



MEMORANDUM ON THE DISCONTINUATION OF THE USE OF COAL TAR IN ROAD CONSTRUCTION

BACKGROUND

With South Africa's reintegration into the world community during the 1990's, the development of the law relating to health, safety and the environment in South Africa has been influenced by law in foreign jurisdictions and international legal standards.

In the development of environmental law locally and internationally certain policy considerations have emerged. Central to these policies and principles is the understanding that we live in a finite world with limited resources, which must therefore be managed as judiciously as possible.

Included amongst the policies and principles are the following:

- Sustainable development is the underlying principle of environmental management;
- The precautionary principle is the basis for a conservative approach to the regulation of adverse impacts. In terms of this principle, if the impact of specific action is not clearly understood, then these actions should not be undertaken;
- Adverse environmental impacts should be dealt with proactively by avoiding them or, where this is not possible, by limiting them;
- A partnership exists between the State, the public and industry to achieve sound environmental management.

Although there are a number of specific acts and regulations dealing with particular resources the **Constitution of the Republic of South Africa Act 108 of 1996** contains overriding principles for environmental management.

The South African Constitution

The Constitution is the supreme law of the country and, as such, all other legislation that is inconsistent, can be declared invalid. Chapter 2 contains a Bill of Rights containing 25 fundamental rights that the State has undertaken to guarantee and protect and an infringement of these rights may result in civil damages claims.

Environmental Right (Section 24)

"Everyone has the right-

- (a) to an environmental **that is not harmful to their health or well-being**; and*

(b) to have **the environment protected**, for the benefit of present and future generations, through reasonable legislative and other measures that -

- (i) prevent pollution and ecological degradation;
- (ii) promote conservation; and
- (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

The Constitution provides that in interpreting the provisions of the Bill of Rights, a court of law must have regard to public international law and may also have regard to comparable foreign case law (s39). **This is a clear mandate to the courts and to government to ensure that environmental and safety policies are kept in line with international standards and norms.**

Specific Legal Duties

In addition to the general legal principles, particular duties are set out in specific acts, which are designed to address problems of community health and safety and to protect communal resources of air, land and water. They do so by prohibiting and **criminalising** particular activities and by imposing standards that must be complied with.

Occupational Health and Safety Act 85 of 1993

The Occupational Health and Safety Act (OHSA) focuses on health and safety aspects of employees in the workplace. Penalties in terms of the Act will apply to any employer who is guilty of:

- The failure to provide a safer and healthy workplace environment for employees (s8);
- The failure to ensure that people, including members of the public who may be directly affected by workplace activities, are not exposed to hazards (s9);

From the above it is clear that providing site conditions that are safe to workers and do not incorporate processes that are harmful to the environment is no longer a choice – it is an obligation.

PRODUCT DESCRIPTION

Road bitumen

In South Africa bitumens are obtained from the distillation of crude petroleum oil imported to meet the country's liquid fuel energy demands. At ambient temperatures bitumen is non-toxic, non-volatile and resistant to water and weathering, flexible, generally odourless and serves as a good insulator and adhesive.

Bitumens are complex mixtures containing a large number of chemical components of relatively high molecular weight, typically 82-85% combined carbon, 12-15% hydrogen, 2-8% sulphur, 0-3% nitrogen and 0-2% oxygen.

Bitumen also contains polycyclic aromatic hydrocarbons (PAHs). PAHs occur in crude oils but are present in lesser quantities in bitumens due to the refinery process used to manufacture bitumens, such as vacuum distillation, which removes the majority of components with low molecular weights and boiling points, including PAHs with three to seven fused rings.

Coal Tar

Coal tar is a condensation by-product obtained from the pyrolysis of coal. Coal tars are usually viscous liquids or semisolids, black or almost black in colour, with a characteristic naphthalene-like odour.

In general, coal tars are complex combinations of hydrocarbons, phenols and heterocyclic oxygen, sulphur and nitrogen compounds. Over 400 compounds have been identified in coal tars and as many as 10 000 are actually present. The composition and properties of coal tar products depend mainly on the temperature of carbonisation and, to a lesser extent, on the nature of the coal used as feedstock. The relative proportions of the major components found in coal tars therefore differ quite considerably in tars produced by low-temperature processes compared with those produced by high-temperature processes.

Coal tars also contain PAHs. The concentration of carcinogenic PAHs ***found in both low and high-temperature coal tar products is significantly higher than bitumens. As a result the carcinogenic potential of coal tars is well recognised and widely accepted since 1985 by the International Agency for Research on Cancer (IARC).***

Coal tars are soluble in benzene and nitrobenzene, partially soluble in acetone, chloroform, carbon disulphide, dimethyl ether, ethanol, methanol, petroleum ether and sodium hydroxide solution ***and slightly soluble in water.***

HEALTH HAZARDS

The health hazards associated with the production and use of bitumen and coal tar products are well documented and fall into the broad categories of *acute* and *chronic* hazards. Acute hazards are associated with single or infrequent episodes or exposure. Chronic hazards refer to regular, repeated or ongoing exposure events. These hazards are associated with:

- High handling temperatures;
- Combustible nature of the product;
- Fume emissions generated on heating;
- Persistent skin contact, particularly when in solution.

While the acute hazards associated with both bitumen and coal tar comprise mainly skin burns, the chronic hazards associate with these materials are distinct.

Chronic hazards

Chronic hazards are associated with repeated exposure to the fumes generated when bitumen and coal tar products are heated or when bitumen is mixed with additive substances. The major focus of chronic toxicity studies has been to assess the carcinogenic potential of bitumen and coal tar fumes.

