

## CHAPTER 4 – ENVIRONMENTAL ISSUES

There are several environmental issues related to the use of prime and tack coat which are not solely related to the use of asphalt emulsions versus cutback asphalts. Numerous references were found stating that asphalt emulsions are replacing cutbacks due to environmental concerns. NCAT lists the following four reasons that asphalt emulsions should be used in lieu of cutbacks <sup>(1)</sup>:

1. Environmental regulations. Emulsions are relatively pollution free. Unlike cutback asphalts there are relatively small amounts of volatiles to evaporate into the atmosphere other than water.
2. Loss of high energy products. When cutback asphalts cure, the diluents which are high energy, high price products are wasted into the atmosphere.
3. Safety. Emulsions are safe to use. There is little danger of fire as compared to cutback asphalts, some of which have very low flash points.
4. Lower application temperature. Emulsions can be applied at relatively low temperatures compared to cutback asphalt, thus saving fuel costs. Emulsions can also be applied effectively to a damp pavement, whereas dry conditions are required for cutback asphalts.

Environmental issues related to the use of prime and tack coat are complex due to the overlapping jurisdiction of several federal agencies and the fact that the regulations are subject to interpretation by the courts. Local, state and federal regulations should be consulted for specific regulations regarding environmental issues with use of cutback and asphalt emulsions.

Environmental issues related to the use of prime and tack coats can be grouped under the concerns of air and water quality issues, worker safety and hazardous materials issues, and contractor liability issues. The following is a discussion of some of the environmental issues relating to prime and tack coat usage and is not meant to be a guideline on procedures, reporting requirements or regulations. Appropriate local, state and federal rules and regulations should be consulted.

### AIR QUALITY ISSUES

The primary pollutants of concern from asphalt paving operations are volatile organic compounds (VOC). Cutback asphalts are the major source of VOCs as only minor amounts of VOCs are emitted from emulsified asphalts and asphalt cements. VOC emissions from cutback asphalts result from the evaporation of the petroleum distillate used to liquefy the asphalt cement. VOC emissions can occur at both the job site and the mixing plant; however, the largest source of emissions is from the road <sup>(41)</sup>.

A typical prime coat material would be MC cutback with approximately 25 to 45 percent diluent. The Environmental Protection Agency (EPA) reports that approximately 70 percent of the diluent will eventually evaporate from MC cutback with some of the diluent permanently retained in the asphalt cement. The rate of diluent evaporation for MC cutback, based on limited test data, was reported as 20 percent emitted during the first day after application, 50 percent during the first week and 70 percent after 3 to 4 months <sup>(41)</sup>.

Rapid cure (RC) cutback is occasionally used for tack coat by some agencies, although it is not allowed in current CFLHD specifications. EPA reports that approximately 95 percent of the diluents eventually evaporate from RC cutback with 75 percent emitted during the first day after application, 90 percent during the first month and 95 percent in 3 to 4 months<sup>(41)</sup>.

Asphalt emulsions are typically used in place of cutback asphalts to eliminate VOC emissions. The use of cutback asphalt is regulated in many jurisdictions to help reduce VOC emissions. Prohibitions on the use of cutback, either permanently or during certain times of the year, are common in jurisdictions that have either reached, or are nearing non attainment for ozone requirements of the Clean Air Act.

## **WATER QUALITY ISSUES**

Water quality issues are much more complex than air quality issues because of the overlapping jurisdiction of several federal agencies, the complexity of many of the regulations, and the variability of regulations and jurisdictions on the state and local levels. Local, state and federal regulations should be consulted for specific reporting and remediation requirements and for regulations regarding water quality issues with use of cutback and asphalt emulsions.

HMA has been successfully used as a liner for drinking water reservoirs. The Asphalt Institute reported that the Metropolitan Water District of Southern California has been using asphalt-lined water reservoirs for over 50 years<sup>(42)</sup> and that Washington and Oregon operate fish hatchery ponds that are lined with HMA with an emulsified asphalt seal coat<sup>(43)</sup>.

