

BITUMEN HEALTH SAFETY & ENVIRONMENT



RBA Training Modules



Bitumen HSE

The information in this module is given in good faith and belief in its accuracy at the time of publication, but does not imply any legal liability or responsibility by the Refined Bitumen Association.

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General Issues

- **Bitumen is traditionally regarded as a “safe” product when handled properly**
- **Bitumen is relatively inert under ambient conditions**
 - Low volatility
 - Very low water solubility
 - Highly durable
- **Bitumen is delivered & handled hot**
 - Risk of burns
- **There is regular scrutiny of**
 - Health Aspects
 - Environmental Aspects

Bitumen Grades & Properties

BITUMEN TYPES & USES

- **Paving Grades**
 - Road surfacing & some industrial applications
- **Hard Paving Grades**
 - Road bases
- **Hard Grades**
 - Paints/enamels, etc
- **Oxidised / Blown Grades**
 - Roofing/waterproofing, electrical products, etc.
- **Bitumen Emulsions**
 - Bond coats, surface dressing and surfacing applications
- **Polymer Modified Binders**
 - PMB can be used for many of the above applications



Hazards Associated with Hot Bitumen

- **High handling temperatures**
- **Vapour emissions**
- **Combustible nature**
- **Water contact**
- **Pressure discharge**

Material Safety Data Sheet



BITUMEN MSDS

Suppliers' information on product composition + HSE issues:

- **Composition**
 - Ingredients, Physical/Chemical properties, Reactivity
- **Health**
 - Toxicology, Hazards, Personal Protection and First-Aid
- **Safety**
 - Handling, Storage, Fire-Fighting information
- **Environmental**
 - Ecological information, Handling of Spillages and Disposal

Transport / Regulatory information

- **Not classified as hazardous to health or environment**
 - No statutory labelling
- **The product is classified under the ADR Regs and IMDG code.**
 - Proper shipping name: *ELEVATED TEMPERATURE LIQUID UN 3257 Not Otherwise Specified (N.O.S. Bitumen); at > 100°C & below its Flash Point.*

Material Safety Data Sheet – Mandatory Headings

1. Identification of the Substance / Preparation and Company
2. Hazards identification
3. Composition / Information on Ingredients
4. First-Aid measures
5. Fire-Fighting measures
6. Accidental Release measures
7. Handling and Storage
8. Exposure Control and Personal Protection
9. Physical and Chemical properties
10. Stability and Reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

Registration, Evaluation and Authorisation of Chemicals

- Deals with substances manufactured or imported into EU / EEA
- Registration of High Production Volume chemicals 30 November 2010
- Data requirements
 - Chemical Safety Report
 - Approved uses
- List of registered uses on www.bitumenuk.com
- Registration dossier prepared by CONCAWE

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Health Awareness

Skin Burns

Hot bitumen is sticky!

- Bitumen is stored and delivered at temperatures above 150°C (much hotter than boiling water).
- Bitumen burns can cause severe damage to eyes and skin.



Required PPE

- Personal Protective Equipment must be worn when handling hot liquid product
- Protective Clothing & Equipment:
 - High Visibility Coverall
 - Gauntlet Gloves
 - Head Protection
 - Neck/Face Protection
 - Protective Footwear (Rigger Boot Style)



First Aid

- **HOT BITUMEN**

- Cool burn (water showers)
- Leave bitumen in place
- Do not bandage
- Call assistance (999 if necessary)
- Advice in Eurobitume Burns Card

Skin Contact with Cold Bitumen

- Intimate and prolonged skin contact with bitumens and emulsions should be avoided
- Appropriate systems of work and PPE should be provided where intimate contact may occur

First Aid

- **COLD BITUMEN**

- Clean/wash skin
- Remove contaminated clothing
- Eye wash
- Medical check

Bitumen Fumes



Keep handling temperatures down

- When heated, bitumen gives off fumes
 - Fumes contain particulates, hydrocarbons, H₂S
 - The amount of fume depends on temperature
- Bitumen fumes can cause irritation to the respiratory system
- Occupational Exposure Limits are in place:
 - UK OEL : 5 mg/m³ (8 hr Time Weighted Average)
 - 10 mg/m³ (15 min Short Term Exposure)

Bitumen Fumes

Hydrogen Sulphide - be aware !

