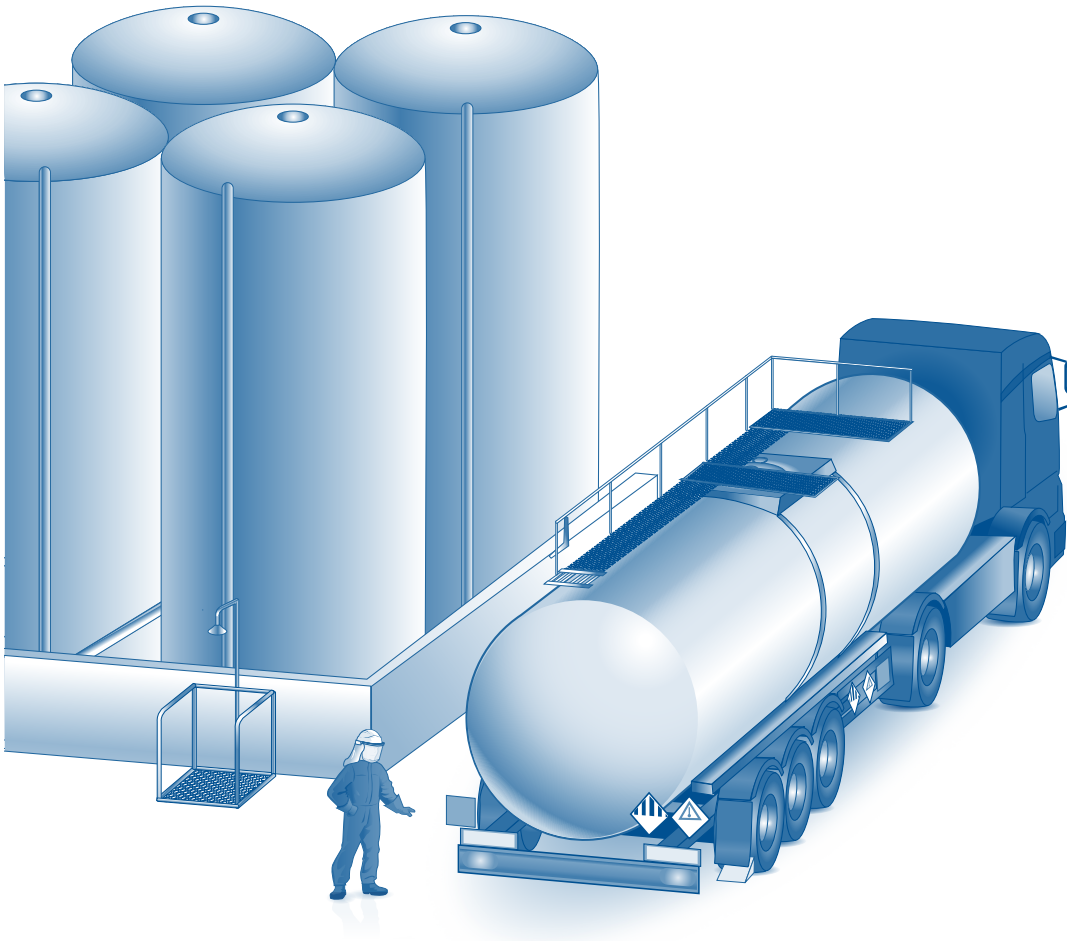
eurobitume

Guide to the Safe Delivery of Bitumen

Standard European version
3rd edition



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Foreword to the third edition

Eurobitume aims to be the first reference for bitumen in Europe, representing the bitumen industry in Europe. We educate and promote the efficient, economic, effective, safe and sustainable use of refined bitumen.

The Eurobitume Guide to the Safe Delivery of Bitumen was produced by Eurobitume members to highlight the responsibilities of those involved throughout the supply chain and summarise best practices. For the launch at national / regional level, adjustments have been included to account for local conditions and regulations.

