

# Approved tank requirements

The provisions for bottom loading and vapour recovery systems of mobile containers carrying petrol

Carriage of Dangerous Goods by Road Regulations 1996

Carriage of Dangerous Goods by Rail Regulations 1996



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This guide gives the basic specification for petrol tanks which has to be met in order to comply with the Carriage of Dangerous Goods by Road Regulations 1996 and the Carriage of Dangerous Goods by Rail 1996.

It is aimed at anyone who designs, manufactures, imports, supplies, modifies, examines, tests, certifies or fills any tank which is being used (or is intended to be used) for the carriage of dangerous goods.

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This Code has been approved by the Health and Safety Executive, with the consent of the Secretary of State. It gives practical advice on how to comply with the law. If you follow the advice you will be doing enough to comply with the law in respect of those specific matters on which the Code gives advice. You may use alternative methods to those set out in the Code in order to comply with the law.

However, the Code has a special legal status. If you are prosecuted for breach of health and safety law, and it is proved that you did not follow the relevant provisions of the Code, you will need to show that you have complied with the law in some other way or a Court will find you at fault.

# Contents

**Notice of Approval 4**

**Introduction 5**

**Duty holders 6**

**Scope 6**

**Definitions 6**

**General requirements for mobile containers 7**

Residual vapours 7

Measurement of tank contents 7

**Specific requirements for road tankers 8**

Design of the liquid loading and discharge system 8

Design of the vapour recovery system 8

Overfill detection and vehicle earth 8

Location of the adaptors and connector 9

Safety interlocks and emergency shut-off valves 9

Provision of an information plate 9

Loading 10

Testing of pressure vacuum vent valves 10

Leakproofness testing of the tank and fittings 10

**Appendix 1** Specification for the 101.6 mm (4 inch) API bottom loading adaptor 11

**Appendix 2** Specification for the 101.6 mm male cam and groove adaptor 13

**Appendix 3** Location envelope on the road tanker for the couplings 14

**References 15**

## Notice of Approval

By virtue of section 15(4)(a) of the Health and Safety at Work etc Act 1974 and in accordance with regulation 5(1)(c) of the Carriage of Dangerous Goods by Road Regulations 1996 and regulation 3(1)(b) of the Carriage of Dangerous Goods by Rail Regulations 1996, the Health and Safety Commission has on 3 July 1996 approved this document entitled *Approved Tank Requirements* for the purposes of specifying the detailed tank requirements which have to be met in order to comply with the said Regulations.

The *Approved Tank Requirements* shall come into force on 1 September 1996.

Signed

TA GATES  
*Secretary to the Health and Safety Commission*  
16 August 1996

# Introduction

1 The *Approved Tank Requirements* has been approved by the Health and Safety Commission for the purposes of regulation 5(1)(c) of the Carriage of Dangerous Goods by Road Regulations 1996<sup>1</sup> (CDGRoad) and regulation 3(1)(b) of the Carriage of Dangerous Goods by Rail Regulations 1996<sup>2</sup> (CDGRail2).

## **2 CDGRoad and CDGRail2 impose requirements by reference to the *Approved Tank Requirements* and to that extent it is legally binding.**

3 The *Approved Tank Requirements* gives the basic specification for petrol tanks which has to be met in order to comply with CDGRoad and CDGRail2. CDGRoad, CDGRail2 and the *Approved Tank Requirements* implement that part of the European Parliament and Council Directive 94/63/EC on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations,<sup>3</sup> which applies to mobile containers.

4 Before CDGRoad came into force, the approved information necessary for the manufacture of tanks intended for the carriage of dangerous goods by road was contained in Codes of Practice which were approved under the Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations 1992.<sup>4</sup> The Approved Codes of Practice are:

- *Design and construction of vacuum operated road tankers used for the carriage of hazardous wastes;*<sup>5</sup>
- *Design and construction of road tankers used for the carriage of carbon disulphide;*<sup>6</sup>
- *Design and construction of vented, non-pressure road tankers used for the carriage of flammable liquids;*<sup>7</sup>
- *Design and construction of vacuum insulated road tankers used for the carriage of non-toxic deeply refrigerated gases.*<sup>8</sup>

5 Before CDGRail2 came into force, the information necessary for the manufacture of tanks intended for the carriage of dangerous goods by rail was contained in Group Standards which were approved by Railtrack.

6 The *Approved Tank Requirements* has been drawn up following consultations with representatives of the Confederation of British Industry (CBI), the Trades Union Congress (TUC), local authorities, independent experts, government departments and the Health and Safety Executive (HSE).

