

## EUROPEAN PARLIAMENT AND COUNCIL DIRECTIVE 94/63/EC

of 20 December 1994

on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

transboundary fluxes, which provides for a considerable reduction of the VOC emissions;

Having regard to the Treaty establishing the European Community, and in particular Article 100a thereof,

Whereas a significant step in a strategy for an overall reduction of VOC emissions in the Community was taken by Council Directive 91/441/EEC of 26 June 1991 amending Directive 70/220/EEC on the approximation of the laws of the Member States relating to measures to be taken against air pollution by emissions from motor vehicles<sup>(5)</sup> which aims at reducing by some 80 to 90 %, over 10 to 15 years, VOC emissions from tail-pipe exhaust gases and evaporative emissions from motor vehicles, representing some 40 % of the present emissions of man-made VOCs to the atmosphere; whereas, at the time of adoption of that Directive, the Commission was requested to submit a proposal for a Directive on the measures to reduce evaporation losses at every stage in the process of storage and distribution of motor fuels;

Having regard to the proposal from the Commission<sup>(1)</sup>,

Having regard to the opinion of the Economic and Social Committee<sup>(2)</sup>,

Acting in accordance with the procedure referred to in Article 189b of the Treaty<sup>(3)</sup>,

Whereas the VOC emissions from the system for storage and distribution of petrol represent some 500 000 tonnes per year or some 5 % of the total emissions of man-made VOCs in the Community; whereas these emissions, represent a significant contribution to air pollution especially in urban areas;

Whereas successive programmes of action of the European Communities on the protection of the environment<sup>(4)</sup> have stressed the importance of preventing and reducing air pollution;

Whereas available technologies can ensure a considerable reduction of the evaporative losses in the distribution system for petrol, not least through the recovery of vapours which are displaced;

Whereas emissions of volatile organic compounds (VOCs) from petrol and solvents in the Community would be in the order of 10 million tonnes per year if no control measures were taken; whereas VOC emissions contribute to the formation of photochemical oxidants such as ozone, which in high concentrations can impair human health and damage vegetation and materials; whereas some of the VOC emissions from petrol are classified as toxic, carcinogenic or teratogenic;

Whereas on 2 April 1992 the Community signed the Protocol to the 1979 Convention on long range transboundary air pollution concerning the control of emissions of volatile organic compounds (VOCs) or their

Whereas, on grounds of international standardization and of safety during the loading of ships, standards must be drawn up at International Maritime Organization level for vapour control and recovery systems to apply to both loading installations and ships; whereas the Community must therefore endeavour to ensure that the necessary provisions are introduced into the Marpol Convention during the current revision of Marpol due to be completed in 1996; whereas in the event that the Marpol Convention is not so revised, the Community, after discussion with its major trading partners, should propose appropriate measures to apply to ships and port installations servicing ships;

(1) OJ No C 227, 3. 9. 1992, p. 3 and OJ No C 270, 6. 10. 1993, p. 12.

(2) OJ No C 73, 15. 3. 1993, p. 6.

(3) Opinion of the European Parliament of 24 June 1994 (OJ No C 194, 19. 7. 1993, p. 325), Council common position of 4 October 1993 (not yet published in the Official Journal) and Decision of the European Parliament of 9 March 1994 (OJ No C 91, 28. 3. 1994, p. 82). Confirmed on 2 December 1994 (OJ No C 342, 20. 12. 1993, p. 15). Joint text of the Conciliation Committee of 8 November 1994.

(4) OJ No C 112, 20. 12. 1973, p. 1, OJ No C 139, 13. 6. 1977, p. 1; OJ No C 46, 17. 2. 1983, p. 1 and OJ No C 328, 7. 12. 1987, p. 1.

(5) OJ No L 242, 30. 8. 1991, p. 1.

Whereas further action will be needed to reduce the vapour emissions during refuelling operations at service stations, which at present amount to some 200 000 tonnes per year, thereby controlling all vapour emissions during the distribution of petrol;

Whereas, in order to avoid distortion of competition and in order to ensure the operation of the internal market, it is necessary to harmonize certain measures concerning the distribution of petrol on the basis of a high level of environmental protection;

Whereas account should nevertheless be taken of the advantages and burdens which may result from action or the absence of action; whereas it is therefore appropriate to provide for the possibility of derogations and sometimes of exclusions in certain cases; whereas certain Member States should also be given the option of longer periods in which to adapt in order to take account of any major environmental measures of differing kinds which they may already have adopted in this area or of the particular burden imposed by the measures in this Directive owing to the structure of their networks;