### **Oil Spills into Waterways**

The EPA has interpreted asphalt emulsions and cutback as oil as defined in Section 311(a)<sup>(1)</sup> of the Clean Water Act<sup>(44)</sup>. Therefore, according to the Clean Water Act, there is no differentiation between spills of cutback or asphalt emulsion. The Clean Water Act, in part, requires that any spill of oil that could enter a waterway, as defined by The Clean Water Act, and violates applicable water quality standards or causes a film or sheen on the water, would require reporting to the National Response Center and local authorities<sup>(45)</sup>. The EPA states that “a sheen” refers to an iridescent appearance on the surface of the water<sup>(44)</sup>. Both cutback and asphalt emulsion would most probably leave a sheen on any body of water they entered.

A direct spill into a waterway is not the only way prime and tack coat materials can enter a waterway. Entry is available through a spill that enters storm water and waste water sewers, drainage ditches, etc. to name but a few sources. There is even a possibility that rain water could wash a freshly applied uncured prime or tack coat into a waterway in sufficient quantity to cause a sheen to form on the water way. Figure 29 shows the effect of rain on a freshly applied prime coat. The Storm Water Pollution Prevention Plans (SWP3), required by the storm water permit process for construction sites, further addresses requirements for pollution prevention from storm water runoff of waterways and environmentally sensitive areas. The Asphalt Institute<sup>(2)</sup> recommends that prime coat be omitted if there is a strong possibility of runoff.



**Figure 29. Photo. Effect of rain on a freshly applied prime coat.**

### **Oil Spills on Ground**

The reporting requirements for a spill of oil on the ground that does not enter a waterway, for oil as defined by the clean water act, is more complicated due to the various agencies that could have jurisdiction. Under Spill Prevention, Control and Countermeasure (SPCC) regulations <sup>(44)</sup>, a spill of oil must be reported to the National Response Center and local authorities if, in part, the spill is greater than 3,785 L (1,000 gal) or a spill of over 160 L (42 gal) of oil in each of two spills occurs within a 12 month period. Local requirements could be more stringent.

According to the Resource Conservation and Recovery Act (RCRA) <sup>(46)</sup>, hazardous chemicals have an associated reportable quantity (RQ) that is contained in an EPA list. If a spill or release of more than a RQ of a material occurs at a site, the spill must be reported to the National Response Center and local authorities. There can be RCRA regulated materials in cutback and occasionally in some asphalt emulsions. However, these RCRA hazardous materials are usually present in such low concentrations that those RQs would rarely be reached in normal paving operations. State and local jurisdictions can have lower RQ requirements and suppliers and local agencies should be contacted if there is a question concerning a reportable spill.

### **ACCIDENTAL SPILL PROCEDURES**

The following procedures to be taken in case of a spill or release of cutback or asphalt emulsion were obtained from supplier's material safety data sheets (MSDS) <sup>(47,48,49,50)</sup>.

A spill or accidental release should be contained immediately by diking or impounding. Do not allow spill to enter sewers or watercourse. Remove all sources of ignition. Absorb with appropriate inert materials such as sand, clay, etc. Notify appropriate authorities of spill. The spill may be a regulated waste. If regulated solvents are used to clean up the spilled material, the resulting waste mixture may be a regulated waste. Assure conformity with local state and federal governmental regulations for disposal.

Disposal of recovered spill material must be in accordance with applicable local, state and federal regulations. Disposal methods could include recycling of the waste, incineration of the waste at an approved facility, landfilling at an approved facility or a special waste or industrial landfill.

**WORKER SAFETY AND HAZARDOUS MATERIALS ISSUES**

Under RCRA, asphalt cement is not considered a hazardous material <sup>(46)</sup>. However, occasionally RCRA defined hazardous materials are contained in diluents used to make cutback asphalts or in additives added to emulsifying agents or performance enhancing agents in asphalt emulsions. The concentrations of these RCRA defined hazardous materials in MC cutbacks and asphalt emulsions are usually in such small quantities that a major release, much larger than would be likely to occur on a typical CFLHD paving project, would be required to meet or exceed RCRA reportable quantity (RQ) limits.

