

## Asphalt Safety and Best Practices

### Introduction

Asphalt is a strong adhesive used for road paving, roofing tar, roll-roofing, roofing felt, shingles, pipe covering, floor tile, waterproofing, and many other products and processes.

Asphalt is a dark brown or black substance derived from crude oil. It may be a solid, a semi-solid, or a liquid. Other names for asphalt include road tar, road binder, mineral pitch, petroleum pitch, petroleum asphalt, and seal-coating material.

Asphalt is often mistakenly confused with “tar,” “coal tar,” or “pitch” because the appearance is similar and the substances may be used interchangeably in many industrial processes. Tar and pitch are derived from coal products that are both chemically and physically different.

There are two main types of asphalt: straight-run asphalt or asphalt cement and air-blown or oxidized asphalt. Straight-run asphalt is used for paving roads, airport runways, and parking lots. Because of its solid to semi-solid nature, it must first be “cut” with a solvent to bring it to a more liquid state; this is known as cut-back asphalt. Road workers are most likely to use straight-run asphalt. Air-blown asphalt has a high softening point and is used primarily in roofing, pipe covering, and similar situations.

Millions of tons of asphalt are produced and used every year in the paving and roofing industries. Over a half-million workers are exposed to fumes from asphalt. Health effects from exposure to asphalt fumes can include headache, skin rash, sensitization, fatigue, reduced appetite, throat and eye irritation, and cough.

There have been a number of studies conducted to better understand the potential for asphalt fume to cause cancer. To date, these studies have been inconclusive and all seem to call for continued investigation.

Cal/OSHA has adopted a 5 mg/m<sup>3</sup> (petroleum) Permissible Exposure Limit (PEL) for Asphalt Fume in [Table AC-1 of Cal/OSHA code 5155](#). This means that a total particulate sample is taken and if it is near the 5 mg/m<sup>3</sup> standard the lab would do a solvent extraction of the sample to see how much of the weight was actually due to Asphalt Fume. If that extraction were to weigh over the 5 mg/m<sup>3</sup> PEL there would be an overexposure. In addition, exposures to various chemical components of asphalt fumes are addressed in specific standards for general industry and or construction.



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## **Hazards**

There are two main hazards associated with asphalt:

- Fire and explosion hazards, and
- Health hazards associated with skin contact, eye contact, and/or inhalation of fumes and vapors

## **Fire Prevention and Control**

Since asphalt products are often stored and handled at elevated temperatures, fire prevention is extremely important.

One of the greatest hazards in handling hot asphalt is exposure to a source of ignition. Sparks, electricity, open flames, incandescent material (lighted cigarette), or other possible ignition sources should be prohibited or otherwise strictly controlled in the vicinity of asphalt operations.

## **Distributors**

Asphalt that is applied while at temperatures above flash point is especially vulnerable to combustion. For example, applying a prime coat with a distributor involves using cutback asphalt heated above its flash point. If a fire is initiated at the spray bar, it may spread through accumulated asphalt deposits on the distributor chassis and destroy the vehicle. Therefore, asphalt distributors should be kept clean and free from asphalt accumulations.

Before spraying begins, the burners must be shut off. If practical, the hot parts of the burner should be permitted to cool.

Exterior parts of the distributor truck exhaust systems should be kept clean by wire brushing to remove debris that could ignite and fall in the path of the spray-bar.

When spraying is in progress, there is always the danger of a fire starting from a cigarette or match thrown down by a passerby. It is advisable to post a warning with the traffic signs indicating roadwork ahead and that spraying operations are underway.

A distributor spray-bar fire can be put out quickly if dealt with in the early stages. The spray-bar must be shut off at the earliest possible moment by closing the spray valve, or, if necessary, by stopping the pump.

To help ensure success, the distributor crew should be trained to put out this kind of fire. Dry chemical or carbon dioxide extinguishers should be stored in the cleanest place on



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the vehicle, preferably in the cab. A second extinguisher should also be available in case the first fails to operate.

Asphalt will support combustion if overheated in the presence of an adequate air (oxygen) supply. Some asphalt cements and air-blown asphalts are not combustible until heated above 450 °F (232 °C).

The combustibility of asphalt varies with the type and amount of solvent. Therefore, rapid-curing cut-backs are the most susceptible to combustion because their solvents have flash points near those of gasoline and naphtha. Medium-curing cutbacks contain solvent with a flash point near that of kerosene. Slow-curing cut-backs contain oil of lower volatility and higher flash point as a solvent, and therefore these cutbacks are the least susceptible to combustion.

Asphalt cements and oxidized asphalts require heating to high temperatures for transfer and application. The resultant high temperature materials can cause severe burns, and precautions are necessary to prevent injury. Emulsified and cut-back asphalts may also be heated sufficiently to cause severe burns on contact.

### **Personal Protective Equipment**

Cal/OSHA requires employers to use personal protective equipment (PPE) to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective. Employers are required to determine all exposures to hazards in their workplace and determine if PPE should be used to protect their workers. If PPE is to be used to reduce the exposure of employees to hazards, according to [Cal/OSHA Code 3380](#), a written PPE/workplace hazard assessment certification program must be developed and maintained. This program should include the following:

- The identification and evaluation of hazards in the workplace
- Logic as to if the use of PPE is an appropriate
- How PPE is selected, maintained, and its use evaluated
- Training of employees using the PPE
- Vigilance of the program to determine its effectiveness in preventing employee injury or illness.

PPE is necessary to protect workers from asphalt burns and irritation. In addition, many of the solvents used to cut asphalt can be absorbed through unprotected skin into the bloodstream, where they can travel throughout the body and cause damage to many different organs.