Whereas Community action must take account of environmental conditions in the various regions of the Community; whereas in this connection Member States must be able to uphold or impose more stringent measures relating to the evaporative losses from fixed installations throughout their territory or in geographical areas where it is established that such measures are necessary for the protection of human health or the environment because of special conditions;

Whereas the provisions of paragraph 1 of Articles 3, 4 and 6 of this Directive apply without prejudice to Council Directive 83/189/EEC of 28 March 1983 laying down a procedure for the provision of information in the field of technical standards and regulations;

Whereas it is necessary to introduce harmonized specifications for the equipment for bottom loading of road tankers in order to ensure the possibility of free trade in petrol and equipment within the Community and to ensure a high level of safety; whereas provision should be made for standardizing such specifications and adapting them to technical progress;

Whereas a committee should be set up to assist the Commission in adapting the Annexes to this Directive to technical progress,

HAVE ADOPTED THIS DIRECTIVE:

#### Article 1

##### Scope

This Directive shall apply to the operations, installations, vehicles and vessels used for storage, loading and transport of petrol from one terminal to another or from a terminal to a service station.

#### Article 2

##### Definitions

For the purpose of this Directive:

- (a) 'petrol' shall mean any petroleum derivative, with or without additives, having a Reid vapour pressure of 27,6 kilopascals or more, which is intended for use as a fuel for motor vehicles, except liquefied petroleum gas (LPG);
- (b) 'vapours' shall mean any gaseous compound which evaporates from petrol;
- (c) 'storage installation' shall mean any stationary tank at a terminal used for the storage of petrol;
- (d) 'terminal' shall mean any facility which is used for the storage and loading of petrol onto road tankers, rail tankers, or vessels, including all storage installations on the site of the facility;
- (e) 'mobile container' shall mean any tank, transported by road, rail or waterways used for the transfer of petrol from one terminal to another or from a terminal to a service station;
- (f) 'service station' shall mean any installation where petrol is dispensed to motor vehicle fuel tanks from stationary storage tanks;
- (g) 'existing' petrol storage installations, loading installations, service stations and mobile containers shall mean such installations, service stations and mobile containers which were in operation before the date referred to in Article 10 or for which an individual construction licence or operating licence, where required under national legislation, was granted before the date referred to in Article 10;
- (h) 'new' in relation to petrol storage installations, loading installations, service stations and mobile containers shall mean such installations, service stations and mobile containers which are not covered by paragraph (g);

(<sup>1</sup>) OJ No L 109, 26. 4. 1983, p. 8. Directive as last amended by Commission Decision 92/400/EEC (OJ No L 221, 6. 8. 1992, p. 55).

- (i) 'throughput' shall mean the largest total annual quantity of petrol loaded from a storage installation at a terminal or from a service station into mobile containers during the three preceding years;
- (j) 'vapour-recovery unit' shall mean equipment for the recovery of petrol from vapours including any buffer reservoir systems at a terminal;
- (k) 'vessel' shall mean an inland waterway vessel as defined in Chapter 1 of Council Directive 82/714/EEC of 4 October 1982 laying down technical requirements for inland waterway vessels <sup>(1)</sup>;
- (l) 'target reference value' shall mean the guideline given for the overall assessment of the adequacy of technical measures in the Annexes and is not a limit value against which the performance of individual installations, terminals and service stations will be measured;
- (m) 'intermediate storage of vapours' shall mean the intermediate storage of vapours in a fixed roof tank at a terminal for later transfer to and recovery at another terminal. The transfer of vapours from one storage installation to another at a terminal shall not be considered as intermediate storage of vapour within the meaning of this Directive;
- (n) 'loading installation' shall mean any facility at a terminal at which petrol can be loaded onto mobile containers. Loading installations for road tankers comprise one or more 'gantries';
- (o) 'gantry' shall mean any structure at a terminal at which petrol can be loaded on to a single road tanker at any one time.

### Article 3

#### Storage installations at terminals

1. Storage installations shall be designed and operated in accordance with the technical provisions of Annex I.

These provisions are designed to reduce the total annual loss of petrol resulting from loading and storage at each storage installation at terminals to below the target reference value of 0,01 weight by weight (w/w) % of the throughput.

Member States may maintain or require more stringent measures throughout their territory or in geographical areas where it is established that such measures are necessary for the protection of human health or the environment owing to specific conditions.

Member States may adopt technical measures for the reduction of losses of petrol other than those set down in Annex I if such alternative measures are demonstrated to have at least the same efficiency.