Some of the four to six ring polycyclic aromatic hydrocarbon (PAH) compounds have been shown to exhibit carcinogenic potential in animal skin painting studies. Below is a list of the PAHs found in bitumen and tar that have been evaluated by the IARC.

- Benz [a] anthracene (2A, probably carcinogenic to humans. IARC. A2, suspected human carcinogen, American Conference of Government Industrial Hygienist).
 - Bitumen 0,15 - 35 ppm
 - Coal tar pitch 8 900 - 12 500 ppm
- Benzo [a] pyrene (2A, probably carcinogenic to humans, IARC)
 - Bitumen 0,1 - 27 ppm
 - Coal tar pitch 8 400 - 12 500 ppm
- Benzo [k] fluoranthene (2B, possibly carcinogenic to humans, IARC)
 - Bitumen Not detectable - present in small amounts
 - Coal tar pitch 7 100 - 9 000 ppm

Indeno (1,2,3 - cd) pyrene (2B, possibly carcinogenic to humans, IARC)

- Bitumen Trace amounts - 1,0 ppm
- Coal tar pitch 7 300 - 9 300 ppm

- Chrysene (A2, suspected human carcinogen. American Conference of Government Industrial Hygienists)
- Bitumen 0,04 - 34 ppm
- Coal tar pitch 7 400 - 10 000 ppm

The differences in concentrations of PAHs between bitumens and coal tars are of significance as the concentration of carcinogenic PAHs found in coal tar pitch fumes are **several orders of magnitude** greater than those found in bitumen fumes.

Substantial PAH concentrations may however develop during spraying operations with coal tar in view of its significantly higher aromaticity. Many researchers believe that this accounts for the strong evidence of carcinogenicity in coal tars versus the limited evidence for bitumens.

To date, experimental and epidemiological evidence on the link between cancer and bitumen exposure is inadequate to classify bitumen fumes on their own as carcinogenic to humans. They can nonetheless cause irritation to the respiratory system that may result in chronic bronchitis.

The carcinogenic potential of coal tar fumes is, however, well recognised and has been widely accepted.

ENVIRONMENTAL IMPACTS

The chemical composition of bitumen and coal tar themselves as well as the processes involved in their production and application have the potential to impact on the biophysical environment. The impacts associated with leachate, and ecotoxicology are differentiated and discussed below.

Leachate

The potential threats to surface water, ground water and soil are associated with the long-term environmental effects caused by the gradual release of leachates consisting of volatile compounds, produced by leaching of components by rain water and losses caused by vehicle tyre abrasion.

The leachability of bitumen, in particular PAHs, is very low. The threat posed by leachate contamination of surface and ground water supplies is therefore low. ***The widespread use of bitumen products as liners in dams and water reservoirs is indicative of the low pollution risk associated with bitumen at ambient temperatures.***

Due to the high molecular weight of the hydrocarbons present in penetration grade bitumen, bioaccumulation is also unlikely. Due to their low bio-availability, the components of bitumen are not biodegraded to any significant extent in the environment and therefore do not pose a serious threat as potential contaminants.

The leachability of coal tar products is higher than that of bitumen. The potential threat posed by coal tar products to surface and ground water suppliers is also higher due to the fact that coal tars contain compounds of substantially lower molecular weight than bitumen and many of the products are liquid at ambient temperatures.

PAHs, such as phenols and other aromatic compounds present in coal tars do have the potential to contaminate the soil and ground water. Instances where contamination has taken place have been reported from wood preservation activities employing creosote. Effluent from coking operations also contains phenols and cyanide that pose a threat to the environment.

Ecotoxicology

While there is limited information on the ecotoxicology of bitumen and coal tar products, an assessment can be made based on the physico-chemical properties of the constituents of these products.

Bitumen contains hydrocarbon components in the molecular weight range of 500 to 1500. Since water solubility is low, significant migration of the material into water is improbable. As such, concentrations which are acutely toxic to aquatic organisms are unlikely to occur and significant bioaccumulation is also unlikely, due to the high molecular weight of the hydrocarbons. In the light of their low bio-availability, the components of bitumen are not expected to biodegrade to any significant extent in the environment.

Coal tar products, on the other hand, are far more aromatic than bitumen and contain compounds of substantially lower molecular weight. As such, they are more soluble in water and are **likely to pose a greater toxic threat to aquatic organisms**. A number of coal tar products are also liquid at ambient temperatures which increase the risk of contamination.

USER GUIDELINES

In terms of the General Administrative Regulations promulgated under the Occupational Health and Safety Act, a Material Safety Data Sheet (MSDS) should be provided by a manufacturer, seller, importer or supplier or any hazardous chemical substance to the receiving party.

A MSDS enables suppliers to provide users with information on various aspects of a chemical product concerning safety, health and environmental protection.

In terms of ISO 11014-1:1994(E) and European Commission Directive 91/155/EEC, the MSDS should provide relevant information on the chemical product under 16 standard headings:

1. Product and company identification
2. Composition/information on ingredients
3. Hazard identification
4. First aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal information
14. Transport information
15. Regulatory information
16. Other information

If certain information is not available, then it should be clearly stated why this is the case. No blanks should be left. The names of the chemical product as displayed on the label should appear on each page of the MSDS, together with the latest revision date.

Typical MSDSs for both penetration grade bitumen and coal tar products are given in Appendix A. The carcinogenicity and toxic nature of coal tar products is evident in the sections of "hazard identification".

APPLICATION OF ALTERNATIVE PRODUCTS

The domain of coal tar products in road construction is largely limited to prime coats and precoating of aggregates for seal coats and texturing of hot mix asphalt. Alternative products readily available are:

- MC30 cutback bitumen and inverted emulsions for prime coats; and
- Bitumen based precoating fluids for precoating of aggregates.