Under normal circumstances of bitumen use,
Hydrogen Sulphide does not pose a problem

However

- H_2S can concentrate in confined spaces of bitumen storage tanks
 - Lethal concentrations can occur
- The familiar smell of 'bad eggs' cannot be relied upon as a warning
 - Sense of smell can be deadened below hazardous concentration
- Exposure to low levels of H_2S can cause irritation to nose & throat
- Areas around dip hatches and vents should be regarded as hazardous areas
- Systems of work should take account of potential presence of H_2S , and monitors should be worn as appropriate

- **First Aid**

- Move to fresh air
- Check breathing
- Give Artificial Respiration if necessary
- Call assistance
(999 if necessary)

Bitumen Fumes - Health Aspects

Bitumen fume does contain small quantities of Polycyclic Aromatic Hydrocarbon compounds

- The bitumen industry continues to pay much attention to working conditions and supports the use of good working practices, including temperature control
- Exposure levels should be kept to a minimum to avoid irritation effects for workers handling hot bitumen
- The industry supports ongoing studies which help give reassurance of the lack of long term health effects for bitumen workers

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Bitumen Storage

Bitumen Storage - Operations



- **Labelling Tanks & Fill-Pipes**
 - Tanks/valves must be clearly marked, to avoid cross-loading.
- **Product Temperature Control**
 - Maximum working temp should be specified per grade, to avoid flammable atmospheres & product hardening.
- **Tank Level Gauging**
 - An adequate and reliable means to gauge tank contents, to prevent spillages.
- **High Level Alarms**
 - A high level alarm (HLA) and an independent high high level alarm (HHLA) system is needed, to prevent spillages.
- **Avoiding 'Boil-over'**
 - Water ingress must be avoided, to avoid violent foaming or the risk of 'boil-over'.
- **Vent Pipes**
 - Overflow & vent pipes must be carefully located, and kept clear, to avoid risk to personnel or vehicles.
- **Access to Tank Tops**
 - Should be avoided as far as is reasonably practicable.
 - Safe access must be provided

Bitumen Storage - Inspection

Regular inspection programme of storage facilities should be in place, and the results logged.



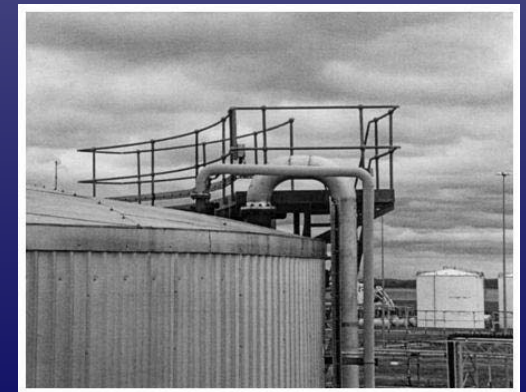
- **General**
 - Make regular external inspections of tank wall fittings.
 - Keep comprehensive records of all inspections.
- **Thermal Insulation (lagging)**
 - In vulnerable areas lagging should be non-absorbent, and sealed to avoid risk of auto-ignition.
 - Carefully remove in vulnerable areas for corrosion checks.
 - Replace when there are signs of oil impregnation.

- **Breather Vents**

- Vents & pressure relief valves are susceptible to fouling, and in extreme cases complete blockage.

- **Heating Coils**

- Integrity checks on steam and hot oil heating coils.



Bitumen Storage – Maintenance/Cleaning

Regular maintenance and cleaning of bitumen storage facilities is essential to ensure operational effectiveness.

- **General**
 - All tanks and fittings, including gauges and high level alarms, should be regularly maintained to ensure they remain serviceable.
- **Tank Bottom Cleaning**
 - To ensure full working capacity of the tank is available and to maintain the required flow rate, it is necessary from time to time to remove the build-up of carbonaceous and other deposits from the tank bottom.
- **Tank Entry**
 - In all cases where personnel have to enter a tank for inspection or cleaning purposes, risk assessment must be carried, a method statement issued, and the tank totally isolated.
- **Records**
 - Comprehensive records of all maintenance activities should be kept.

Prevention of Fire in Bitumen Storage

FLAMMABLE SITUATIONS CAN OCCUR

- **WHEN BITUMEN VAPOUR AND AIR REACH CERTAIN PROPORTIONS**

Between 1% and 8% air mixture, in tank vapor spaces or vent/fill pipes.

Good house-keeping is essential.

- Keep area around storage tanks clear of combustible materials: rubbish/weeds etc.

- **WITH CHANGE IN CONDITIONS IN THE TANK**

Dramatic changes in temp, or increase in air flow can create a flammable situation.

It is imperative to:

- Keep to suppliers recommended storage temperature.
- Keep any source of ignition (eg hot work) clear of vents or fill pipes

BITUMEN CAN AUTO-IGNITE

- **POROUS MATERIAL IMPREGNATED WITH BITUMEN**

Porous material such as tank insulation, can auto-ignite at 100°C

Main cause is leaking gland seals on pumps - Pump maintenance is critical.

- **PYROPHORIC DEPOSITS**

Deposits build up over many years, and hang down like stalactites from tank roof.

