This category is a niche segment of the primers, sealers and undercoaters category that recognizes different VOC content requirements for primers, sealers and undercoaters that seal fire, smoke or water damage, condition excessively chalky surfaces and block stains. The proposed content limit is consistent with OTC. There are compliant products contained in the Environment Canada survey and the technical assessment indicates complying water-based coatings are available.

Stains			
US EPA - 550 g/L (clear and semitransparent) or 350 g/L (opaque)	CARB - 250 g/L	OTC - 250 g/L	Proposed - 250 g/L
Definition: A clear, semitransparent, or opaque coating labelled and formulated to change the colour of a surface but not conceal the grain pattern or texture.			
Technical Assessment Results: Stains are used for both interior and exterior applications. Exterior stains are used in soft wood exterior structures such as fences, decks and on wood siding to protect from UV and moisture. Interior stains are used on wood floors and a variety of wooden furniture and cabinetry. Stains are available in both solvent-based and water-based formulations. For clear/semi-transparent stains the proposed VOC content limit can be met by increasing the solids content of solvent-based products or by using a water-based acrylic/latex formulation. Once applied and dried properly, compliant solvent-based stains do not have significant performance issues. Water-based stains may have issues with quality and durability of acrylic resin finish due to a lower degree of penetration into the wood substrate than solvent-based stains. For opaque stains, the proposed limit can be met by formulating water-based stains. There are many compliant opaque stains on the market and no technical issues with the proposed limit. ¹			
Survey Results: Number of products: 2,040 Products complying with Proposed limit: 936 (46%) Volume of sales: 23,334,644 L Sales complying with Proposed limit: 4,565,796 L (20%) WB products: 49% SB products: 51% VOC content range: 20-447 g/L (WB), 241-800 g/L (SB) ² Products complying with Proposed EC - clear:47%, opaque:44% Sales complying with Proposed EC: - clear:7%, opaque:35% A significant portion (38%) of stains are sold in small containers. Considering the small container exemption, 56% of sales of stains would comply with the proposed EC limit			
MPI Information: Overall 31% of MPI approved stains have VOC contents less than 350 g/L.			
Information from Other Jurisdictions: CA - The CARB Staff Report indicates that their limit was selected because it is technically and commercially feasible. ⁵			
Summary: The proposed limit is consistent with OTC model rule. There are 20% complying sales and 46% complying products reported in the Environment Canada survey. Considering the small container exemption, the level of complying sales increases to 56%. In addition, MPI lists complying products.			

Swimming Pool Coatings

US EPA - 600 g/L

CARB - 340 g/L

OTC - 340 g/L

Proposed - 340 g/L

Definition:

A coating formulated and recommended to coat the interior of swimming pools and to resist swimming pool chemicals.

This category would also apply to the EPA category called "Swimming Pool Repair and Maintenance Coatings"

Technical Assessment Results:

Water-based acrylic and epoxy swimming pool coatings are able to meet the proposed 340 g/L limit, however, solvent-based (chlorinated rubber) coatings cannot be formulated to meet the proposed limit. Epoxy swimming pool paints are applied at much greater thicknesses than acrylic or chlorinated rubber products. They are more expensive, but last much longer than other types of swimming pool coatings. The performance of water-based coatings is similar to chlorinated rubber coatings. In addition, they tend to have lower odour and are slightly less resistant to UV degradation.¹

Survey Results:

Number of products: 20

Products complying with Proposed limit: 3 (15%)

Volume of sales: 88,608 L

Sales complying with Proposed limit: 2,923 L (3%)

WB products: 4%

SB products: 96%²

MPI Information:

There is no MPI category for swimming pool paint.

Technical Data/Manufacturer Info:

According to the National Spa and Pool Institute of Canada, concrete pools (which require swimming pool coatings) make up approximately 5% of the total number of pools in Canada. This is not forecast to increase in the future.

Information from Other Jurisdictions:

CA - The CARB Staff Report indicates that their limit was selected because it is technically and commercially feasible.⁵

Summary:

This category was created to recognize the unique properties of swimming pool coatings to resist pool chemicals. This category includes those coatings which would have been categorized as swimming pool maintenance coatings in the EPA rule. The proposed limit is consistent with OTC. There are available complying products.

Temperature Indicator Safety Coatings

US EPA - [650 g/L] (considered high temp coatings)	CARB - 550 g/L	OTC - 550 g/L	Proposed - 550 g/L
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Definition:

A coating labelled and formulated as a colour-changing indicator coating for the purpose of monitoring the temperature and safety of the substrate, underlying piping, or underlying equipment, and for application to substrates exposed continuously or intermittently to temperatures above 204°C.

These products are exempted from the most restrictive limit provision in the proposed regulation.