Comparisons of the costs of alternative products would of course depend on the location of the site and application rates adopted. A preliminary study indicates that the cost differences are marginal and, seen as a proportion of the total surfacing cost, minimal.

According to preliminary and general investigations in the Gauteng region it seems that using bitumen precoating fluid could add about 10c/m² to the total price of the surfacing. The application of fog sprays of diluted emulsion could also be considered as a cost-effective alternative to precoating. For prime coats, using invert emulsions could add 4c/m² whereas the application of a MC30 could be cheaper by some 30c/ m².

It is therefore evident that the use of safer and environmentally less harmful products is eminently affordable, or could lead to more cost effective processes.

EFFECT ON COAL TAR INDUSTRY

As Sabita does not represent producers of coal tar it is not possible to offer a comprehensive study of the effects of non use of coal tar in the road industry on these producers. The following information is however germane to the issue and is presented for the reader to assess the impact:

1. Currently it is estimated that the annual volumes of coal tar constitutes at most about 5% of the total binder market in South Africa.
2. Tar has many alternative uses, notably as an electrode binder in the steel beneficiation/alloy manufacturing processes as well as a furnace fuel.
3. The marginal nature of the road market to one manufacturer (ISCOR) was demonstrated during a workshop session at the 6th Conference on Asphalt Pavements for Southern Africa held in 2004 when a representative of that firm indicated that they were quite willing, in the interests of health and safety of workers, to exploit the conventional markets, such as given in 2 above and withdrawing from the road market.

SUMMARY AND CONCLUSIONS

1. As a result of experimental and epidemiological studies, coal tar pitch volatiles as benzene soluble substances are classified as A1 substances by the American Conference of Government Industrial Hygienist (ACGIH).
(A1: Confirmed Human Carcinogens. Substance or substances associated with industrial processes, recognised to have carcinogenic potential.)
2. Based on the findings of various studies the International Agency for Research on Cancer (IARC), evaluation of bitumens and coal tars is as follows:
 - a. There is ***inadequate*** evidence that bitumens alone are carcinogenic to humans;
 - b. Coal tars and coal tar pitches are ***causally associated with cancer*** in humans.
3. Environmentally, due to the presence of relatively high proportions of PAHs such as phenols and other aromatic compounds, tars do have the potential to contaminate the soil and ground water and poses a greater toxic threat to aquatic organisms.
4. Continued use of coal tar products flies in the face of global best practice and may be deemed to constitute an infringement of the laws of the country and could lead to prosecution. And, as nothing of substance stands in the way of proceeding with alternative products to coal tar in road construction, road owners should consider doing so as an obligation to society.

PA Myburgh
Executive Director

28 March 2005

TYPICAL MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

No: 1
Date Issued: 15/02/1999
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COMPANY DETAILS

Name:	Sasol Carbo-Tar	Tel:	+27 (0) 16 960 9111
Address:	P O Box 1; Sasolburg; 9570	Emergency no.:	+27 (0) 16 960 3440
	Republic of South Africa	Fax:	+27 (0) 16 960 3922

STONEKOTE

1. Product identification

Trade name: Stonekote
Chemical family: Coal tar distillate
Chemical name: Coal tar distillate
Synonyms: Road primer

Chemical Abstract no.: 8001-58-9
NIOSH no.: *Not available*
Hazchem code: 3W
UN no.: 2810

2. Composition

Hazardous components: Tar acids(25 % max by volume)
EEC classification: *Not available*
R Phrases: R11 / 20 / 22 / 44 / 45.1 / 46-49

3. Hazard identification

Main hazard: Flammable
Flammability: Flammable
Chemical hazard: Gives off toxic or irritant fumes in a fire – keep upwind. Can react with oxidizing agents. Can form explosive mixture with air. Harmful vapour/fumes.
Health effects: Eyes: Will be irritating
Skin: Reddening and itching of skin. Readily absorbed. Heated material will cause thermal burns. Can cause phototoxic reaction in sunlight.
Ingestion: Causes salivation, vomiting, respiratory difficulties, headache and mild convulsions. Prolonged and/or repeated exposure may result in weakness, lack of coordination, circulatory collapse, coma and possible death.
Carcinogenicity: Creosote has been shown to be carcinogenic in experimental animals.

4. First aid measures

Product in eye: Wash with plenty of water for at least 15 minutes (remove contact lenses).
Product on skin: Remove contaminated clothing immediately and drench affected skin with plenty of water. Wash with soap and water.
Product ingested: Give 250 ml of bland fluid (milk or water) to drink. If unconscious, keep warm. Get medical help. **Do not induce vomiting or give anything by mouth to an unconscious person.**
Product inhaled: Keep patient warm and administer oxygen. Administer artificial respiration if person stops breathing.

5. Fire fighting measures

Fire fighting media: CO₂, foam, dry chemical
Special hazards: Gives off toxic or irritating fumes in a fire – keep upwind. Can form explosive mixture with air. Beware of re-ignition. Keep container(s) cool with water.
Protective clothing: Chemical protection suit, including breathing apparatus.

6. Accidental release measures

Personal precautions: Wear protective clothing, keep upwind.
Environmental precautions: Prevent substance entering watercourses and sewers.
Small spills: Absorb spillage in earth or sand. Use flameproof equipment at incident site. Stop leaks if without risk. Wash spillage site thoroughly with water and detergent.
Large spills: Absorb spillage in earth or sand. Use flameproof equipment at incident site. Stop leaks if without risk. Wash spillage site thoroughly with water and detergent. Dike far ahead of liquid spill for later disposal.

