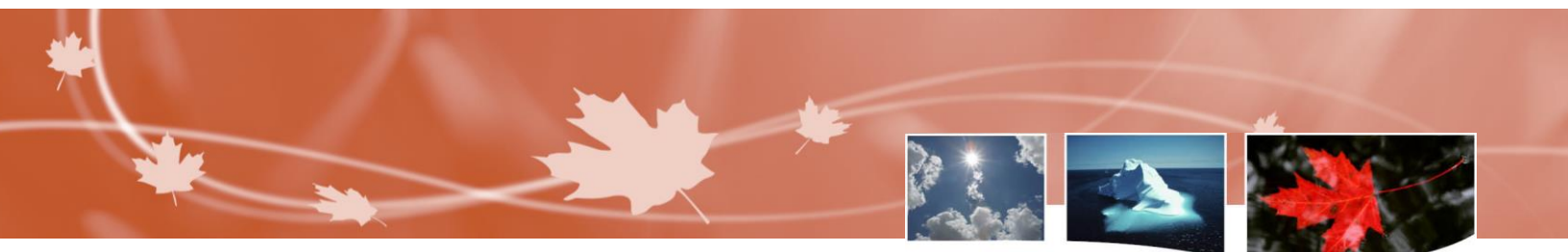




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Code of Practice for the Reduction of Volatile Organic Compounds Emissions from the Use of Cutback and Emulsified Asphalt

Draft document for review and consultation

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1 Preface

1.1 Background

Canada has approximately one million kilometers of roads and highways, of which just under half are paved¹. With more than 20 million road vehicles registered in Canada, the transportation system also includes large areas of parking lots and private driveways. Asphalt is the material of choice for road and parking lot pavement. It is used for construction, maintenance and repairs. With such a large paved surface across Canada, the asphalt sector (manufacturing, distribution, supply and use) is an important industry sector in Canada.

Emulsified asphalt (EA) and cutback asphalt (CA) are used for various applications associated with road construction, maintenance and repairs. Examples include:

- Plant mix (open-graded, dense-graded, sand);
- Road mix (mixed in place), including mining with open- and dense-graded aggregate, sand, sandy soil;
- Surface treatment, including fog, sand, chip, sandwich, and slurry seals, micro-surfacing and cape seal;
- Asphalt applications including prime and tack coat, dust palliative, crack filler;
- Maintenance mix;
- Cold in-place recycling; and
- Full-depth reclamation.

In preparing these products, asphalt cement is mixed with either a petroleum diluent to produce CA or with emulsifiers, water and sometimes a small quantity of petroleum diluent to produce EA. Once the liquefied asphalt cement is applied to the surface of the road, the diluent (petroleum solvent in the case of asphalt cutbacks and primarily water in the case of asphalt emulsions) evaporates, leaving the residual asphalt cement to perform its function.

The application of asphalt causes emissions of volatile organic compounds (VOC) through the evaporation process described above and contributes to the creation of ground-level ozone and particulate matter, which are major components of smog.

In 2013, some jurisdictions in Canada and 30 jurisdictions in the United States have adopted practices to control the level of VOC emissions from this sector. All of the jurisdictions include restrictions of CA during the ozone season, which is typically the summer months, while many of the jurisdictions also include restrictions of VOC content in both EA and/or CA product manufacturing. Some jurisdictions also prohibit CA throughout the year.

1 U.S. Central Intelligence Agency (2008). The World Factbook. www.cia.gov/library/publications/the-world-factbook/geos/ca.html accessed March 2013.

1.2 Asphalt use in Canada and VOC emissions

The level of VOC emissions depends on a number of factors, including the type of asphalt used and the ambient temperature. New formulations of asphalt using bio-products instead of petroleum solvents are being developed and are becoming more available. The hardening of this type of asphalt is done through polymerization of the bio-diluent rather than through evaporation, thereby eliminating VOC emissions.

The majority of asphalt used in Canada is the EA type. Based on a study conducted for Environment Canada in 2010, 301 kilotonnes (kt) of liquefied asphalt were used in Canada in 2009, 85 percent of which was EA while 15 percent was CA². The total VOC emissions associated with this usage are estimated to be 8.8 kt (5.2 kt for CA and 3.6 kt for EA). While CA represented only 15 percent of asphalt use in Canada in 2009, it was responsible for 59 percent of the VOC emissions associated with the use of asphalt. The same study estimated that VOC emissions from asphalt could reach 10.8 kt in 2020 in the absence of an environmental framework to guide the use of asphalt in Canada.