Technical Assessment Results:

Special inorganic pigments in temperature indicator safety coatings change colour if the temperature of the substrate exceeds certain design thresholds. These types of coatings are applied by industrial contractors and are sold through distributors. This is an extremely small, niche category, in which sales volume of coatings manufactured and used is very low. Solvent-based products identified in the technical assessment meet the proposed limit. There is a need to apply coating in a thin film so that blistering will not occur. Reducing the VOC content may result in greater film thickness.¹

Survey Results:

One product was reported in the survey with a VOC_{regulatory} content of 492 g/L. It is solvent-based and meets the proposed limit.²

MPI Information:

There is no MPI category for temperature indicator safety coatings.

Information from Other Jurisdictions:

CA - The CARB SCM limit was proposed as a cap on existing VOC contents. The Staff Report indicated this was a very low volume product where one refinery uses ten gallons in 2 to 3 yrs.⁵

Summary:

This category was created to describe a coating which changes colour at a certain temperature (usually between 200-325 °C). The proposed limit is consistent with OTC model rule. Only one product was reported in the Environment Canada survey and it complies with the proposed limit.

Thermoplastic Rubber Coatings and Mastics

US EPA - 550 g/L

CARB - [250 g/L] (considered roof coatings)

OTC - 550 g/L

Proposed - 550 g/L

Definition:

A coating or mastic formulated and recommended for application to roofing or other structural surfaces and that incorporates no less than 40 percent by weight of thermoplastic rubbers in the total resin solids and may also contain other ingredients including, but not limited to, fillers, pigments, and modifying resins.

These products are exempted from most restrictive limit provision in proposed regulation.

Technical Assessment Results:

Thermoplastic rubber and mastic coatings are designed to seal roof coatings and other construction details subject to considerable detail. Elastomeric resins in the formulation provide flexibility to stresses and are designed to be resistant to wear and fatigue. No technical issues were identified for manufacturing these coatings below the proposed limit of 550 g/L. Existing solvent-based products are already below this limit. One manufacturer indicated that there would be issues with formulating a coating below 400 g/L as there would not be sufficient solvent present to properly dissolve the rubber in the resin. ¹

Survey Results:

Number of products: 106

Products complying with Proposed limit: 106 (100%)

Volume of sales: Protected Data

Sales complying with Proposed limit: 100%

All products reported in the survey are solvent-based products. ²

MPI Information:

There is no MPI category for thermoplastic rubber and mastics.

Information from Other Jurisdictions:

CA - CARB did not include a category for this product in their SCM since it was not sold in California.
OTC States - The Consolidated Impact Statement for the NY regulation indicates these coatings are applied as one coat system which could result in lower VOC emissions than bituminous roof coatings. These coatings offer a high solar reflectivity. ⁸

Summary:

This category defines coatings which has no less than 40% by weight of thermoplastic rubbers in the total resin solids and is applied to roof or other structural surfaces. The definition and limit are consistent with the OTC Model Rule. All products reported in the Environment Canada survey comply with the proposed limit.

Traffic Marking Coatings

US EPA - 450 g/L (zone markings) or 150 g/L (traffic markings)

CARB - 150 g/L

OTC - 150 g/L

Proposed - 150 g/L

Definition:

Traffic marking coating: A coating formulated and recommended for marking and striping streets, highways, or other traffic surfaces including, but not limited to curbs, berms, driveways, parking lots, sidewalks and airport runways.

Technical Assessment Results:

Traffic marking coatings are largely purchased by contractors who apply coatings for governments and private businesses. The coatings are generally sprayed hot and under pressure to speed up drying. Traffic paints are required to dry quickly in order to allow use of the road immediately after application. Most traffic paint currently sold in Canada is solvent-based, although the proportion of water-based paint is forecast to increase in the future. Existing water-based traffic coatings are already formulated to below 150 g/L. Once applied, water-based coatings have comparable performance to solvent-based coatings, however, they must be applied at a minimum of 10°C. This is a potential issue for new construction painting which occurs in late fall/early winter. Solvent-based traffic coatings can be applied in temperatures as low as 5°C. They are generally used in regions of Canada where the environment can be quite humid and temperatures during application low and in all regions during the early spring and late fall when temperatures are low. ¹

Survey Results:

Number of products: 181	Products complying with Proposed limit: 51 (28%)
Volume of sales: 17,863,971 L	Sales complying with Proposed limit: 3,275,630 L (18%)
WB products: 29%	SB products: 71%
Range of VOC content: 201-464 g/L (SB), 64-150 g/L (WB) ²	

MPI Information:

There are 27 MPI approved alkyd traffic & zone markings. Only one of these meets the proposed 150 g/L limit. There are 30 MPI approved water-based latex zone marking coatings which all meet the proposed 150 g/L.