The laws and regulations in Europe require employers to provide safe systems of work to ensure the safety of their employees and the public. Health and safety laws impose duties on all relevant stakeholders and on all involved parties to provide safe systems of work. This Guide to the Safe Delivery of Bitumen is intended to help all parties comply with their responsibilities during the delivery of bitumen products and does not alter the legal responsibility of either party.

The document aims to define the minimum industry standards for design, equipment and procedures based on legislation and experience. These standards should be used by member companies, bitumen hauliers and customer sites. It is specified where standards are mandatory, by stating that such levels must be achieved. In other areas the standards should be seen as industry recommendations, for example where best practice is not currently achievable due to infrastructure or legacy issues.

This third edition has been updated and aligned with other guidances from Eurobitume, mainly but not limited to ground-based operations, emergency safety showers, and personal protective equipment.

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1 Introduction

Bitumen is delivered hot (up to 230˚C) and may be under pressure. Therefore exercising extreme caution and correct handling of bitumen helps minimise risk of burns or other injury to those associated with deliveries as well as damage to the environment or equipment.

This document is intended to raise awareness on safety and environmental aspects within the delivery process and to highlight the responsibilities of those involved within the supply chain. European legal requirements as well as the ADR regulations are also considered.

Safety during delivery requires the commitment of all stakeholders, e. g.:

- Suppliers
- Hauliers
- Drivers
- Receivers
- Customers

This document is intended to define best practice in the following areas:

1. Customer Site
2. Personal Protective Equipment
3. Delivery Vehicle
4. Operation and Maintenance of Storage Tanks and Pipework
5. Delivery Procedures
6. Bitumen Specific Training
7. Bitumen Safety Documentation

In accordance with Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace, it is a legal requirement for every employer and self-employed person to make an assessment of the health and safety risks arising out of their work. The purpose of the assessment is to identify what needs to be done to control health and safety risks. This should be repeated at regular intervals and after any safety incident, or changes to work site equipment/ procedures.

In addition to personal safety risk assessments, consideration should be given to risks such as loss of containment, fire and explosion. This specifically includes safety measures in case of work alone situations, if the discharge site permits these.

A number of important European safety and environmental regulations are referenced in Appendix 1 of this document.

2 Customer site

2.1 Access and induction

2.1.1 The site should be equipped with a map showing the delivery route.

2.1.2 The bitumen delivery driver must receive a site specific safety induction, including use of PPE, guardrails, emergency safety shower operations, and preferably including site plans for the driver to retain. The induction must be documented signed and dated, and must cover, if applicable, work alone situations.

2.1.3 The customer is responsible for the driver's well-being while on their premises.

2.1.4 All site roads should be clearly marked, signposted and well-lit during hours of darkness.

2.1.5 If drivers are required to exit their delivery vehicle, e.g. to weigh in and out at the delivery site, a clearly marked pedestrian route must be provided to enable safe access to and from the delivery vehicle.

2.2 Delivery point

2.2.1 The traffic management system should consider the impact of nearby access roads and movement of plant or equipment in the vicinity of the delivery point.

2.2.2 The need for delivery vehicle reversing should be minimised. Where reversing is required, safety measures should be implemented.

2.2.3 Surrounding or adjacent operations which could impair a safe delivery should be avoided.

2.2.4 A flat and even surface should be provided for the delivery vehicle in order to minimise the risk of slips, trips and falls.

2.2.5 The area around the delivery point should be kept tidy and clear of obstruction.

2.2.6 A suitable system (e.g. sand bed receptacle) for the collection and disposal of all hose and pipe drainings should be provided.

2.2.7 The entire discharge area should be adequately illuminated.

2.2.8 Adequate space around the delivery vehicle should be provided to allow unrestricted movement for the driver.

2.2.9 A 6 metre exclusion zone should be marked with signs or barriers if possible.

2.2.10 The delivery point should provide a safe exit route for the driver in the event of an emergency.

2.2.11 Clearly identifiable, simple instructions on operational and safety procedures should be posted in the immediate area of the customers' inlet pipework.