7. Handling and storage

Suitable material: Mild steel tanks or drums. Store in area that is adequately ventilated.
Handling/Storage precautions: Products should be stored in covered or closed containers in areas that are adequately ventilated. Storage conditions must be controlled to prevent overheating and pressure build-up in containers. No ignition sources. Use non sparking handtools. Do not use compressed air for load transfer. Static electricity dangers will be present during emergency load transfer. Samplers should wear goggles, face mask, protective gloves and overalls when handling the product

8. Exposure controls/Personal protection

9. Physical and chemical properties

Appearance: Black liquid
Odour: Typical tar odor (Strong odour)
pH: Not applicable
Boiling point: Distillation range (101.3 kPa): 200 – >420°C
Melting point: *Not available*
Flash point: 90 °C min (c.c.)
Flammability: Flammable
Autoflammability: *Not available*
Explosive properties: *Not available*
Oxidizing properties: Non oxidizing
Vapour pressure: 1 mm Hg at 30 °C (estimated)
Density: 1.04 kg/l
Solubility – Water: Insoluble

10. Stability and reactivity

Conditions to avoid: Overheating, sparks, open flame.
Incompatible materials: Strong oxidizers. Incompatible with sulfuric acid, nitric acid, caustic, aliphatic amines and amides.
Hazardous decomposition products: Carbon oxides. Hazardous polymerization will not occur.

11. Toxicological information

Acute toxicity: Exposure to high concentrations of vapour may cause nausea and headaches. Ingestion: Grade 2 poison: LD50 = 0.5 to 5 g/kg body mass.
Skin and eye contact: Skin irritant: May cause pain and second degree burns after long contact.
Chronic toxicity: May lead to damage of internal organs.
Carcinogenicity: Possible human carcinogen. IARC group 2 carcinogen.

12. Ecological information

Aquatic toxicity – Fish: Brahydanio rerio: LC50 (40 hrs) = 5.2 mg/l.
Aquatic toxicity – Daphnia: Daphnia magna: EC50 (40 hrs) = 4.3 mg/l.
Aquatic toxicity – Algae: *Not available*
Biodegradability: *Not available*
Bio – accumulation: None
Mobility: *Not available*
German wqk: *Not available*

13. Disposal considerations

Disposal methods: Stonekote may be disposed of in sealed containers in a secure sanitary landfill or in approved incinerators.
Disposal of packaging: As for Stonekote.

14. Transport information

UN no.:	2810
Substance identity no.:	2810
ADR/RID class:	3
ADR/RID item no.:	3° (b)
ADR/RID hazard identity no.:	33
IMDG – Shipping name:	Coal tar distillates, flammable
IMDG – Class:	3.3
IMDG – Packaging group:	III
IMDG – Marine pollutant:	yes
IMDG – EMS no.:	3-07
IMDG – MFAG table no.:	310
IATA – Shipping name:	<i>Not available</i>
IATA – Class:	<i>Not available</i>
IATA – Subsidiary risk(s):	<i>Not available</i>
ADNR – Class:	<i>Not available</i>
UK – description:	<i>Not available</i>
UK – Emergency action class:	<i>Not available</i>
UK – Classification:	<i>Not available</i>
Tremcard no.:	<i>Not available</i>

15. Regulatory information

EEC hazard classification: *Not available*
Risk phases: R11 / 20 / 22 / 44 / 45.1 / 46-49

Occupational exposure limits: 0.2 mg/m³ averaged over 8 hour shift work. NIOSH recommended limit: 0.1 mg/m³ TLV-TWA.

Engineering control measures: Enclose operations and/or provide local exhaust ventilation at the site of release. Where possible, pump directly from storage container to process containers. Personal protection – Respiratory: Not necessary under normal conditions. Airline respirator if TLV exceeds. Personal protection – Hand: PVC gloves. Personal protection – Eye: Industrial safety glasses with side shield, safety goggles or face shield if splashing is possible. Personal protection – Skin: Overalls or PVC apron. Protective creams can be worn. Other protection: A high standard of personal hygiene is essential. Hands should be washed before smoking, eating, drinking or using the toilet.

Safety phases: S3,7,9 / 20,21 / 36-39 / 43.8 / 44 / 56

National legislation: *Not available*

16. Other information

Product is stable

Although all possible care is taken to ensure the correctness of the information supplied in this MSDS, the information is supplied as is, without any warranty and Sasol Carbo-Tar cannot be held responsible for any injuries or other incidents that may result from use or misuse of this information.

No: 1

Date Issued: 15/02/1999

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MATERIAL SAFETY DATA SHEET

COMPANY DETAILS

<u>Name:</u>	Sasol Carbo-Tar	<u>Tel:</u>	+27 (0) 16 960 9111
<u>Address:</u>	P O Box 1; Sasolburg; 9570 Republic of South Africa	<u>Emergency no.:</u>	+27 (0) 16 960 3440
		<u>Fax:</u>	+27 (0) 16 960 3922

RTL 3/12

1. Product identification

Trade name: RTL 3/12
Chemical family: Coal tar distillate
Chemical name: Coal tar distillate
Synonyms: Road tar primer

Chemical Abstract no.: N/A
NIOSH no.: *Not available*
Hazchem code: 2W
UN no.: 1999

2. Composition

Hazardous components: Coal tar Pitch (Benzo[α]pyrene (BaP)) (CAS 65996-93-2), Coal tar naphta (64741-41-9)
EEC classification: Carcinogenic category 2
R Phrases: R11 / 20 / 22 / 44 / 45.1 / 46-49

3. Hazard identification

Main hazard: Flammable liquid
Flammability: Flammable
Chemical hazard: Gives off toxic or irritant fumes in a fire – keep upwind. Can react with oxidizing agents. Can form explosive mixture with air. Harmful vapour/fumes.
Health effects: Eyes: Will be irritating.
Health effects: Skin: Reddening and itching of skin. Readily absorbed. Heated material will cause thermal burns. Can cause phototoxic reaction in sunlight.
Health effects: Ingestion: Causes salivation, vomiting, respiratory difficulties, headache and mild convulsions.
Carcinogenicity: Overall IARC evaluation of carcinogenic risk: Group 1 (causally associated with cancer in humans). (3)ACGIH has classified coal tar pitch as a confirmed human carcinogen (A1). The U.S. National Toxicology Program (NTP) identifies this chemical as a known carcinogen.