Technical Data/Manufacturer Info:

The percentage of water-based traffic paints used by provincial ministries of transportation ranges from zero or "very little" in several provinces to 70% in Saskatchewan.

Information from Other Jurisdictions:

CA - According to the CARB Staff Report, in northwest California where damp, cool weather conditions require solvent-based coatings, acetone based coatings are being used to comply with the 150 g/L limit. ⁵

Summary:

The VOC content of 150 g/L has been proposed preliminarily. Based on information gathered from provincial and municipal departments of transportation, it may not be feasible to implement this limit on a year round basis. Further discussions with manufacturers and end users of traffic coatings will be necessary to determine the proper VOC content limit.

Varnishes

US EPA - 450 g/L

CARB - 350 g/L

OTC - 350 g/L

Proposed - 350 g/L

Definition:

A clear or semi-transparent coating, excluding lacquers and shellacs, formulated to dry by chemical reaction on exposure to air. Varnishes may contain small amounts of pigment to colour a surface, or to control the final sheen or gloss of the finish.

Technical Assessment Results:

Varnishes are made from alkyds, urethanes, polyurethanes, phenols and modified resin systems which polymerize by chemical reaction. They produce a hard, durable film that is resistant to chemicals and hydrocarbons, but can be subject to yellowing with age. Varnishes are commonly used as wood floor coatings, however, they are also used on furniture, doors and windows. Solvent-based formulations using polyurethane resins have become the preferred system for most clear varnish applications. Solvent-based clear varnishes can be reformulated to meet 350 g/L, but may have a higher solids content, be less durable and require longer application and drying times. Water-based polyurethane formulations which can meet the proposed 350 g/L limit are the newest technology development where a substantial amount of research and development has been invested. According to suppliers, the quality of water-based varnish formulations is continuing to improve rapidly. ¹

Survey Results:

Number of products: 480

Products complying with Proposed limit: 141 (29%)

Volume of sales: 8,078,909 L

Sales complying with Proposed limit: 799,769 L (10%)

WB products: 26%

SB products: 74%

VOC content range: 0-528 g/L (WB), 107-824 g/L (SB) ²

A significant portion (56%) of varnishes are sold in small containers. Considering the small container exemption, 74% of sales of varnishes would comply with the proposed EC limit

MPI Information:

Approximately 37% of MPI approved varnishes are water-based. Of water-based products, 68% are less than 250 g/L VOC and all are less than 380 g/L. Of solvent-based products, 13% are less than 350 g/L. Overall, approximately 45% of MPI approved varnishes meet the proposed limit of 350 g/L. ³

Information from Other Jurisdictions:

CA - The CARB Staff Report indicates the limit was chosen since it is technically and commercially feasible. ⁴

Summary:

The proposed limit is consistent with the OTC rule. The Environment Canada survey responses indicate that 29% of varnish products in the Canadian market meet the proposed limit. Considering the small container exemption, approximately 74% of varnishes would comply with the proposed limit.

Waterproofing Sealers - concrete/masonry

US EPA - 600 g/L (waterproofing sealers) or 400 g/L (concrete protective coatings) or 700 g/L (concrete curing and sealing compounds)

CARB - 400 g/L

OTC - 400 g/L

Proposed - 400 g/L

Definition:

Waterproofing Sealer - concrete/masonry - A clear or pigmented coating that is formulated and recommended for sealing concrete and masonry to provide resistance against water, alkalis, acids, ultraviolet light and staining.

Concrete curing and sealing compounds - A liquid membrane-forming compound marketed and sold solely for application to concrete surfaces to reduce the loss of water during the hardening process and to seal old and new concrete providing resistance against alkalis, acids, and ultraviolet light, and provide adhesion promotion qualities.

Technical Assessment Results:

Waterproofing concrete/masonry sealers are used in a variety of commercial, industrial and residential applications including formed and poured concrete floors, walls and columns, concrete block or brick walls, sidewalks, driveways, etc. Larger concrete surfaces such as bridges, roads, overpasses and other transportation related structures also use waterproofing sealers. The sealers form a moisture barrier by forming a thin continuous film membrane over the substrate (as with acrylic resin formulations). It is possible the proposed limit can not be met using solvent-based coatings. Exempt solvents could potentially be used, but would likely be too high in price. Water-based formulations are available for most resin systems. There are potential issues are cold weather application and surface penetration.