2.2.12 Additional safety measures for work alone situations must be in place.

2.3 Emergency equipment

2.3.1 The location of emergency equipment should be clearly indicated.

2.3.2 Emergency equipment must be maintained, inspected and / or tested regularly and a record kept.

2.3.3 At least one dry powder extinguisher (min. 9 kg, if possible 50 kg) should be available in the area of the delivery point.

2.3.4 Extinguishers should be housed in suitable weather-proof boxes or shrouds to ensure serviceability at all times.

2.3.5 At least one emergency safety shower must be provided in the area of the delivery point. It is recommended that the shower should be positioned at a minimum distance of 6 metres and no further than 20 metres away from the discharge point. If the shower is positioned within 6 metres of the discharge point it must be shielded from the possible effects of bitumen spray (see the Eurobitume Emergency Safety Shower Guidance).

2.3.6 The shower should be capable of immediately providing sustained volumes of clean tepid (cool, not cold) water for at least 20 minutes from point of activation at any time, including during freezing conditions.

2.3.7 If the shower becomes temporarily inoperative, a suitable alternative system must be in place prior to the delivery. Note that the provision of alternative measures such as hosepipes, buckets, extinguishers, portable showers (if not meeting the requirements on emergency safety showers) etc. is not acceptable as alternative measures.

2.3.8 The shower should be easily operated by an operative in distress, e.g. foot plate.

2.3.9 It is recommended that the shower is alarmed in such a way as to ensure site management are aware of its use.

2.3.10 Advice on the treatment of bitumen burns must be displayed in the delivery area and made available in the event of further medical treatment being required (see Eurobitume Bitumen Burns Card).

2.3.11 The Eurobitume Bitumen Burns Card in its latest version should be available at the site, and should be fixed to the injured person for transport to medical support.

2.4 Site specific safety and emergency procedures

2.4.1 Site management must document and provide a compilation of site specific safety instructions for bitumen deliveries for both employees and delivery drivers.

2.4.2 Site specific safety and emergency procedures should be tested on an annual base, preferably at the beginning of the production season, if possible with appropriately trained staff and local emergency services.

2.4.3 Site employees must be trained in site procedures and emergency procedures must be tested.

2.4.4 Safety Data Sheets must be available at the delivery site for all hazardous products handled and should be used to prepare risk assessments and work instructions and to inform site personnel of the hazards and controls that are necessary to protect people against injuries caused by products.

3 Personal Protective Equipment (PPE) (drivers and site staff)

3.1 Personnel involved in the delivery of bitumen

3.1.1 Any person within 6 metres of the delivery of bitumen, irrespective of their specific duties, must wear appropriate PPE.

3.1.2 PPE must be compliant with the Eurobitume Guidance on Personal Protective Equipment (PPE) or superior standards, be in good condition and fit for purpose.

3.1.3 PPE must be provided by the haulier for all drivers.

3.1.4 The site must provide PPE for relevant site staff.

3.1.5 If applicable, PPE must include safety measures for work alone situations, e.g. an on person „work alone alarm".

3.1.6 All PPE should be regularly checked and cleaned or replaced. Responsibility lies with the user as well as with the company providing the PPE.

4 Delivery Vehicle

4.1 Vehicle design

4.1.1 All delivery vehicle discharge equipment should be operable from ground level in order to avoid the need for the driver to climb on top of the delivery vehicle during delivery.

4.1.2 If it is absolutely necessary for the driver to climb on top of the delivery vehicle, fall protection must be provided.

4.1.3 The vehicle must be fitted with brake interlocks, or other means like drive-away protection and wheel chocks to ensure that the delivery vehicle cannot move during discharge.

4.1.4 The delivery vehicle should be fitted with an Emergency Secondary Safety Valve (ESSV) with a recommended minimum of two emergency shut-down devices at different positions.

4.1.5 Reverse camera / sensors, or other similar reversing aid should be fitted.

4.1.6 Reverse noise warning bleeper should be fitted.

4.1.7 The position of the delivery truck discharge valve actuator wheel should ensure that the driver is not in the path of a bitumen spray in the event of a flange or hose connection failure.