<sup>(1)</sup> OJ No L 301, 28. 10. 1982, p. 1.

Member States shall inform the other Member States and the Commission of any existing measures or of any special measures referred to in this paragraph which they contemplate taking and of their grounds for taking them.

2. The provisions of paragraph 1 shall apply:

- (a) from the date referred to in Article 10 for new installations;
- (b) three years from the date referred to in Article 10 for existing installations if the throughput loaded at a terminal is greater than 50 000 tonnes/year;
- (c) six years from the date referred to in Article 10 for existing installations if the throughput loaded at a terminal is greater than 25 000 tonnes/year;
- (d) nine years from the date referred to in Article 10 for all other existing storage installations at terminals.

### Article 4

#### Loading and unloading of mobile containers at terminals

1. Loading and unloading equipment shall be designed and operated in accordance with the technical provisions of Annex II.

These provisions are designed to reduce the total annual loss of petrol resulting from loading and unloading of mobile containers at terminals to below the target reference value of 0,005 w/w % of the throughput.

Member States may maintain or require more stringent measures throughout their territory or in geographical areas where it is established that such measures are necessary for the protection of human health or the environment owing to specific conditions.

Member States may adopt technical measures for the reduction of losses of petrol other than those set down in Annex II if such alternative measures are demonstrated to have at least the same efficiency.

Member States shall inform the other Member States and the Commission of any existing measures or of any special measures referred to in this paragraph which they contemplate taking and of their grounds for taking them. The Commission shall verify the compatibility of these measures with the provisions of the Treaty and those of this paragraph.

All terminals with loading facilities for road tankers shall be equipped with at least one gantry which meets the specifications for bottom-loading equipment laid down in Annex IV. These specifications shall be re-examined at regular intervals and, if appropriate, shall be revised in accordance with the procedure laid down in Article 8.

2. The provisions of paragraph 1 shall apply:
- (a) from the date referred to in Article 10 for new terminals for loading onto road tankers, rail tankers and/or vessels;
  - (b) three years from the date referred to in Article 10 for existing terminals for loading onto road tankers, rail tankers and/or vessels if the throughput is greater than 150 000 tonnes/year;
  - (c) six years from the date referred to in Article 10 for existing terminals for loading onto road tankers and rail tankers if the throughput is greater than 25 000 tonnes/year;
  - (d) nine years from the date referred to in Article 10 for all other existing loading installations at terminals for loading onto road tankers and rail tankers.
3. Nine years after the date referred to in Article 10 the requirements for bottom-loading equipment set in Annex IV shall apply to all road tanker loading gantries at all terminals unless exempted under the terms of paragraph 4.
4. By way of derogation, paragraphs 1 and 3 shall not apply:
- (a) to existing terminals with a throughput of less than 10 000 tonnes/year and;
  - (b) to new terminals with a throughput of less than 5 000 tonnes/year located in small remote islands.
- Member States shall inform the Commission of terminals concerned by such a derogation through the reporting arrangements referred to in Article 9.
5. The Kingdom of Spain may grant a derogation of one year from the time limit set down in paragraph 2 (b).

#### Article 5

##### Mobile containers

1. Mobile containers shall be designed and operated in accordance with the following requirements:
- (a) mobile containers shall be designed and operated so that residual vapours are retained in the container after unloading of petrol;
  - (b) mobile containers which supply petrol to service stations and terminals shall be designed and operated so as to accept and retain return vapours from the storage installations at the service stations or terminals. For rail tankers this is only required if they supply petrol to service stations or to terminals where intermediate storage of vapours is used;
  - (c) except for release through the pressure relief valves, the vapours mentioned in subparagraphs (a) and (b) shall be retained in the mobile container until reloading takes place at a terminal.

If after the unloading of petrol the mobile container is subsequently used for products other than petrol, in so far as vapour recovery or intermediate storage of vapours is not possible, ventilation may be permitted in a geographical area where emissions are unlikely to contribute significantly to environmental or health problems;

- (d) the Member States' competent authorities must ensure that road tankers are regularly tested for vapour tightness and that vacuum/pressure valves on all mobile containers are periodically inspected for correct functioning.

2. The provisions of paragraph 1 shall apply:

- (a) from the date referred to in Article 10 for new road tankers, rail tankers and vessels;
- (b) three years from the date referred to in Article 10 for existing rail tankers and vessels if loaded at a terminal to which the requirement of Article 4 (1) applies;
- (c) for existing road tankers when retrofitted for bottom loading in accordance with the specifications laid down in Annex IV.