4. First aid measures

Product in eye: Wash with plenty of water for at least 15 minutes (remove contact lenses).
Product on skin: Remove contaminated clothing immediately and drench affected skin with plenty of water. Wash with soap and water.
Product ingested: Give 250 ml of bland fluid (milk or water) to drink. If unconscious, keep warm. Get medical help. **Do not induce vomiting or give anything by mouth to an unconscious person.**
Product inhaled: Move to fresh air. Keep patient warm and administer oxygen. Administer artificial respiration if person stops breathing.

5. Fire fighting measures

Fire fighting media: CO₂, foam, dry chemical
Special hazards: Gives off toxic or irritating fumes in a fire – keep upwind. Can form explosive mixture with air. Beware of re-ignition. Keep container(s) cool with water.
Protective clothing: Chemical protection suit, including breathing apparatus.

6. Accidental release measures

Personal precautions: Wear protective clothing, keep upwind.
Environmental precautions: Prevent substance entering watercourses and sewers.
Small spills: Absorb spillage in earth or sand. Use flameproof equipment at incident site. Stop leaks if without risk. Wash spillage site thoroughly with water and detergent.
Large spills: Absorb spillage in earth or sand. Use flameproof equipment at incident site. Stop leaks if without risk. Wash spillage site thoroughly with water and detergent.

7. Handling and storage

9. Physical and chemical properties

Appearance: Black viscous liquid
Odour: Typical tar odor (Strong odour)
pH: Not applicable
Boiling point: Distillation range (101.3 kPa): 200 - >400°C
Melting point: *Not available*
Flash point: 70 °C min (c.c.)
Flammability: Flammable
Autoflammability: *Not available*
Explosive properties: *Not available*
Oxidizing properties: Non oxidizing
Vapour pressure: Not applicable
Density: 1.05 kg/l
Solubility – Water: Insoluble

10. Stability and reactivity

Conditions to avoid: Overheating, sparks, open flame.
Incompatible materials: Strong oxidizers. Incompatible with sulfuric acid, nitric acid, caustic, aliphatic amines and amides.
Hazardous decomposition products: Carbon oxides. Hazardous polymerization will not occur.

11. Toxicological information

Acute toxicity: Exposure to high concentrations of vapour may cause nausea and headaches. Ingestion: Grade 2 poison: LD50 = 0.5 to 5 g/kg body mass.
Skin and eye contact: Skin irritant: May cause pain and second degree burns after long contact.
Chronic toxicity: May lead to damage of internal organs.
Carcinogenicity: Designation A1. Confirmed human carcinogen.

12. Ecological information

Aquatic toxicity – Fish: Brahydanio rerio: LC50 (40 hrs) = 5.2 mg/l.
Aquatic toxicity – Daphnia: Daphnia magna: EC50 (40 hrs) = 4.3 mg/l.
Aquatic toxicity – Algae: *Not available*
Biodegradability: *Not available*
Bio – accumulation: None
Mobility: *Not available*
German wgk: *Not available*

13. Disposal considerations

Disposal methods: RTL 3/12 may be disposed of in sealed containers in a secure sanitary landfill or in approved incinerators.
Disposal of packaging: As for RTL 3/12.

14. Transport information

UN no.: 1999
Substance identity no.: 1999
ADR/RID class: 3
ADR/RID item no.: 5° (b),(c)
ADR/RID hazard identity no.: 33
IMDG – Shipping name: Tars, liquid
IMDG – Class: 3.3
IMDG – Packaging group: III
IMDG – Marine pollutant: *Not available*

Suitable material: Mild steel tanks/drums. Store in adequately ventilated area.
Handling/Storage precautions: Products should be stored in covered or closed containers in areas that are adequately ventilated. Storage conditions must be controlled to prevent overheating and pressure build-up in containers. No ignition sources. Use non sparking handtools. Do not use compressed air for load transfer. Static electricity dangers will be present during emergency load transfer. Samplers should wear goggles, face mask, protective gloves and overalls when handling the product

IMDG – EMS no.:	3-05
IMDG – MFAG table no.:	311
IATA – Shipping name:	Not available
IATA – Class:	Not available
IATA – Subsidiary risk(s):	Not available
ADNR – Class:	Not available
UK – description:	Tars, liquid
UK – Emergency action class:	3W
UK – Classification:	3
Tremcard no.:	786/30G37

8. Exposure controls/Personal protection

Occupational exposure limits: BaP: TLV-TWA: 0.2 mg/m³ over 8 hour shift. For naphtha (benzene) the following limits are given: 10 ppm (32 mg/m³) TLV (ACGIH); 1 ppm PEL, 5 ppm STEL (OSHA); 0.1 ppm TWA, 1 ppm STEL (NIOSH)

Engineering control measures: Enclose operations and/or provide local exhaust ventilation at the site of release. Where possible, pump directly from storage container to process containers.

Personal protection – Respiratory: Not necessary under normal conditions. Airline respirator if TLV exceeds.

Personal protection – Hand: PVC gloves.

Personal protection – Eye: Industrial safety glasses with side shield, safety goggles or face shield if splashing is possible.