4.2 ADR requirements

4.2.1 In accordance with ADR, all hauliers and suppliers of bitumen must engage a Dangerous Goods Safety Advisor (DGSA).

4.2.2 ADR markings must be displayed on the delivery vehicle and the delivery vehicle must carry equipment according to ADR requirements.

5 Operation and Maintenance of Storage Tanks and Pipework

5.1 Hazard Identification and Hazard and Operability studies

During the design stage of any new plant and retrospectively for existing plants, a Hazard Identification (HAZID) study and a Hazard and Operability (HAZOP) study should be carried out. The HAZID and HAZOP techniques are used across high hazard industries as a method of identifying hazards and operability problems in new and existing plants.

Before a HAZID/HAZOP study is started, detailed information on the process should be available including:

- Up-to-date process flow diagram (PFD);
- Process and instrumentation diagram (P&ID) certified as-built;
- Detailed equipment specifications;
- Construction materials.

A Functional Safety Assessment (FSA) should be carried out in accordance with EN 61511.

This process ensures a systematic and well documented evaluation of hazards and will assist in the identification of:

- Any safety instrumented systems that are required by EN 61511.
- Compliance with Directive 1999/92/EC - on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres.

5.2 Storage tank markings

5.2.1 Each storage tank and its associated delivery pipework and control valve should be uniquely identified with the storage tank number.

5.2.2 The contents of each storage tank should be clearly identified and labelled with the product type/grade. Indicate if the capacity is given in volume or weight.

5.2.3 Safe Working Capacity (SWC) should be displayed for each individual storage tank and be visible to the operator and driver (see also 6.1.2 and Appendix 2).

5.2.4 It is good practice that storage tanks should display an “Elevated Temperature” sign in a size suitable for the size of the storage tank.

5.3 Storage tank gauges

5.3.1 Adequate and reliable means of gauging the storage tank contents and ullage must be available.

5.3.2 Such gauges must clearly identify which storage tank they refer to and should be visible from the driver’s position at the discharge point.

5.3.3 Storage tank gauges must be operational and calibrated.

5.3.4 Content gauges must be regularly checked, maintained in accordance with the manufacturer's recommendations, and service logs maintained.

5.3.5 Wherever possible a duplicate system should be provided in the plant control room.

5.4 Storage tank alarms

5.4.1 A high level alarm (HLA) and an independent high-high level alarm (HHLA) should be installed on each storage tank.

5.4.2 The activation of the HHLA should be independent of the content gauging system.

5.4.3 The HLA should be set to trigger at the available capacity of the storage tank less 10 % (see Appendix 2). The HHLA should trigger at the available capacity less 7,5 %. The HAZOP and HAZID may indicate that the trigger points may vary depending on storage tank size, pump rate and measurement accuracy.

5.4.4 Alarms should clearly identify which storage tank they refer to, when activated.

5.4.5 Alarms must be audible and/or visible to all those responsible, including the delivery driver, for the safe delivery of product.

5.4.6 In the event of an alarm being triggered ground-based pumps should automatically switch off, valves closed to a safe position and the pump should not re-start until the cause of the alarm has been investigated and resolved (see 6.2.7).

5.4.7 All alarms must be operational and calibrated.

5.4.8 Alarms must be regularly checked, maintained in accordance with the manufacturer's recommendations and recorded.

5.5 Storage tank openings

5.5.1 Vent pipes must be located where product emission or release do not pose a risk to any personnel or delivery vehicles.

5.5.2 Storage tank lids must be kept closed and secured at all times during the delivery.

5.5.3 It is recommended that storage tanks should be fitted with a correctly designed drain valve to enable the safe emptying of the storage tank for cleaning and maintenance. In the absence of a drain valve, a specific risk assessment must be carried out prior to any uplift of product.

5.5.4 Samples should not be taken from the delivery vehicle or hoses at the delivery site unless equipment is fitted to do so safely.

5.5.5 If there is a requirement to take product samples a purpose designed valve should be permanently fitted to the storage tank (or corresponding pipework), in a protected space. Sampling valves without direct passage are recommended (e.g. "Strahman®" screw valves).