Concrete curing and sealing compounds could also be considered part of this category. They are either solvent-based or water-based acrylic coatings which can be applied to uncured or cured concrete. They provide a barrier to prevent moisture from evaporating from the concrete as it cures and remain as a sealer on the concrete to provide resistance against alkalis, acids, UV light and to promote adhesion of subsequent coatings. ¹

Survey Results:

Waterproofing Sealers - Concrete/Masonry

Number of products: 143	Products complying with Proposed limit: 79 (55%)
Volume of sales: 3,055,174 L	Sales complying with Proposed limit: 2,527,551 L (83%)
WB products: 26%	SB products: 74%
VOC Content Range: 0-389 g/L (WB), 0-942 g/L (SB) (several 100% solids coatings are included in this range) ²	

Concrete curing and sealing

Number of products: 51	Products complying with Proposed limit: 19 (37%)
Volume of sales: 1,321,838 L	Sales complying with Proposed limit: 322,907 (24%)
WB products: 32%	SB products: 68%
VOC content range: 0-325 g/L (WB), 624-778 g/L (SB) ²	

Overall

Number of products: 194	Products complying with Proposed EC: 98 (51%)
Volume of sales: 4,377,012 L	Sales complying with Proposed EC: 2,850,458 (65%)

MPI Information:

There are four MPI categories of waterproofing sealers for concrete and masonry listed. Of all products, 42% are water-based and 58% are solvent-based. Approximately 43% of approved products are less than 400 g/L.

Information from Other Jurisdictions:

CA - This category was first created by CARB when it split the "waterproofing sealers" category into two categories - "waterproofing sealers" and "waterproofing sealers for concrete/masonry".⁵

Summary:

The proposed limit is consistent with the OTC rule. Overall, approximately 65% of sales of products that would be considered waterproofing sealers for concrete/masonry meet the proposed limit.

Categories not included in Proposed Regulation

Anti-fouling coatings - The Pest Management Regulatory Agency (PMRA) will be managing any VOC emission reduction initiatives dealing with this category.

Anti-graffiti coatings - This EPA category is considered to be included in the industrial maintenance category in CARB and OTC rules. There were six anti-graffiti coatings reported in the Environment Canada survey and none met the proposed industrial maintenance coating limit of 250 g/L. The Technical Assessment indicated that there are several water-based anti-graffiti products available on the market which are VOC-free. Solvent-based anti-graffiti coatings may be reformulated using exempt compounds.

Chalkboard resurfacers - This EPA category is considered to be included in the industrial maintenance category in CARB and OTC rules. Six solvent-based products were reported in the Environment Canada survey, but did not provide any VOC_{regulatory} information. Information in the Technical Assessment indicated that water-based chalkboard resurfacers would have no technical issues with meeting the 250 g/L industrial maintenance limit.

Concrete curing and sealing compounds - This EPA category is considered either a concrete curing compound or waterproofing sealer - concrete/masonry in the CARB, OTC and proposed regulation. These coatings are discussed in the waterproofing sealer - concrete/masonry section.

Concrete protective coatings - This EPA category is considered to be included in the waterproofing sealer - concrete/masonry category. The EPA VOC content limit for concrete protective coatings is the same as the proposed VOC content limit for waterproofing sealer for concrete and masonry.

Heat reactive coatings - This EPA category not considered an AIM coating since it has to cure at high temperatures.

Magnesite cement coatings - This category is used in rules in all US jurisdictions however there is no evidence that magnesite cement flooring is used in Canada. There were no products reported in the Environment Canada survey.

Nonferrous ornamental metal lacquers and surface protectants - This EPA category is considered to be part of the industrial maintenance category in the CARB, OTC rules and proposed regulation.

Repair and maintenance thermoplastic coatings - This EPA category is considered to be part of the industrial maintenance category in the CARB, OTC rules and proposed regulation. The technical assessment indicates that water-based repair and maintenance thermoplastic coatings may be formulated to meet the industrial maintenance VOC content limit of 340 g/L. Reformulated solvent-based products may have an increase viscosity resulting in application issues.

Stain controllers - This EPA category is considered to be part of the low solids category in the CARB, OTC and proposed regulation. There were seven stain controllers reported in the Environment Canada survey. One was water-based and would meet the proposed limit for low solids coatings. The solvent-based products would not meet the proposed limit. Approximately 70% of stain controllers in the survey were sold in small containers and would be considered exempt from the VOC content requirement. According to the Technical Assessment, stain controllers would have to be formulated as water-based products to meet the low solids VOC content limit.

Wood preservatives - The Pest Management Regulatory Agency (PMRA) will be managing any VOC emission reduction initiatives dealing with this category.

Zone markings - This EPA category is included in the traffic markings category in CARB and OTC rules. The EPA VOC content limit for zone markings is 450 g/L. These coatings would be considered Traffic Markings in the proposed Environment Canada regulation and have a VOC content limit of 150 g/L.

References for Background Information

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6. State of Delaware Department of Natural Resources and Environmental Control, Regulation 41, Section 1, "Architectural and Industrial Maintenance Coatings" Response Document, March 2002.
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9. US EPA, 1998. National Volatile Organic Compound Emission Standards for Architectural Coatings - Background for Promulgated Standards. EPA-453/R-98-006b, August 1998