Personal protection – Skin: Overalls or PVC apron. Protective creams can be worn.

Other protection: A high standard of personal hygiene is essential. Hands should be washed before smoking, eating, drinking or using the toilet.

15. Regulatory information

EEC hazard classification: Carcinogenic category 2 [Carc.cat.2]

Risk phases: R11 / 20 / 22 / 44 / 45.1 / 46-49

Safety phases: S3,7,9 / 20,21 / 36-39 / 43.8 / 44 / 56

National legislation: Not available

16. Other information

Product is stable

Although all possible care is taken to ensure the correctness of the information supplied in this MSDS, the information is supplied as is, without any warranty and Sasol Carbo-Tar cannot be held responsible for any injuries or other incidents that may result from use or misuse of this information.

Date of Issue: 20th August 2004

1. Identification of the Substance / Preparation and Company

Product name: Mexphalte 60/70

Product type: Paving grade bitumen

.03.SIP4001

Main uses: Paving Grade Bitumen for road paving

SUPPLIER:

Name & Address: Shell South Africa Marketing (Pty) Limited

PO box 2231

Cape Town 8000

Telephone, Telefax & Contact name: 083-629 0526, 031-764 6208, Bob Hornsey

EMERGENCY TELEPHONE NUMBER: 0800 147 112 or 0800 114 445

2. Composition / Information on Ingredients

Bitumens and Vacuum Residues - Complex combinations of high molecular weight organic compounds, mainly hydrocarbons, which are obtained by processing residue streams from the refining of petroleum crude oils.

02.01.SIP4003

3. Hazards Identification

Human Health hazards

Molten product adheres to the skin and causes burns.

03.01.100

Prolonged exposure to vapour concentrations above the recommended exposure standard may cause irritation of the skin, eyes and upper respiratory tract.

03.01.SIP4002

Hydrogen sulphide may accumulate in the head-space of containers filled with heated product

03.01.018A

Physical and Chemical hazards

Contact of hot bitumens with water leads to violent expansion and high potential for 'boil-over'.

03.02.SIP4001

Not classified as flammable, but will burn.

03.02.036

Not classified as dangerous under EC criteria

03.01.099

4. First-Aid Measures

Inhalation

Remove to fresh air.

04.03.002

Prolonged exposure to vapour concentrations above the recommended occupational exposure standard may cause irritation of the skin, eyes and upper respiratory tract.

04.01.SIP4001

If rapid recovery does not occur, obtain medical attention.

04.03.005

Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconscious

04.01.SIP2002

If breathing has stopped, apply artificial respiration

04.03.003

If breathing but unconscious, place in the recovery position.

04.03.011

If heartbeat absent give external cardiac compression

04.03.012

OBTAIN MEDICAL ATTENTION IMMEDIATELY.

04.03.004

Skin

If molten material should contact the skin and adhere; cool quickly with running water - do not attempt to remove.

04.04.614

During cooling avoid body hypothermia.

All burns should receive medical attention.

In case of a circumferential burn with adhesion of the bitumen, the adhering material should be split to prevent a tourniquet effect as it cools. **04.04.SIP4001**

Contaminated clothing must be laundered before re-use **04.04.016**

Eyes

Immediately irrigate with copious quantity of water for at least 15 minutes. Eyelids to be held open. **04.05.107**

Hot bitumen. Flush with water until the bitumen has cooled. Do not attempt to remove adherent bitumen - refer urgently for specialist medical treatment **04.05.117**

Advice to doctors

Treat symptomatically. **04.07.001**

In the case of burns no attempt should be made to remove firmly adherent bitumen from the skin, it will provide a sterile dressing and detach itself after a few days.

04.07.SIP4001

When it is necessary to remove adhering bitumen from the skin liberal amounts of warm medicinal paraffin can be used. **04.04.SIP4002**

5. Fire-Fighting Measures

Suitable Extinguishing media

Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. **05.02.004**

Unsuitable Extinguishing Media

Do not use water in a jet. **05.05.107**

Specific hazards

Hot bitumen can cause violent eruptions in contact with water, and may splatter hot material. **05.08.SIP4001**

Respiratory problems or nausea by excessive exposure to hot bitumen fumes.

Combustion is likely to give rise to a complex mixture of gases and airborne particulates, including carbon monoxide, oxides of sulphur, and unidentified organic and inorganic compounds **05.01.034**

Keep adjacent drums and tanks cool by spraying with water. **05.08.006**

Fire fighter Protection

Full protective clothing and self-contained breathing apparatus. **05.07.001**

6. Accidental Release Measures

Personal precautions

Do not allow hot material to contact water or other liquids. **06.01.SIP4001**

Shut off leaks, if possible without personal risk. **06.01.015**

Environmental precautions

Prevent from spreading or entering into drains, ditches or rivers by using sand, earth, or other appropriate barriers. **06.03.003**

Clean-up methods

Small spill:

Absorb or contain liquid with sand, earth or spill control material. **06.04.001**

Shovel into a suitable, clearly marked container for disposal or reclamation in accordance with local regulations. **06.04.017**

Large spill:

Prevent from spreading by making a barrier with sand, earth or other containment material. **06.05.008**

Dispose of as for small spills. **06.05.010**

7. Handling and Storage

Avoid handling above 200°C, otherwise the product may form flammable/explosive vapour-air mixtures. **07.01.050**

Handling

Bitumen is handled and stored as a liquid, which means elevated temperatures (>100°C).

Avoid breathing fumes or vapours from heated product. **07.01.SIP4003**

When using do not eat or drink. **07.01.001**

Clean, dry and heat resistant hoses (free of twists, etc.) should be used.

Do not use steam to empty pipelines and hoses.