5.5.6 At high temperature the headspace of storage tanks can contain hydrogen sulphide (H_2S), which may reach dangerous concentrations. After full risk assessment, appropriate control measures should be applied which may include, but is not limited to, delineation of zones, information panels, alarmed monitors set to signal if concentrations approach the Occupational Exposure Limit (OEL), use of adequate local ventilation (see Eurobitume´s guidance documents on H_2S).

5.6 Storage tank pipework and flanges

5.6.1 Installation of a ground-based pump is the preferred means of delivery. Such installations should be subject to a thorough Hazard and Operability (HAZOP) study during design and construction.

5.6.2 The customer's storage tank inlet pipework must be of appropriate design, well supported and maintained to ensure no residue will block or seriously reduce the nominal bore of the pipework.

5.6.3 All storage tank pipework should be insulated.

5.6.4 Storage tank flanges should be vertical and located between 500 mm (as measured from the bottom of the flange face) and 1000 mm (as measured to the top of the flange face) above ground level.

5.6.5 Coupling design, including adaptors, must provide a safe and secure connection between the hose and the storage tank flange.

5.6.6 To contain any spray of hot bitumen at the storage tank flange, flange shrouds should be fitted and used during the delivery.

5.6.7 It is recommended that an end valve is fitted behind the storage tank flange which can be closed in the event of an emergency.

5.6.8 Access to the storage tank connection flange must be such as to allow for safe and easy connection of the delivery hose.

5.6.9 The distance between the delivery vehicle and the storage tank flanges must not be more than one hose length in order to avoid two flexible hoses being connected to each other.

5.6.10 A connection security system (e.g. locks) should be fitted to control discharge, prevent cross contamination and possible spillage. Each system should be robust, storage tank specific and fit for purpose.

5.6.11 Discharge inlet pipework flanges must be clean and serviceable, e.g. free from warping, excessive wear, rust and fractures.

5.6.12 Storage tank vent / overflow pipes must be kept clear of blockage at all times.

5.6.13 The pipework between the customer's delivery flange and the storage tank must not be flexible.

5.6.14 Whenever flexible hoses or a hose crane are made available at customer sites, the customer is responsible for their maintenance (including periodic inspection) and function.

5.7 Storage tank design and use

5.7.1 If customer storage tanks are fitted with inlet / fill pipes that pass through the top of the storage tank and extend to the bottom of the storage tank (to minimise oxidation of the bitumen during circulation), the inlet pipe must be slotted or fitted with an alternative device to prevent spillages resulting from siphoning at the end of the delivery. A vacuum breaker, e.g. installing a significant hole at the top of the filling pipe inside the tank, needs to be foreseen to avoid siphoning.

5.7.2 All access ladders and walkways on storage tank roofs must be fitted with suitable guards to prevent falls.

5.7.3 Where other product storage tanks, e.g. bitumen emulsion, kerosene, etc. are present, all supply and return pipework must be segregated from the bitumen pipework system and identified.

5.7.4 Where out of service bitumen storage tanks are being returned to service after maintenance or long interruption, clear procedures must be developed to ensure that the storage tank is safe to operate and is free of water (see Eurobitume Guidance for Bitumen Deliveries into new Storage Tanks and Storage Tanks being returned to Service).

5.7.5 Polymer modified bitumen and oxidised bitumen storage tanks should be located closest to the discharge connection to minimise the risk of pipework blockages.

5.8 Storage temperature

5.8.1 For recommended and maximum storage temperatures please refer to the supplier's Safety Data Sheet.

5.8.2 Storage temperatures must not exceed the Eurobitume maximum safe handling temperatures.

6 Delivery Procedures

6.1 Pre-delivery

6.1.1 It is the responsibility of the customer to authorise each delivery (see also 6.4.3).

6.1.2 It is the customer's responsibility to ensure that there is sufficient storage tank ullage. Sufficient ullage to take the load + 10 % safety margin must be provided (see Appendix 2).

6.1.3 It is the responsibility of the customer to confirm that the grade and quantity being delivered are correct, as stated on the drivers' delivery documentation, preferably in writing.