3. By way of derogation, the provisions of paragraph 1, subparagraphs (a), (b) and (c) shall not apply to losses of vapours resulting from measuring operations using dipsticks in relation to:

- (a) existing mobile containers; and
- (b) new mobile containers which come into operation during the four years following the date referred to in Article 10.

#### Article 6

##### Loading into storage installations at service stations

1. Loading and storage equipment shall be designed and operated in accordance with the technical provisions of Annex III.

These provisions are designed to reduce the total annual loss of petrol resulting from loading into storage installations at service stations to below the target reference value of 0,01 w/w % of the throughput.

Member States may maintain or require more stringent measures throughout their territory or in geographical areas where it is established that such measures are necessary for the protection of human health or the environment owing to specific conditions.

Member States may adopt technical measures for the reduction of losses of petrol other than those set down in Annex III if such alternative measures are demonstrated to have at least the same efficiency.

Member States shall inform the other Member States and the Commission of any existing measures or of any special measures referred to in this paragraph which they contemplate taking and of their grounds for taking them.

2. The provisions of paragraph 1 shall apply:

- (a) from the date referred to in Article 10 for new service stations;
- (b) three years from the date referred to in Article 10:
  - for existing service stations with a throughput greater than 1 000 m<sup>3</sup>/year,
  - for existing service stations, regardless of their throughput, which are located under permanent living quarters or working areas;
- (c) six years from the date referred to in Article 10 for existing service stations with a throughput greater than 500 m<sup>3</sup>/year;
- (d) nine years from the date referred to in Article 10 for all other existing service stations.

3. By way of derogation, paragraphs 1 and 2 shall not apply to service stations with a throughput of less than 100 m<sup>3</sup>/year.

4. For service stations with an annual throughput of less than 500 m<sup>3</sup>/year, Member States may grant a derogation from the requirements of paragraph 1 where the service station is located in a geographical area or on a site where vapour emissions are unlikely to contribute significantly to environmental or health problems.

Member States shall inform the Commission of the details of the areas within which they intend to grant such derogation in the framework of the reporting arrangements referred to in Article 9 and subsequently of any changes to such areas.

5. The Kingdom of the Netherlands may grant a derogation from the timetable set down in paragraph 2, subject to the following conditions:

- the measures required by this Article are implemented as part of a broader, existing national programme for service stations which simultaneously addresses various environmental problems, such as water pollution, air pollution, ground pollution and waste pollution and the implementation of which is tightly scheduled,
- the timetable may only be varied by a maximum of two years, all programmes being completed within the time limit set out in paragraph 2 (d),
- the Commission shall be notified of the decision to diverge from the timetable set down in paragraph 2, including full information on the scope and deadline of the derogation.

6. The Kingdom of Spain and the Portuguese Republic may grant a derogation of one year from the time limit set down in paragraph 2 (b).

#### Article 7

##### Amendments to the Annexes

Except for the limit values referred to in Annex II, point 2, the amendments necessary for adapting the Annexes to this Directive to technical progress shall be adopted in accordance with the procedure specified in Article 8.

#### Article 8

##### The committee

1. The Commission shall be assisted by a committee composed of the representatives of the Member States and chaired by the representative of the Commission.

2. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

3. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

4. If on the expiry of three months from the date of referral to it the Council has not acted, the proposed measures shall be adopted by the Commission.

#### Article 9

##### Monitoring and reporting

The reports on the implementation of this Directive shall be established according to the procedure laid down in Article 5 of Council Directive 91/692/EEC of 23 December 1991 standardizing and rationalizing reports on the implementation of certain Directives relating to the environment<sup>(1)</sup>. The Commission is invited to

<sup>(1)</sup> OJ No L 377, 31. 12. 1991, p. 48.

accompany its first report where appropriate with proposals for the amendment of this Directive, including in particular the extension of the scope to include vapour control and recovery systems for loading installations and ships.

*Article 10*

**Transposition into national legislation**

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 31 December 1995. They shall forthwith inform the Commission thereof.

When these measures are adopted by Member States, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such a reference shall be laid down by the Member States.

2. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field governed by this Directive.

*Article 11*

**Final provision**

This Directive is addressed to the Member States.

Done at Brussels, 20 December 1994.