Do not use solvents to clear obstructions of pipeline.

Gentle heat can be used to clear obstructions.

Storage

Prevent ingress of water. **07.03.057**

Carbonaceous deposits, which maybe pyrophoric, occur on the roofs and walls of heated bitumen tanks. **07.03.SIP4004**

Use lowest practicable storage temperatures and avoid through-draughts of air to minimise risk of generating a flammable condition in the tank space **.03.SIP4005**

Proper ventilation is required (vents should not terminate near windows or air inlet).

Precautions during discharge from bitumen tanks:

Ensure heating coils are always covered with product (minimum 15 cm).

07.03.SIP4003

Maximum temperature during product transfer 200°C

07.05.016

A check should be made to ensure that the receiving tank has sufficient ullage space to accommodate the load.

8. Exposure Controls and Personal Protection

Engineering measures

Bitumen has a low volatility. Fume formation is therefore low.

Exposure to fumes should be minimised.

Exposure Limit Values

In the absence of occupational exposure standards for this product, it is recommended that the following are adopted: **08.02.005**

- Bitumen fumes: 0.5 mg/m³ Benzene Extractable Inhalable Particulate [ACGIH] or 5 mg/m³ Total Particulate Matter [NIOSH].
- Hydrogen Sulphide: 10 ppm [15 mg/ m³] 8 hour time weighted average.

Monitoring procedures for bitumen fumes and hydrogen sulphide can be found on the following web-sites:

- [<http://www.acgih.org>]
- [http://europe.osha.eu.int/good_practice/risks/ds/oel]

Collective protection

Use local exhaust ventilation if there is a risk of inhalation of vapours, mists or aerosols.

08.01.SIP1001

Personal protection

If splashes of hot product are likely to occur use helmet with neck cloth and full face shield. **08.07.SIP4002**

Safety shoes or boots - chemical resistant. **08.07.017**

Respiratory Protection

Not normally required. **08.04.021**

Use approved respiratory protective equipment in spaces where hydrogen sulphide vapours may accumulate.

Hand Protection

Heat resistant gloves, close fitting at wrist. **8.05.SIP4001**

PVC or nitrile rubber gloves. **08.05.008**

Eye Protection

Wear full face shield if splashes or spray deposition are likely to occur.

08.06.SIP1001

Skin Protection

Wear overalls to minimise contamination of personal clothing. Launder overalls and undergarments regularly. **08.07.027**

If splashes of hot product are likely to occur use helmet with neck cloth and full face shield. **08.07.SIP4002**

Wash hands before eating, drinking, smoking and using the toilet. **08.03.SIP1001**

Launder overalls and undergarments regularly. **08.03.010**

9. Physical and Chemical Properties

Appearance

Physical State:

Solid at ambient temperature **09.01.006**

Colour: Black **09.03.002**

Odour

Characteristic mineral oil/bitumen **09.04.SIP1003**

Flash Point

Cleveland Open Cup: >230°C.

Oxidising Properties

Not applicable.

pH

Not applicable

Evaporation rate

Not applicable.

Specific Temperature of change of physical state

Softening point 46 to 57°C. **09.18.008**

Distillation characteristics

Initial boiling point: >250°C. **09.07.007**

Vapour pressure

Negligible at ambient temperature

Vapour density

Greater than 1 **09.15.SIP3001**

Density

0,990 to 1,100 kg/m³ at 25°C **09.12.006**

0,850 to 1,000 kg/m³ at 200°C **09.12.006**

Solubility

Water: Insoluble **09.31.010**

Organic solvents: Readily soluble in various organic solvents. **09.33.027**

Fats: Partly soluble.

Log Po/w: log Pow > 6 **09.34.006**

Explosive properties

Auto-Ignition Temperature: Greater than 300°C

Viscosity

Not determined (see Penetration data).

Other data

Penetration

80 to 100 x 10⁻¹ mm at 25°C; Test Method ASTM D5 **09.19.006**

Softening Point

46 to 56 °C

Electrical conductivity: Insulating.

Hygroscopicity: Not hygroscopic

10. Stability and Reactivity

Conditions to avoid

Excessive heating above the maximum recommended handling and storage temperatures will cause degradation and evolution of flammable vapours.

Materials to avoid

Do not allow molten product to contact water or other liquids. **10.03.SIP4001**

Strong oxidizing agents. **10.03.002**

Oil and bitumen contamination of thermal insulation near hot surfaces should be avoided and lagging should be replaced where necessary by a non-absorbent type of insulation.

Self-heating, leading to auto-ignition at the surfaces of porous or fibrous materials

impregnated with bitumen or condensates from bituminous fumes can occur at temperatures below 100°C.

Hazardous decomposition products

Thermal decomposition/incomplete combustion will generate a complex mixture of particulates, unidentified organic/inorganic compounds and gases such as CO₂, CO, NO_x, O₂.

Hydrogen sulphide **10.04.014**

11. Toxicological Information

Toxicological data have not been determined specifically for this product. **11.01.001**

Information given is based on a knowledge of the constituents and the toxicology of similar substances. **11.01.008**

Acute toxicity

Inhalation

If mists/vapours or fumes are inhaled, slight irritation of the respiratory tract may occur. **11.07.010**

Sensitisation and irritation

Bitumen is not known to be a skin sensitiser, although condensed bitumen fume is likely to be slightly irritant to the skin.

Chronic toxicity

Bitumens present no chronic hazards at ambient temperature.

Under normal conditions of application skin contact with bitumens is expected to be limited by the high temperatures needed to work the material. The safety hazard, therefore, normally limits any chronic skin hazard.