7 Before approving any revision to the *Approved Tank Requirements*, the Health and Safety Commission (HSC) consults relevant organisations and any revisions do not take effect until at least 6 months from the date of approval. However, during that time, consignors and operators may use the new revision if they so wish.

8 Within 3 months of the date of approval of any revision, HSC is required to publish a notice specifying the revision, the date on which it was approved and the date on which it takes effect. At the same time as the notice is published, HSE issues a press release announcing the approval of the revision. Users can check that this edition is still correct by contacting HSE's InfoLine.

9 Reference in this publication to another document does not imply approval by HSC except to the extent necessary to give effect to the *Approved Tank Requirements*.

10 The *Approved Tank Requirements* is one of three publications supporting the provisions of CDGRoad and CDGRail2. The other publications are the *Approved Carriage List*<sup>9</sup> and the *Approved Vehicle Requirements*.<sup>10</sup>

## Approved Tank Requirements

# Duty holders

11 The operator of any tank which is intended to be, or is being, used for the carriage of dangerous goods shall take all reasonable steps to ensure that such of the requirements specified in the *Approved Tank Requirements* as are relevant to that tank are complied with in relation thereto.

12 Any person who designs, manufactures, imports, supplies, modifies, repairs, examines, tests, certifies or fills any tank which is intended to be, or is being, used for the carriage of dangerous goods shall ensure, insofar as they are matters within his or her control, that such of the requirements specified in the *Approved Tank Requirements* as are relevant to that tank are complied with in relation thereto.

## Approved Tank Requirements

# Scope

13 The requirements of the *Approved Tank Requirements* apply to mobile containers intended to carry petrol (see definitions, paragraph 16) from one terminal (see definitions) to another, or from a terminal to a service station (see definitions). They apply to all mobile containers constructed after 31 August 1996 and to all existing road tankers which are retrofitted for bottom loading after 31 August 1996.

14 The *Approved Tank Requirements* gives a minimum specification for bottom loading and vapour recovery systems to ensure compatibility between the equipment of road tankers and the installation at terminals and at service stations.

## Approved Tank Requirements

# Definitions

15 Words and expressions which are defined in CDGRoad, CDGRail2 or in the Health and Safety at Work etc Act 1974 (HSW Act) have the same meaning in the *Approved Tank Requirements* unless the context requires otherwise or a definition is given in this publication. However, in the context of this publication, the term 'dangerous goods' has the same meaning as in the Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996<sup>11</sup> (CDGCPL2) except that it does not include explosives or radioactive material. Wherever a specific regulation is referred to by number, it is a regulation in either CDGRoad or CDGRail2 as appropriate.

16 For the purpose of the *Approved Tank Requirements*:

- (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) 'terminal' shall mean any facility which is used for the storage and loading of petrol onto road tankers, rail tank wagons, or vessels, including all storage installations on the site of the facility;
- (d) 'service station' shall mean any installation where petrol is dispensed to motor vehicle fuel tanks from stationary storage tanks;

## Approved Tank Requirements

- (e) 'mobile container' shall mean any tank, transported by road or rail used for the transfer of petrol from one terminal to another or from a terminal to a service station;
- (f) 'vapour-recovery unit' shall mean equipment for the recovery of petrol from vapours including any buffer reservoir systems at a terminal;
- (g) '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';
- (h) 'gantry' shall mean any structure at a terminal at which petrol can be loaded on to a single road tanker at anyone time.
- (i) '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.

## Approved Tank Requirements

# General requirements for mobile containers

### Residual vapours

17 Mobile containers shall satisfy the following requirements:

- (a) mobile containers shall be designed so that residual vapours are retained in the container after unloading of petrol, except for the release of internal overpressure through the pressure relief valves;
- (b) mobile containers which supply petrol to service stations and terminals shall be designed so that they can accept and retain return vapours from the storage installations at the service stations or terminals, except for the release of internal overpressure through the pressure relief valves. 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) mobile containers shall be designed so that the retained vapours referred to in sub-paragraphs (a) and (b) can be transferred to an installation designed to accept said vapours.

### Measurement of tank contents

18 The measurement of the content of a tank or compartment of a mobile container first taken into use after 31 December 1999 shall not be made by a method which involves opening any part of the tank which would allow vapour to be released into the atmosphere.