6.1.4 It is the responsibility of the customer to confirm that the driver has connected to the appropriate storage tank flange for the delivery and the lines and valves are routed to correct storage tanks.

6.1.5 The customer must make sure the emergency safety shower is working.

6.1.6 Where necessary guard rail systems on the delivery vehicle, or provided by the customer, must be used for work at height. It is the responsibility of the customer to ensure that the equipment is used (see section 4.1).

6.1.7 The delivery vehicle must be immobilised by engaging the braking system and, if necessary, wheel chocks should be used (see also 4.1.3).

6.1.8 Avoid breathing the vapours, which escape when the manlid or valves are opened or closed. This is best be done by ground-based operations. Alarmed monitors should be foreseen.

6.2 During delivery

6.2.1 Only operatives involved in the delivery process and wearing the correct Personal Protective Equipment (PPE, also see section 3) are allowed within 6 metres of the discharge point.

6.2.2 The customer must monitor the driver during the discharge process by at least one of the following methods:

a) Visually monitoring, e.g. line of sight or CCTV; or

b) Regular checks made during the delivery process as per site specific risk assessment for bitumen delivery;

c) Attend the discharge process with the driver.

In case the discharge site permits accordingly, the driver might be discharging alone without site facility personnel being available. In these situations, an on person „work alone alarm" should be used.

6.2.3 Personnel must not be permitted on top of the storage tanks, or on top of the delivery vehicle during the delivery.

6.2.4 Where storage tanks are situated inside buildings, activities inside the building must be kept to a minimum and notice must be given that a delivery is taking place (e.g. mobile sign). It is recommended that the building has a suitable extraction or ventilation system. Entry to the building must be restricted to authorised personnel only.

6.2.5 The driver is solely responsible for the operation of the delivery vehicle and equipment throughout the discharge procedure and must remain by the delivery vehicle shut off valves while the discharge is taking place.

6.2.6 The driver must wear the required PPE at all times correctly during the discharge process.

6.2.7 If the high level alarm is activated, discharge of product should stop and should not resume until the cause of the alarm activation has been identified and resolved (see 5.4.6).

6.2.8 Appropriate control measures should be applied at delivery sites to reduce the possibility of exposure to bitumen emissions, including hydrogen sulphide (H_2S), potentially present. This may include, but is not limited to, delineation of zones, information panels, detectors set to signal if concentrations approach the Occupational Exposure Limit (OEL) or other limit values, driver training, documentation, use of adequate local ventilation.

6.2.9 The driver should stop the discharge whenever there is concern about safety for any reason (e.g. people without PPE entering the 6 metre exclusion zone, vehicle movements in close vicinity, excessive dust, etc.).

6.2.10 When delivery is conducted with ground-based pumps, in case of leakage, it is strictly forbidden to tighten the connection without stopping the pump first.

6.2.11 At the end of the delivery the driver should minimise the amount of air that is blown into the storage tank to avoid the formation of a flammable atmosphere in the storage tank headspace.

6.3 Split loads

6.3.1 Split loads are not recommended and should be avoided whenever possible.

6.3.2 If the load is to be delivered into more than one storage tank, each storage tank must be treated as a separate delivery point.

6.3.3 If the delivery vehicle needs to be moved, the delivery procedure must be repeated in full. This will require the removal of the delivery hose from both the delivery vehicle outlet and customer flange.

6.3.4 Delivery documents must be endorsed by the customer accordingly to identify the additional storage tank(s) and, in particular, that ullage and grade checks have been completed prior to delivery.

6.4 Post-delivery

6.4.1 The driver must clear all discharge delivery pipework and disconnect the delivery hose.

6.4.2 All hose drainings must be disposed of in a safe and suitable receptacle provided by the customer for this purpose, e.g. a sand bed.

6.4.3 On completion of the delivery, it is the customer's responsibility to complete and sign the delivery documents to acknowledge receipt of the load. The customer should also confirm that the pipework connection security system is reinstated and the delivery area is clean and tidy.