Bitumens are not classified as dangerous under EC criteria. They contain very low concentrations of Polycyclic Aromatic Compounds (PAC's). In undiluted bitumens these PAC's are not considered to be bio-available. However, if bitumens are mixed with diluents to obtain a low viscosity at ambient temperatures it is believed that such materials may become bio-available.

Despite the known presence of PAC's there is no evidence that exposure to undiluted bitumens, or their fumes is harmful.

12. Ecological Information

Eco-toxicity

Ecotoxicological data has not been specifically determined for this product. **12.01.001**

Information given is based on a knowledge of the components and the ecotoxicology of similar products. **12.01.006**

The product is not environmentally toxic. It is not dangerous to plant and aquatic environments.

Mobility

Ground: Remains on surface soil. **12.02.SIP1004**

Water: Insoluble. The water solubility is so low that it can be considered to be negligible.

May float or sink on water. **12.02.SIP1003**

Persistence and degradability

Not inherently biodegradable. **12.03.004**

Degradation is very slow. Under normal circumstances the product will remain in place.

Bio-accumulative potential

Does not bioaccumulate. **12.04.001**

Although all the constituents of bitumens have log Kow values in excess of 6 and hence are potentially bio-accumulative, in practice the very low water solubilities and high molecular weights of these substances is such that their bio-availability to aquatic organisms is very limited and therefore bio-accumulation is unlikely.

Other adverse effects

Bitumens are not thought to present any significant environmental hazard. If hot bitumen is spilled onto soil or water it quickly cools and becomes solid and only a physical fouling hazard then exists. Bitumen is not inherently biodegradable.

13. Disposal Considerations

Waste from residues

Methods for safe disposal.

- Waste arising from a spillage or tank cleaning should be recycled or disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the contractor to deal satisfactorily should be established beforehand.
- All waste must be collected and disposed of on land in compliance with local regulations.

13.02.SIP2005

Contaminated packaging

Methods for safe disposal:

- Through authorised contractor or collector.
- The recommendations given are considered appropriate for safe disposal. However, local regulations may be more stringent and these must be complied with.

13.05.502

14. Transport Information

Cold

Not dangerous for conveyance under UN, IMO, ADR/RID and IATA/ICAO codes.

14.00.001

Hot

Transported at >100°C but below its flashpoint

Conform to local requirements, if none exists recommend:

Land (Railroad/Road – RID/ADR)

Class: 3 Packing Group: III UN Number: 1999

Classification Code: Hazard Identification Number.:

Transport document name:

UN 1999, ELEVATED TEMPERATURE, LIQUID, N.O.S. (Bitumen), Class 3
PG III

Sea (IMDG)

Class: 3 Packing Group: III UN Number: 1999

Marine Pollutant: No

Risk Label:

EMS (Emergency Schedule) Number:

Prevent spillage spreading by making barrier with inert material (e.g. sand). Allow to cool and solidify.

Subsidiary Risk: No

Transport document name:

UN 1999, ELEVATED TEMPERATURE, LIQUID, N.O.S. (Bitumen), Class 3
PG III

Air (IATA/ICAO):

Transport of this product on passenger aircraft is forbidden.

14.19.SIP2001

Note

Under ADR emptied uncleaned tankers are classified as follows: Emptied container class 3
ADR latest cargo UN1999, ELEVATED TEMPERATURE, LIQUID, N.O.S. (Bitumen)

15. Regulatory Information

Not classified as Dangerous under EC criteria.

15.02.002

16. Other Information

Shell penetration grade bitumens are used as components in road construction and maintenance and also in roofing, flooring, waterproofing, adhesive, sealing and anti-corrosion applications.

16.01.SIP4003

The advice given in this safety data sheet reflects current knowledge of the hazards and risks associated with the handling of bitumen. If this product is mixed with non-bituminous materials then users should take these into account in identifying any additional hazards and risks which might arise. Guidance should be sought from the suppliers of the other materials and from appropriate codes of practice, e.g. Environmental guidelines on Best Available Techniques for the production of asphalt mixes [EAPA, 1994 - ISBN 90-801214-2-8]

Legislation and other sources which have been used in the compilation of this Safety Data Sheet include:

- CONCAWE Product Dossier 92/104 "Bitumen and bitumen derivatives" which contains all relevant toxicological and ecological data. December 1992. Available from CONCAWE, Boulevard du Souverain 165 - 3rd Floor, B - 1160 Brussels, Belgium
- CONCAWE Safety Data Sheet report (final draft stage) which outlines the requirements of the amended SDS directive. This report also includes: sources of member state OELS and recommended monitoring methods, guidance on respiratory protection, and, guidance on hand, eye and skin protection
- Institute of Petroleum - Bitumen Safety Code Part 11 of Model Code of Safe practice, July 1990.
- CEN/TC 19/SC 1 N80 Petroleum Products - Bitumen and Bituminous Binders - Terminology
- European Inventory of Existing Chemical Substances (EINECS)
- Chemical Abstracts Service (CAS)
-
- European Agreement Concerning the international carriage of Dangerous Goods by Road (ADR)
- International Maritime Dangerous Goods code (IMDG)
- Bitumen Burns Card - Notes for Guidance of First Aid and Medical Personnel [<http://www.eurobitume.org>]

This product is supplied on the understanding that it will be used in the manner and for the purpose(s) specified in the Product Data Sheet, the user having taken all precautions stipulated.

Failure to follow such directions may adversely affect any rights that the user might have against the Company.

Before application other than as directed, advice must be obtained from the company.

SDS Distribution

This document contains important information to ensure the safe storage, handling and use of this product. The information in this document should be brought to the attention of the person in your organisation responsible for advising on safety matters.

16.07.001

Further Information

For further information, contact your local Shell company or agent.

16.02.001