² Environmental Health Strategies Inc. *Technical and Economic Study on VOC (Volatile Organic Compound) Emissions from Emulsified and Cutback Asphalt Use in Canada*. October 2010. Prepared for Environment Canada.

2 Context

Smog is an air quality issue that poses serious health and environmental concerns in Canada. Particulate matter (PM) and ground-level ozone are the two principal components that comprise smog. PM and ozone can be transported by prevailing winds over long distances, making them not only a local urban issue but one that also extends regionally in Canada into many smaller communities and rural areas.³



Ozone is formed by complex reactions between the precursor emissions, i.e. nitrogen oxides (NO_x) and VOCs, in the presence of sunlight. PM is released directly into the air by industrial activity, and it is also formed in the atmosphere via complex chemical reactions involving the emissions of smog precursors, including sulphur dioxide (SO₂), NO_x, VOC and ammonia (NH₃). In order to reduce smog levels and improve air quality, it is necessary to control and reduce the direct PM and the precursor emissions of SO₂, NO_x, VOC and NH₃.

On July 2, 2003, an Order⁴ added ozone and PM precursors 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 formation of ground-level ozone and particulate matter. The addition of the precursors enables the Government of Canada to regulate, under CEPA 1999, VOC emissions contributing to PM and ozone.

In March 2004, the Ministers of the Environment and of Health published the *Federal Agenda for the Reduction of Emissions of Volatile Organic Compounds (VOC) from Consumer and Commercial Products*⁵. The 2004 Federal Agenda outlined the Government of Canada's plan for

3 Government of Canada Five-year Progress Report: Canada-wide Standards for Particulate Matter and Ozone. January 2007. Available at www.ec.gc.ca/Publications/default.asp?lang=En&xml=31B2381E-56BF-44CC-8D65-BF6FDB7125AD accessed March 2013.

4 Government of Canada website: www.gazette.gc.ca/archives/p2/2003/2003-07-02/html/sor-dors229-eng.html accessed March 2013.

5 Environment Canada website: www.ec.gc.ca/cov-voc/default.asp?lang=En&n=424DFC9B-1 accessed March 2013.

2004 to 2010 to develop regulations under CEPA 1999 to reduce VOC emissions from specific consumer and commercial products.

In June 2010, Environment Canada published a document entitled *Renewal of the Federal Agenda on the Reduction of Volatile Organic Compound (VOC) Emissions from Consumer and Commercial Products: A Discussion Paper for the 2010 to 2020 Period*⁶. The discussion paper outlines a number of possible initiatives for the Government of Canada to take in order to reduce VOC emissions from consumer and commercial products during the 2010 to 2020 period. The “Emulsified and Cutback Asphalt” category has been identified as one of the possible areas for the development of reduction measures by the Government of Canada.

In March 2012, Environment Canada held a consultation on possible control instruments with representatives from the asphalt sector, non-governmental organizations and Health Canada. Based on feedback received from stakeholders and on its own analysis, Environment Canada decided that the best control instrument to reduce VOC emissions from the use of asphalt would be a Code of Practice. A Code of Practice will encourage reduction of VOC emissions while allowing for flexibility among industry in terms of application of select practices that reduce VOC emissions.

Information gathered from industry stakeholders at the 2012 consultation and information collected through Environment Canada’s own research has indicated that adherence to the recommendations in the Code of Practice will not result in significant additional costs to the industry and will not compromise the safety or the technical quality of paving projects. The practices recommended in the Code primarily involve changes to timing of application (i.e. seasonal) and administrative changes (i.e. labelling/guidelines for end users). Any recommendations in the Code to consider alternative products refer to alternative products that have already been proven in other markets in terms of quality.

CEPA 1999 provides the Minister of the Environment with the authority to issue codes of practice respecting pollution prevention or specifying procedures, practices or release limits for environmental control relating to works, undertakings and activities during any phase of their development and operation, including the location, design, construction, start-up, closure, dismantling and clean-up phases and any subsequent monitoring activities. A code of practice identifies recommended standards and operating practices, but compliance with these desirable practices remains voluntary.