6.4.4 Drivers must report any defects that they identify at customer sites to the customer, the haulier company and/or to the bitumen supplier, so that corrective action can be taken.

6.4.5 Any non-compliance to site specific rules or the driver's delivery procedures, the customer must promptly report to the bitumen supplier and/or haulier company who will investigate and take corrective action. The customer must intervene immediately and appropriately.

6.4.6 After unloading bitumen, personnel should allow gases and vapours to dissipate before securing the delivery vehicle. Avoid breathing the vapours, which escape when the manlid or valves are opened or closed. This is best be done by ground-based operations. Alarmed monitors should be foreseen.

7 Bitumen Specific Training

7.1 Delivery drivers

7.1.1 Hauliers are responsible for ensuring that their drivers have received training and instruction on loading, transport and unloading the delivery vehicle.

7.1.2 All drivers employed in the transportation and delivery of bitumen products must have received training and been issued with an ADR training certificate or (for UK) ADR Vocational Training Certificate (VTC) for the relevant class, in tanks. Drivers must have their ADR training certificate / ADR VTC with them at all times.

7.1.3 All drivers must additionally receive industry specific hazard awareness and safety training prior to working unassisted. Training should include actions to be taken in the event of incidents (see Eurobitume Bitumen Burns and Safe Handling Cards, and section 2.4 of this document).

7.1.4 Site specific induction on operations and safety and emergency response must be provided and should be documented by customer personnel (see sections 2.1.2 and 2.4.1). This must cover, if applicable, work alone situations.

7.1.5 Training requirements should be reviewed regularly and refresher training provided as required.

7.1.6 Training records of all individuals must be kept on file.

7.2 Site operatives

7.2.1 Site management is responsible for ensuring that site operatives have received training and instruction on safe handling, receipt and storage of bitumen products.

7.2.2 Customer representatives and operatives must receive competence training on the safe handling, receipt and storage of bitumen products. Training should include actions to be taken in the event of incidents (see Eurobitume Bitumen Burns and Safe Handling Cards and section 2.4 of this document).

7.2.3 Most bitumen suppliers will, upon request, offer assistance and advise on safe handling of bitumen.

7.2.4 Training requirements should be reviewed regularly and refresher training provided as required.

7.2.5 Training records of all individuals must be kept on file.

Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
CCTV	Closed Circuit Television
DGSA	Dangerous Goods Safety Advisor
ESSV	Emergency Secondary Safety Valve
HAZOP	Hazard Operability study
HAZID	Hazard Identification study
HLA	High Level Alarm
HHLA	High-High Level Alarm
OEL	Occupational Exposure Limit
PFD	Process Flow Diagram
P&ID	Process and Instrumentation Diagram
FSA	Functional Safety Assessment
PPE	Personal Protective Equipment
SWC	Safe Working Capacity
VTC	Vocational Training Certificate

Eurobitume reference documents

The following documents are available from the Eurobitume website:

Eurobitume Bitumen Burns Card

Eurobitume Safe Handling of Bitumen Card

Eurobitume Guidance on Personal Protective Equipment (PPE)

Eurobitume Guidance on Safety Footwear for Bitumen Delivery Drivers

Eurobitume Emergency Safety Shower Guidance

Eurobitume Potential Risks of Hydrogen Sulphide through the Bitumen Manufacture and Delivery Process

Eurobitume Card Hydrogen Sulphide (H_2S) in Bitumen Emissions

Eurobitume Pocket Guide Managing H_2S Risks during Bitumen Operations

Eurobitume Recommendation Maximum Safe Handling Temperatures

Eurobitume Guidance for the Storage of Bitumen

Eurobitume Guidance for Bitumen Deliveries into new Storage Tanks and Storage Tanks being returned to Service

Eurobitume Guidance for the Operational Considerations for Hot Bitumen Storage Tanks and Off-Loading Systems