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PPE recommended when handling heated asphalt:

- Chemical goggles and an 8 inch (200 mm) minimum sized face shield.
- Loose clothing in good condition with collars closed and cuffs buttoned at the wrist.
- Thermally insulated gloves with gauntlets that extend up the arm and worn loosely so that they can easily be flipped off if covered with hot asphalt.
- Boots with tops at least 6 inches (150 mm) high and laced without openings.
- Pants without cuffs which extend over the tops of the boots.
- Safety shoes at least 6 inches (150 mm) high and laced.
- Barrier creams and lotions leave a thin film on skin and act as a barrier against skin irritants worn with protective clothing.
- Long handled sprayers with flexible hoses should be used when emulsified asphalts are applied by hand for tack coats, or when cut-back asphalts are applied by hand for prime coats.

### **First Aid**

Whenever a person is injured from exposure to asphalt fumes, cold asphalt, or hot asphalt, obtain first aid/medical attention immediately. To prevent the possibility of future medical complications, have the victim examined by a physician even if the injury does not appear to be serious.

### **Asphalt Fumes**

- Move victim to fresh air.
- Administer oxygen if breathing is difficult.
- Start artificial respiration if breathing stops.
- Have victim examined by a physician.

### **Cold Asphalt**

- Remove cold asphalt from skin with waterless hand cleaner [warm mineral oil 110 °F (43 °C) can also be used].
- Wash skin thoroughly with soap and water.
- Remove contaminated clothing and shower victim at once.
- Flush out contaminants from eyes for at least 5 minutes with water, lifting upper and lower eyelids occasionally.
- Have victim examined by a physician.



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## **Hot Asphalt**

- Apply cold water or ice pack to asphalt skin burns.
- If burns cover more than 10 percent of body (about equal to surface of one arm or one half a leg) apply lukewarm water, or warmer if needed to alleviate pain, but heat in the asphalt must be removed as rapidly as possible.
- Do not remove asphalt from skin.
- Do not bandage burn.
- Have victim examined by a physician.

## **Safe Work Procedures**

### **Training**

All workers who can be exposed to asphalt fumes should be trained about hazards and safe work procedures. This training should include specific information about the solvents used in mixing the asphalt.

Safety Data Sheets (SDS) should be made available to each employee assigned to work with or near asphalt processes. The SDS should include specific information on the solvents present in the asphalt mix and should list all pertinent information including flashpoint, boiling point, acute and chronic effects of all chemical ingredients in the solution, recommended PPE, as well as other fire and emergency cleanup information.

### **Engineering Controls**

#### **Substitution**

The best method of controlling exposure to asphalt fumes and solvent vapors is to substitute a safer asphalt mix. If explosion hazards are a problem in a paving operation, Medium Cure (MC)-250 may be substituted for Rapid Cure (RC)-250. The flashpoint of the mix is nearly doubled, which means that the mix is less likely to ignite.

If the toxicity of the chemical is a problem, the employer may be able to order an asphalt mixture which contains a less toxic solvent (for example, using toluene instead of benzene).

#### **Enclosure**

Enclosing the process where the asphalt is used is not possible in road paving and roofing operations. It may, however, be possible for smaller operations such as pipe covering processes.



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## **Mechanization and Automation**

Certain parts of asphalt processes may be mechanized. For example, stirring asphalt in a tar kettle exposes the worker to asphalt fumes, solvent vapors, and potentially severe burns; mechanical devices can accomplish this task without exposing the employee to such risks.

## **Local Exhaust Ventilation**

Local exhaust ventilation may be an effective way to control worker exposure to fumes and vapors, particularly in areas where enclosure of the operation is impossible.

## **General Dilution Ventilation**

General dilution ventilation involves flooding a work area with uncontaminated air in an attempt to remove contaminants from the worker's breathing zone. The use of fans and blowers set up for this purpose, however, is often not adequate to remove the contaminants. This is generally not the most effective way of removing contaminants from the worker's breathing zone, but may be used to supplement local exhaust ventilation.

## **Respiratory Protection**

While engineering controls are the preferred method for controlling worker exposure to fumes and vapors, respirators should be worn where this is not possible. In selecting the proper respirator, it is important to know all of the hazards to which workers may be exposed. A NIOSH-approved dust respirator will control exposure to asphalt fumes, but will do nothing to protect the worker against exposure to the toxic vapors given off by the solvent in the mix. In situations where vapors are concerned, the minimum requirement would be for a full-face mask respirator with organic vapor and particulate cartridges. Because of the possibility of eye irritation, a half face mask respirator would be inadequate.

## **Improper Use of Respirators is Dangerous**

The employer must have a written respirator program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in [Cal/OSHA code 5144](#).

## **Asphalt Safety Reminders**

- When working with any asphaltic material, avoid prolonged contact of the material with skin.
- Excessive breathing of asphalt materials should be avoided.
- Wear PPE (heavy work gloves, old clothing, protective shoe, etc.) to protect against asphalt spatters.



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- When chipping or chiseling old blacktop, wear eye protection. Also, don't chisel with a carpenter's hammer, because it isn't designed for this type of job and may chip; use a hand-drilling hammer or machinist's hammer.
- Keep all asphalt materials away from high heat. Keep solvent-thinned materials away from open flames.
- Close containers after each use.
- Always follow the manufacturer's instructions for the product being used.

Note: This Safety Guideline was published with information from the Jebro Incorporated, National Asphalt Pavement Association, Centers for Disease Control, Occupational Health and Safety Administration, Cal/OSHA, and the Texas Department of Insurance.