# Specific requirements for road tankers

## Design of the liquid loading and discharge system

19 The liquid loading and discharge pipework which is connected to the primary closure (foot valve) of each compartment of the tank shall terminate in a 101.6 mm (4 inch) API male adaptor as defined by section 2.1.1.1 of the API Recommended Practice 1004 *Bottom loading and vapour recovery for MC-306 tank motor vehicles* seventh edition, November 1988.<sup>12</sup> This specification is reproduced in Appendix 1.

## Design of the vapour recovery system

20 The vapour recovery pipework including any valves and fittings shall be designed so as to give as low a pressure resistance to vapour flow as is reasonably practicable.

21 The vapour recovery pipework shall be connected with a shut-off valve to each compartment so as to enable the compartment to be isolated from the pipework during the carriage operation.

22 The outlet of the vapour recovery pipework shall be terminated, at the end remote from the compartment, in a 101.6 mm cam and groove male adaptor (vapour collection adaptor). This 101.6 mm vapour recovery adaptor shall be as defined by section 4.1.1.2 of the API Recommended Practice 1004 *Bottom loading and vapour recovery for MC-306 tank motor vehicles* seventh edition, November 1988. This specification is reproduced in Appendix 2.

## Overfill detection and vehicle earth

23 The compartments of the tank shall be fitted at high level with sensors which will detect the level of the product before the tank becomes overfull.

24 The sensors shall be either 2-wire thermistor devices, 2-wire optical devices or 5-wire optical devices or a compatible equivalent, provided that the system is 'fail safe'. Thermistors shall be of the negative temperature coefficient type.

25 The sensors shall be connected to a 10-pin male connector which shall be compatible with the female connector providing the link with the gantry-mounted control unit. The 'common' return wire from each sensor shall be connected to the vehicle chassis which in turn shall be connected to pin number 10 of the male connector.



## Approved Tank Requirements

### Location of the adaptors and connector

26 The API male adaptor (liquid adaptor), the cam and groove vapour adaptor (vapour collection adaptor) and the 10-pin connector shall be located in accordance with the following requirements (see Appendix 3):

- (a) the height of the centre line of the liquid adaptors shall be: maximum 1.4 metres (unladen); minimum 0.5 metres (laden), the preferred height being 0.7 to 1.0 metres;
- (b) the horizontal spacing of the adaptors shall be not less than 0.25 metres (preferred minimum spacing is 0.3 metres);
- (c) all liquid adaptors shall be located within an envelope not exceeding 2.5 metres in length;
- (d) the vapour collection adaptor shall be located to the right of the liquid adaptors and at a height not exceeding 1.5 metres (unladen) and not less than 0.5 metres (laden).

27 The 10-pin connector shall be located to the right of the liquid and vapour collection adaptors and at a height not exceeding 1.5 metres (unladen) and not less than 0.5 metres (laden).

28 The above connections shall all be on the same side of the vehicle.

### Safety interlocks and emergency shut-off valves

29 Safety interlocks shall be provided:

- (a) to ensure that a vapour collection hose is connected to the vapour collection adaptor before loading can commence;
- (b) on each valve in the vapour collection system to ensure that the valves are open before loading of the relevant compartment can commence.

30 In the event of an accidental overfill or a loss of vehicle earth, the valves on the tanker shall not be used as the emergency shut-off of the liquid feed to the tank.

### Provision of an information plate

31 Every carrying tank of a road tanker subject to the provisions of the *Approved Tank Requirements* shall have securely fastened to it or to its support structure, in a readily accessible position, a corrosion-resistant plate on which the following information is indelibly marked:

- (a) the type of overfill detection sensors installed - 2-wire or 5-wire or a compatible equivalent (see paragraph 24);
- (b) the number of compartments that can be loaded simultaneously as determined in accordance with paragraph 33.

32 The above requirement will be satisfied if the information in sub-paragraphs 31(a) and 31(b) is included on a similar plate giving additional information for other purposes (eg the tank data plate).

## Approved Tank Requirements

### Loading

33 The number of compartments that can be loaded simultaneously is the number that, under the following conditions, will not cause vapour to be released through any of the pressure vacuum vent valves fitted to the relevant compartments:

- (a) liquid loading rate to each compartment 2500 litres per minute;
- (b) all valves, including the vapour collection adaptor, in the vapour collection system on the tanker shall be in the open position, except that any valve in the system which vents to atmosphere is in the closed position;
- (c) a back pressure of 55 millibar is present at the inlet (tank side) of the vapour collection adaptor. This back pressure should be created by equipment connected to the outlet of the vapour collection adaptor.