Eurobitume Toolbox Talks

Eurobitume Loading Compatibility Matrix

Eurobitume Training Video for Truck Drivers: Safe Delivery of Bitumen

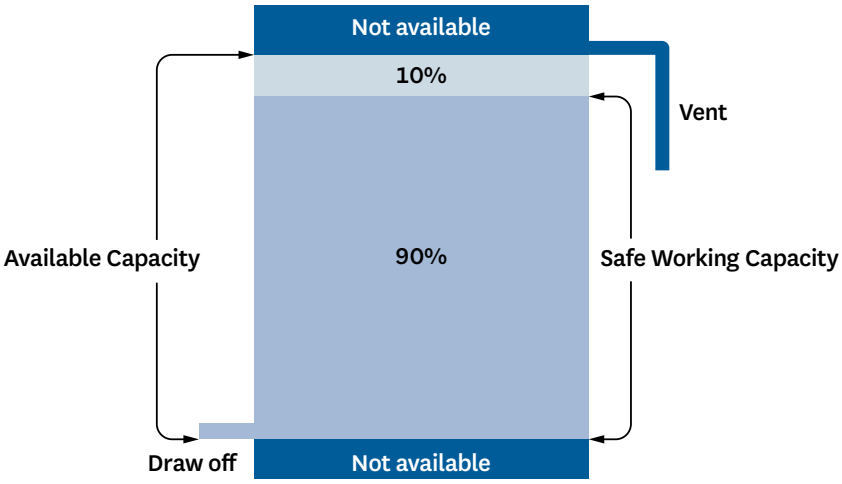
Appendix 1: Reference Literature and Legislation

The following documents represent a non-exhaustive list of relevant legislation within the European Union. These documents will, in most cases, be incorporated into national legislation within EU member states.

1. Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace
2. Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work
3. Council Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work
4. Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006
5. Directive 2004/37/EC of the European Parliament and of the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens or mutagens at work (Sixth individual Directive within the meaning of Article 16(1) of Council Directive 89/391/EEC)
6. Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work (fourteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)
7. Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work (seventh individual directive within the meaning of Article 16(1) of Directive 89/391/EEC)
8. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
9. Fire safety legislation
10. Council Directive 89/656/EEC of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace (third individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
11. ADR https://unece.org/adr-2025-files
12. Model Code of Safe Practice Part 11: Bitumen safety code, Energy Institute, ISBN 9781787253605
13. Council Directive 1999/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (15th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)
14. Directive 2009/104/EC of the European Parliament and of the Council of 16 September 2009 concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)
15. EN 388 Protective gloves against mechanical risks

16. EN 407 Protective gloves and other hand protective equipments against thermal risks (heat and/or fire)
17. EN 1149-5 Protective clothing – Electrostatic properties – Part 5: Material performance and design requirements
18. EN ISO 11612 Protective clothing – Clothing to protect against heat and flame – Minimum performance requirements
19. EN 61511 (Parts 1-4) Functional safety - Safety instrumented systems for the process industry sector

Appendix 2: Tank Capacity



The above diagram shows:

- Nominal Capacity – total internal volume in m³ from the bottom to the top of the storage tank
- Unavailable Capacity - internal volume in m³ from the storage tank draw off pipe to the bottom of the storage tank plus the internal volume in m³ from the overfill/vent pipe to the top of the storage tank
- Available Capacity - internal volume in m³ from the storage tank draw off pipe to the overfill/ vent pipe
- Safe Working Capacity - 90% of the available tank capacity in m³.

The tank capacity can be calculated for example from physical measurements of height, diameter and location of draw off and overfill/vent pipes or by calculation using information from drawings supplied by e.g. the tank manufacturer. It must be considered that the tank capacity can reduce over time due to formation of deposits on the inner surfaces.

Remember that the conversion from mass to volume (and vice versa) includes the temperature dependent density of the bitumen; consult with your supplier for more information. In the example below, a density of 0,92 tonnes/m³ has been used:

	Mass [tonnes]	Volume [m³]
Nominal capacity	100,0	108,7
Unavailable capacity	6,0	6,5
Available capacity	94,0	102,2
Safe working capacity	84,6	91,9

As can be seen from the above, the storage tank is only capable of safely storing 84,6 tonnes of bitumen and not the 100 tonnes implied.