The *Code of Practice for the Reduction of Volatile Organic Compounds Emissions from the Use of Cutback and Emulsified Asphalt* (Code) includes:

- VOC concentration limits for cutback and emulsified asphalt, with specific restrictions during the ozone season (May to September);
- Labelling measures for manufacturers;
- Provisions to guide procurement practices for paving projects proponents; and
- Application guidelines for paving companies.

Record-keeping recommendations are also included in the Code. Information gathered from annual reporting will play an essential role in evaluating the progress achieved through the Code.

6 Ibid.

3 Interpretation

3.1 Definitions

The following definitions apply to this Code:

Asphalt cement: the refined residue from the distillation process of selected crude oils, free of water and foreign material, containing less than 1 percent ash and specially prepared as to quality and consistency for direct use in the manufacture of bituminous pavements.

Cutback asphalt: manufactured by blending asphalt cement with a petroleum solvent. There are three major types of cutback asphalt based on the relative rate of evaporation of the solvent: rapid-curing, medium-curing and slow-curing.

Emulsified asphalt: a mixture of asphalt cement, water and an emulsifying agent. There are two major categories of emulsified asphalt: cationic and anionic. Anionic emulsions have negatively charged asphalt droplets and cationic emulsions have positively charged asphalt droplets. Certain grades of emulsified asphalt contain added petroleum diluent which permits a thicker film to adhere to the aggregate and promotes stronger bonding of the asphalt to the aggregate.

Ozone season: The ground-level ozone season occurs during the warm-season months, when the days are warmer and longer. The period of May 1 through September 30 is considered the ground-level ozone season in Canada, as defined in the *Ozone Annex* (2000) of the *Canada-United States Air Quality Agreement* (1991).

The Minister: refers to the federal Minister of the Environment (Environment Canada).

Volatile organic compounds (VOC): has the meaning of Item 65 on the List of Toxic Substances in Schedule 1 of the *Canadian Environmental Protection Act, 1999* (CEPA 1999). <http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=ODA2924D-1&wsdoc=4ABEFFC8-5BEC-B57A-F4BF-11069545E434>

3.2 Applicability of the Code

Recommendations in the Code propose standards and control actions aimed at the environmental management of cutback and emulsified asphalt in order to reduce VOC emissions.

This Code does not replace nor supersede any laws or regulations adopted by federal, provincial, territorial, municipal or Aboriginal authorities. Nor does this preclude management of asphalt or asphalt products for other possible toxic substances, or new substances added to the List of Toxic Substances in Schedule 1 of CEPA 1999.

4 Objectives

4.1 Intent of the Code of Practice

The main objective of the Code is to make sure that the environment and health of Canadians is protected while maintaining road safety. Consequently, the intent of the Code is to provide guidance to the asphalt sector regarding actions that can contribute to the reduction of VOC emissions from the use of CA and EA in order to reduce health and environmental concerns in Canada. The potential reduction in current VOC emissions from the use of CA is estimated to be between three and five kilotonnes if the Code is followed implicitly on an annual basis.

The Code aims to reduce VOC emissions from that sector by 55 percent over a five-year period. After the five-year period, the Minister will evaluate the performance of the Code to see if it has met its objectives. This assessment will be calculated by comparing the correlation between the total quantity of CA manufactured and imported during the five-year period with the initial quantity of asphalt cutback manufactured and imported in the year of publication of the Code. This evaluation will help determine if amendments to the Code or the development of any other control instrument is required to better manage VOC emissions from the asphalt sector.

4.2 Additional benefits

Applying the standards and operating practices outlined in the Code may also achieve the benefits described below.

- The Code could set national standards and best practices across Canada, fostering consistency and alignment with similar measures in other jurisdictions in North America.
- Reductions in VOC emissions resulting from actions taken accordingly to the Code will generate environmental and health benefits in reducing the intensity and frequency of smog events.
- Following the measures described in the Code will also improve air quality at the site of application of asphalt, reducing the potential health impact on workers and local communities, especially in urban centres.

5 Application

The Code applies to any person or organization involved in the production, import, sale, purchase or use of CA or EA. This includes:

1. Private sector manufacturers;
2. Procurement enablers (governments⁷ and private sector); and
3. Private sector end-users (paving companies).