- The tank must be removed from service on a planned basis and cleaned out.

Bitumen Fire Fighting

- **FIRST RULE: DO NOT PUT YOURSELF AT RISK**

- Small fires may be tackled with a hand held fire extinguisher, **BUT** only if you have had the necessary training.

Call the fire brigade

- Unless you are totally sure that the fire is out, and remember the fire may still be burning inside the tank.
- Regular exercises with the Fire Brigade are recommended.

- **NEVER TACKLE A BITUMEN FIRE WITH WATER.**

- Never use a water hose or extinguisher on a bitumen fire, this could lead to a rapid expansion of the fire.
- At least one 6kg dry powder extinguisher must be positioned in discharge area.

- **NEVER OPEN THE MANHOLE LID**

- Never open the manhole lid during or after a fire as this will increase the air flow to the fire, or re-ignite any bitumen which is at excessive temperature.

- **DEVELOP AN EMERGENCY PLAN.**

- Develop an on-site emergency plan with the local fire brigade.
- In the event of a major fire, although the fire brigade will fight the fire, plant equipment and materials may be used to build bund areas or diversion walls.

Dangerous Substances and Explosive Atmospheres Regulations

Atmospheric Explosives

- All new plant and equipment installed after 30 June 2003 required to comply
- Existing installations required to comply by 30 June 2006 and must be supported by a Risk Assessment
- The regulations require employers to control the risks to safety from fire and explosions
- There is a duty to provide a risk assessment for all workplace activities associated with dangerous substances that have the potential to create danger to personnel from energy releasing events such as fire, explosion, exothermic reactions etc.

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Loading Transport & Discharge

Loading & Delivery

The RBA Eurobitume Guide to Safe Delivery of Bitumen

replaces Code of Practice for Safe Delivery of Bitumen Products



Guide to Safe Delivery

1. Guidance at sites
2. Delivery vehicle equipment
3. PPE
4. Storage tanks
5. Delivery procedures
6. Training
7. Documentation
8. Risk Assessment
9. Audit Sheets

Contact:

**Bitumen Supplier, or
Refined Bitumen Association**

Bitumen Handling Temperatures

	Grade	Minimum pumping temperature (°C)	Typical mixing and short term storage temperature (°C)	Maximum handling and storage temperature (°C)
Paving Grades (BS EN 12591)	250/330	100	135	190
	160/220	110	140	190
	100/150	110	150	190
	70/100	120	155	190
	50/70	125	160	190
	40/60	125	165	200
	35/50	130	165	200
	30/45	130	170	200
	20/30	140	175	200
Hard Paving Grades (BS EN 13924)	15/25	145	180	200
	10/20	150	180	200
Hard Industrial Grades (BS EN 13305)	H80/90	160	200	230
	H100/120	190	220	230
Oxidised Grades (BS EN 13304)	75/30	150	195	230
	85/25	165	210	230
	85/40	165	210	230
	95/25	175	215	230
	105/35	190	220	230
	115/15	205	225	230

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Sampling

Bitumen Sampling

Bitumen Sample Valves

- Sample valves may be provided for sampling from pipelines or tanks
- Depending on the design of the valve it may be necessary to run the product before a representative sample of the tank contents is obtainable
- If the product does not flow immediately when the valve is cracked open the valve should be fully closed again and pre-established procedure for clearance of the blockage should be initiated
- Suitable PPE should be worn as protection against splashes or spills



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Bitumen and the Environment

Environment - Deliveries



Consider your neighbours :-

- Access routes for tankers
- Hours of Operation
- Noise
- Vehicle operations
- Fume
- Waste Disposal

Environment - Leaching



Bitumen and Asphalt are durable and inert, and leaching is not an issue.

- Leaching of Aromatic Hydrocarbons from petroleum bitumens /asphalts meet all current limits
- Leaching of Metals from bitumen meet all current limits
- It is important to differentiate between leaching and run-off of road contaminants
- Bituminous materials have been used in encapsulation of hazardous waste products

Environment - Recycling



Bitumen and (un-contaminated) Asphalt are classified as non-hazardous in the European Waste Catalogue

- **Recycling of asphalt is accepted practice**
 - Asphalt roads are 100% re-useable
- **Current issues in pavement recycling**
 - Reclaimed Asphalt Pavement containing
 - Coal tar materials (hazardous waste)
 - “Road contaminants”

Environment - Developments

Some new developments for Bituminous Materials are aimed at :

- Reduced Environmental Impact**
 - Improved 'Sustainability'**
- Research into cold and warm mixes
 - asPECT (Asphalt Carbon Calculator)
 - Long-life roads
 - Lower noise solutions
 - Emulsions and new surfacing techniques
 - Coloured surfacings

References

For more information

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