*For the European Parliament*

*The President*

K. HÄNSCH

*For the Council*

*The President*

K. KINKEL

## ANNEX I

## REQUIREMENTS FOR STORAGE INSTALLATIONS AT TERMINALS

1. The external wall and roof of tanks above ground must be painted in a colour with a total radiant heat reflectance of 70 % or more. These operations may be programmed so as to be carried out as part of the usual maintenance cycles of the tanks within a period of three years. Member States may grant a derogation from this provision where required for the protection of special landscape areas which have been designated by national authority.

This provision shall not apply to tanks linked to a vapour recovery unit which conforms with the requirements set out in Annex II, point 2.

2. Tanks with external floating roofs must be equipped with a primary seal to cover the annular space between the tank wall and the outer periphery of the floating roof and with a secondary seal fitted above the primary seal. The seals should be designed to achieve an overall containment of vapours of 95 % or more as compared to a comparable fixed-roof tank with no vapour-containment controls (that is a fixed-roof tank with only vacuum/pressure relief valve).

3. All new storage installations at terminals, where vapour recovery is required according to Article 4 of the Directive (see Annex II) must be either:

- (a) fixed-roof tanks connected to the vapour recovery unit in conformity with the requirements of Annex II; or
- (b) designed with a floating roof, either external or internal, equipped with primary and secondary seals to meet the performance requirements set down in point 2.

4. Existing fixed-roof tanks must either:

- (a) be connected to a vapour-recovery unit in conformity with the requirements of Annex II; or
- (b) have an internal floating roof with a primary seal which should be designed to achieve an overall containment of vapours of 90 % or more in relation to a comparable fixed-roof tank with no vapour controls.

5. The requirements for vapour-containment controls mentioned under points 3 and 4 do not apply to fixed-roof tanks at terminals, where intermediate storage of vapours is permitted according to Annex II, point 1.

## ANNEX II

## REQUIREMENTS FOR LOADING AND UNLOADING INSTALLATIONS AT TERMINALS

1. Displacement vapours from the mobile container being loaded must be returned through a vapour-tight connection line to a vapour recovery unit for regeneration at the terminal.

This provision does not apply to top-loading tankers as long as that loading system is permitted.

At terminals which load petrol onto vessels, a vapour incineration unit may be substituted for a vapour recovery unit if vapour recovery is unsafe or technically impossible because of the volume of return vapour. The requirements concerning atmospheric emissions from the vapour recovery unit shall also apply to the vapour incineration unit.

At terminals with a throughput of less than 25 000 tonnes/year, intermediate storage of vapours may be substituted for immediate vapour recovery at the terminal.

2. The mean concentration of vapours in the exhaust from the vapour recovery — unit corrected for dilution during treatment — must not exceed 35 g/normal cubic metre (Nm<sup>3</sup>) for any one hour.

For vapour recovery units, installed before 1 January 1993, the United Kingdom may grant a derogation from the limit value of 35 g/Nm<sup>3</sup> for any one hour, set down in this Annex, subject to the following conditions:

- the installation shall meet a limit value of 50 g/Nm<sup>3</sup> for any one hour measured according to the specifications set down in this Annex,
- the derogation shall expire at the latest nine years from the date referred to in Article 10 of the Directive,
- the Commission shall be notified of the individual installations affected by this derogation including information on their throughput of petrol and vapour emissions from the installation.

The Member States' competent authorities must ensure that the measurement and analysis methods and their frequency are established.

The measurements must be made over the course of one full working day (seven hours minimum) of normal throughput.

Measurements may be continuous or discontinuous. If discontinuous measurements are employed, at least four measurements per hour must be made.

The overall measurement error due to the equipment used, the calibration gas and the procedure used must not exceed 10 % of the measured value.

The equipment used must be capable of measuring concentrations at least as low as 3 g/Nm<sup>3</sup>.

The precision must be at least 95 % of the measured value.

3. The Member States' competent authorities must ensure that the connection lines and pipe installations are checked regularly for leaks.

4. The Member States' competent authorities must ensure that loading operations are shut down at the gantry in the case of a leak of vapour. Equipment for such shutdown operations must be installed at the gantry.

5. Where top-loading of mobile containers is permissible, the outlet of the loading arm must be kept near the bottom of the mobile container, in order to avoid splash loading.

## ANNEX III

## REQUIREMENTS FOR LOADING AND STORAGE INSTALLATIONS AT SERVICE STATIONS AND TERMINALS WHERE THE INTERMEDIATE STORAGE OF VAPOURS IS CARRIED OUT

Vapours displaced by the delivery of petrol into storage installations at service stations and in fixed-roof tanks used for the intermediate storage of vapours must be returned through a vapour-tight connection line to the mobile container delivering the petrol. Loading operations may not take place unless the arrangements are in place and properly functioning.