6 Implementation

6.1 Cutback asphalt

CAs are classified into three groups depending on the relative speed of evaporation:

- Rapid-curing: asphalt cement combined with a light petroleum diluent of high volatility, generally with a boiling point similar to gasoline or naphtha.
- Medium-curing: asphalt cement combined with a petroleum diluent of intermediate volatility, generally with a boiling point similar to kerosene.
- Slow-curing: asphalt cement combined with a petroleum diluent of low volatility, generally with a boiling point similar to fuel oil.

CAs can be used with cold aggregates requiring little or no heat. They are most commonly used in road mixing operations, stockpile mixes and spray applications such as prime, tack and seal coats.

6.1.1 Standards for use during the ozone season

It is not recommended to use CA in paving material or in paving and maintenance operations from May 1 to September 30, except:

- If the asphalt is a slow-curing asphalt that contains no more than 0.5 percent by volume of VOCs, which evaporates at 260°C (500°F) or less.
- If CA is used for prime coating and for stockpile storage of patching mixes.

6.1.2 Standards for use outside of the ozone season

It is not recommended to use CA in paving material or in paving and maintenance operations between October 1 and April 30 that exceeds 5 percent by volume of VOCs, which evaporates at 260°C (500°F) or less.

⁷ All orders of government (municipal, regional, provincial, territorial, federal and Aboriginal authorities) may be proponents of paving projects.

6.2 Emulsified asphalt

Several types and grades of EAs are produced to serve specific applications:

- The RS, MS, SS and QS designations refer to the emulsion setting rate of rapid-setting, medium-setting, slow-setting and quick-setting, respectively.
- The C preceding some of the EA grades designates a cationic asphalt emulsion.
- The *h* that follows certain grades designates a harder base asphalt in the product.
- The *HF* preceding some of the grades indicates a high-float product as measured by a float test specified under ASTM D139. High-float products generally contain added petroleum diluent such as fuel oil, which permits a thicker film to adhere to the aggregate and promotes stronger bonding of the asphalt to the aggregate. HF products are often used with dusty or dense graded aggregate.

EA products are used for road construction and for many specialty applications. RS and CRS products are generally used in spray applications such as aggregate (chip) seals and other surface treatment methods. The medium-setting grades are more commonly used for mixing with coarse aggregate for plant or road mix. The slow-setting grades are designed for maximum mixing stability and are used with dense-graded aggregate containing high fines which are used in soil stabilization, asphalt surface mixes, slurry seal applications, and tack and prime coat applications. Quick-setting grades are specialized emulsions used for quick-set slurry applications.

6.2.1 Standards for use during the ozone season

It is not recommended to use EA in paving material or in paving and maintenance operations between May 1 and September 30 that exceeds 3 percent by volume of VOCs, which evaporate at 260°C (500°F) or less.

6.2.2 Standards for use outside of the ozone season

There are no restrictions on the use of EA in paving material or in paving and maintenance operations from October 1 to April 30.

6.3 Manufacture, import, sale and use

It is not recommended to manufacture, import, sell or offer for sale any CA material which contains more than 5 percent by volume of VOCs, which evaporate at 260°C (500°F) or less.

It is recommended that manufacturers, importers, sellers and users of CA consider manufacturing, importing, selling or using low-emitting VOC product alternatives to replace petroleum solvents in the formulation of CA.

6.4 Labelling

Anyone who manufactures, sells or offers for sale CA or EA should develop a product technical specification sheet that should accompany the product when it is sold and include the instructions regarding recommendations on product use in Canada, in accordance with sections 6.1 and 6.2 of the Code of Practice. This could include seasonal restrictions as well as the type of use that is recommended or discouraged. Reference to the Code should also be displayed.

6.5 Procurement

It is expected that public or private proponents of projects requiring the use of CA or EA be familiar with the Code.

Compliance with the Code should be a condition of any contract that is issued for paving and maintenance operations in Canada by any private or public proponent or any level of government, including municipal, provincial, territorial, federal or Aboriginal authorities.

Contracts referred to in the previous paragraph should promote the use of alternative formulations of asphalt containing low VOC-emitting alternative products available that meet the specifications for the contract instead of petroleum solvents, when appropriate.

6.6 Conditions of use and training of staff

Any person or company conducting paving or maintenance operations using CA or EA should conduct all of their activities in accordance with the Code.