Other worker safety issues concern health risks to workers from exposure to the product, fire danger and stability or reactivity of the product. Table 3 shows the Hazardous Materials Information Resource System (HMIRS) or National Fire Protection Association (NFPA) hazard identification ratings for materials typically used in prime and tack coat applications.

**Table 3. Hazard identification rating and volatility.**

Material / Source	HMIRS / NFPA Hazard Rating <sup>1</sup>			% Volatility
	Health	Fire	Reactivity	
LVOC-1 / Prime Materials <sup>2</sup>	0	0	0	0
AE-P / Prime Materials <sup>2</sup>	0	2	0	10
AE-P / Koch Materials <sup>3</sup>	3	1	0	ND
EAP&T / Prime Materials <sup>2</sup>	1	0	0	NL
SS-1 / Prime Materials <sup>2</sup>	1	0	0	0
CSS-1 / Prime Materials <sup>2</sup>	1	0	0	0
CSS-1H / Citgo <sup>4</sup>	1	1	0	Negligible
MC-70 / Jebro <sup>5</sup>	1	2	0	15-35
Unmodified Asphalt / Citgo <sup>4</sup>	2	1	0	Negligible
Citcoflex SP / Citgo <sup>4</sup>	2	1	0	Negligible

<sup>1</sup> 0-least, 1-slight, 2-moderate, 3-high, 4-extreme, \*-may present chronic health effects

<sup>2</sup> Reference <sup>(47)</sup>

<sup>3</sup> Reference <sup>(48)</sup>

<sup>4</sup> Reference <sup>(49)</sup>

<sup>5</sup> Reference <sup>(51)</sup>

ND = not determined, NL = not listed.

Unmodified and modified asphalt cements are shown for comparison purposes. The information was obtained from supplier MSDS.

As shown in Table 3, none of the materials typically used for prime or tack is reactive or pose more than a slight health risk, with the exception of Koch Material's AE-P, and they are less reactive and pose less of a health risk than unmodified or modified asphalt cement. There is a health risk associated with worker exposure to fumes from heated asphalt products, mainly in confined spaces. This is not usually an issue when applying prime or tack coat if workers stay a reasonable distance away from the spray bar during application.

The two materials with a diluent, MC 70 and AE-P, contain VOCs and have a moderate fire risk. Fire can be a concern when using MC for prime coat or RC for tack coat. Application of MC and RC often involves heating the material above its flash point. A fire that is initiated at the spray bar may spread through accumulated asphalt deposits and destroy the vehicle. Therefore, the Asphalt Institute recommends asphalt distributors should be kept clean and free of asphalt accumulations and the burner should be shut off prior to application. Dry chemical or carbon dioxide extinguishers should be used to extinguish such a fire <sup>(52)</sup>.

There is also a possibility of fire during application of cutbacks, such as by a cigarette or match. This would be more likely with RC, with gasoline or naphtha as the diluent, rather than MC cutback with kerosene as the diluent <sup>(52)</sup>. This should not be a serious issue for CFLHD as they do not specify RC cutback for prime or tack.

### **CONTRACTOR LIABILITY ISSUES**

The above discussion dealt with statutory regulations concerning environmental issues associated with the use of prime and tack coats. There is also the possibility of civil liability and public relations/public perception issues associated with accidental spills or releases of oils. Deleting prime coat would not remove this liability completely, as there are many other products that contractors routinely handle, including fuel and lubricating oils, which are as much an environmental concern as prime and tack coats. However, prime coat has been successfully deleted with few documented cases of failure directly attributed to deletion of the prime coat. Furthermore, prime is generally applied at higher application rates than tack and can take longer to cure before being covered, increasing the possibility that it would be washed into a waterway. Many local jurisdictions, including cities and counties, are routinely deleting prime coat, often at the request of the contractor. The rationale for deleting prime coat appears to be that the benefits of prime do not outweigh the increased liability associated with handling liquid asphalts.