## ANNEX IV

## SPECIFICATIONS FOR BOTTOM-LOADING, VAPOUR COLLECTION AND OVERFILL PROTECTION OF EUROPEAN ROAD TANKERS

## 1. Couplings

- 1.1. The liquid coupler on the loading arm must be a female coupler which must mate with a 4-inch API (101,6 mm) male adapter located on the vehicle as defined by:

— API Recommended Practice 1004  
Seventh Edition, November 1988.

Bottom loading and vapour recovery for MC-306 tank motor vehicles (Section 2.1.1.1 — Type of adapter used for bottom loading)

- 1.2. The vapour-collection coupler on the loading-gantry vapour-collection hose must be a cam-and-groove female coupler which must mate with a 4-inch (101,6 mm) cam-and-groove male adapter located on the vehicle as defined by:

— API Recommended Practice 1004  
Seventh Edition November 1988.

Bottom loading and vapour recovery for MC-306 tank motor vehicles (Section 4.1.1.2 — Vapour-recovery adapter)

## 2. Loading conditions

- 2.1. The normal liquid-loading rate must be 2 300 litres per minute (maximum 2 500 litres per minute) per loading arm.

- 2.2. When the terminal is operating at peak demand, its loading gantry vapour collection system, including the vapour-recovery unit, is allowed to generate a maximum counterpressure of 55 millibar on the vehicle side of the vapour-collection adapter.

- 2.3. All approved bottom-loading vehicles will carry an identification plate which specified the maximum permitted number of loading arms which may be operated simultaneously whilst ensuring that no vapours are released via the compartment P and V valves, when the maximum plant back pressure is 55 millibar as specified in 2.2.

## 3. Connection of vehicle earth/overflow detection

The loading gantry must be equipped with an overflow-detection control unit which, when connected to the vehicle, must provide a fail-safe permission signal to enable loading, providing no compartment-overflow sensors detect a high level.

- 3.1. The vehicle must be connected to the control unit on the gantry via a 10-pin industry-standard electrical connector. The male connector must be mounted on the vehicle and the female connector must be attached to a flying lead connected to the gantry-mounted control unit.

- 3.2. The high-level detectors on the vehicle must be either 2-wire thermistor sensors, 2-wire optical sensors, 5-wire optical sensors or a compatible equivalent, provided the system is fail-safe. (NB: thermistors must have a negative temperature coefficient.)
- 3.3. The gantry control unit must be suitable for both 2-wire and 5-wire vehicle systems.
- 3.4. The vehicle must be bonded to the gantry via the common return wire of the overfill sensors, which must be connected to pin 10 on the male connector via the vehicle chassis. Pin 10 on the female connector must be connected to the control-unit enclosure which must be connected to the gantry earth.
- 3.5. All approved bottom-loading vehicles must carry an identification plate (see 2.3) which specifies the type of overfill-detection sensors installed (i. e. 2-wire or 5-wire).

#### 4. Location of the connections

- 4.1. The design of the liquid-loading and vapour collection facilities on the loading gantry must be based on the following vehicle-connection envelope.
  - 4.1.1. The height of the centre line of the liquid adapters must be: maximum 1,4 metres (unladen); minimum 0,5 metre (laden), the preferred height being 0,7 to 1,0 metres).
  - 4.1.2. The horizontal spacing of the adapters must be not less than 0,25 metres (preferred minimum spacing is 0,3 metres).
  - 4.1.3. All liquid adapters must be located within an envelope not exceeding 2,5 metres in length.
  - 4.1.4. The vapour-collection adapter should be located preferably to the right of the liquid adapters and at a height not exceeding 1,5 metres (unladen) and not less than 0,5 metres (laden).
- 4.2. The earth/overfill connector must be located to the right of the liquid and vapour-collection adapters and at a height not exceeding 1,5 metres (unladen) and not less than 0,5 metre (laden).
- 4.3. The above connections must be located on one side of the vehicle only.

#### 5. Safety interlocks

##### 5.1. *Earth/Overfill detection*

Loading must not be permitted unless a permissive signal is provided by the combined earth/overfill control unit.

In the event of an overfill condition or a loss of vehicle earth, the control unit on the gantry must close the gantry-loading control valve.

##### 5.2. *Vapour-collection detection*

Loading must not be permitted unless the vapour-collection hose has been connected to the vehicle and there is a free passage for the displaced vapours to flow from the vehicle into the plant vapour-collection system.