Any such person or company should provide their employees with appropriate training on the requirements of the Code. Such training should include, as a minimum, knowledge of the type and formulation of asphalt that should be used during and outside the ozone season, the recommended use for various types of asphalt throughout the year, and the operational changes associated with the use of EA with lower concentrations of VOCs compared with the traditional use of CA with higher concentrations of petroleum solvents⁸.



⁸ Curing times of some EAs may be slightly longer than for CA and curing may be more affected by colder weather. This may require adjustments in the planning of daily operations.

7 Record Keeping

7.1 Manufacturers, importers and retailers

Anyone who manufactures, imports, sells or offers for sale CA or EA should keep records of the quantity and formulation of all asphalt sold for that year. These records should be kept for a minimum of six years and made available to the Minister.

7.2 Proponents of paving projects (procurement enablers)

Anyone who enters into a contractual agreement with a paving company for paving or maintenance operations related to highways or roads should keep a copy of such contracts for a minimum of six years and make this information available to the Minister.

7.3 End-users (paving companies)

Anyone who uses CA or EA for paving or maintenance operations should keep records of the quantity and formulation of all asphalt used for each year. These records should be kept for a minimum of six years and made available to the Minister.

8 Annual Reporting

A person who meets the conditions of section 7.1 should send annual reports to the Minister. The first report should be sent, at the latest, six months after the final publication date of the Code in the *Canada Gazette*, Part I and should cover the previous year's activities. Subsequent reports should be sent annually to the Minister by March 31 on the following year.

The report should contain the product classification, quantity manufactured (kg), quantity imported (kg), quantity sold (kg), percent by volume of VOCs and province of use of CA and EA. The report could also contain information on specific actions implemented to reduce the quantity of CA used each year. These actions may be contained in the Code or may be developed by the facility. The date at which these actions were initiated at the facility should also be recorded.

This information will be used to evaluate and determine whether the objectives of the Code were achieved in reducing the emissions of VOC from the asphalt sector.

9 Review of Progress

The Minister will review the implementation of the Code after five years. The review will determine the level of implementation of the best management practices recommended by the Code and the objectives of section 4. The information collected according to section 8 of the Code will help determine whether amendments to the Code or the development of any other control instrument is required or whether the Code has met its objectives of reducing the VOC emissions from this sector.

10 Coming into Effect

The Code will be in effect on the day of its final publication in the *Canada Gazette*, Part I.



Appendix A: Annual Report Form

Information to be enclosed in the annual report

Section 1 – General information

Name (e.g. corporation, company):

Telephone number:

Civic and postal addresses:

Fax number:

Email address:

Name and title of the contact:

Telephone number:

Civic and postal addresses:

Fax number:

Email address:

For Environment Canada use

Section 2 – Information with respect to the asphalt products manufactured, imported or sold

Calendar year:

Asphalt product	Quantity manufactured (kg)	Quantity imported (kg)	Quantity sold (kg)	% by volume of VOCs	By province
Cutback asphalt (ozone season)					
Rapid cure					
Medium cure					
Slow cure					
Cutback asphalt (non-ozone season)					
Rapid cure					
Medium cure					
Slow cure					
Emulsified asphalt (ozone season)					
Quick setting					
Rapid setting					
Medium setting					
Slow setting					
Emulsified asphalt (non-ozone season)					
Quick setting					
Rapid setting					
Medium setting					
Slow setting					

Section 3 – Supplementary information

- ☐ I am enclosing evidence that there is no technically or economically feasible way to reduce the VOC emissions from the product by using a lower VOC-emitting alternative product, such as emulsified asphalt.
- ☐ I am enclosing a description of specific actions implemented to reduce the quantity of cutback asphalt used to promote the reduction in VOC emissions.
- ☐ I am enclosing a rationalization to explain why reductions in manufacturing and importing of cutback asphalt could not be achieved this year.

Section 4 – Confidentiality

An applicant who submits a request, in accordance with section 313 of the *Canadian Environmental Protection Act*, 1999, that information contained in the application be treated as confidential must include with that request the identification of the following:

- a) any information that constitutes a trade secret;
- b) any information the disclosure of which would likely cause material financial loss to, or prejudice the competitive position of, the applicant;
- c) any information the disclosure of which would likely interfere with contractual or other negotiations being conducted by the applicant; and
- d) any financial, commercial, scientific or technical information that is confidential and is treated consistently in a confidential manner by the applicant.

I declare that this information is accurate and complete.

Date

Signature