### Testing of pressure vacuum vent valves

34 Pressure vacuum vent valves shall be tested at intervals not exceeding 24 months to ensure the following:

- (a) the maximum leakage rate of the valve when it is in any orientation shall be not more than 15 ml in 30 minutes;
- (b) the valve will commence to open when the pressure or vacuum in the tank is within  $\pm 20\%$  of the appropriate nominal set pressure of the valve.

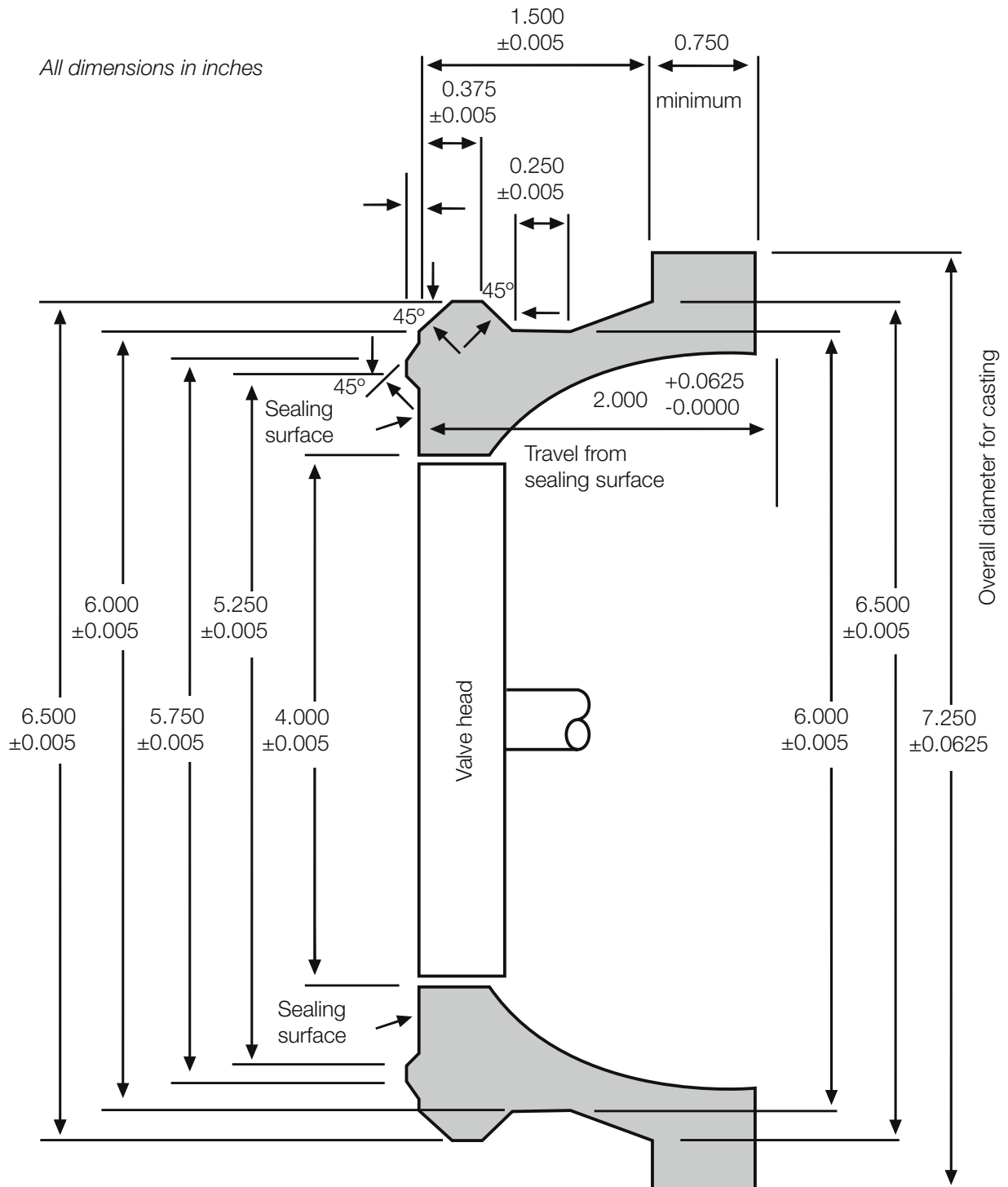
### Leakproofness testing of the tank and fittings

35 The tank and fittings (notwithstanding paragraph 34) shall be subject to a leakproofness test at intervals not exceeding 3 years.

# Appendix 1 - Specification for the 101.6 mm (4 inch) API bottom loading adaptor

1 This appendix reproduces the specification for the 101.6 mm male adaptor as required by paragraph 19 and given in section 2.1.1.1 of API Recommended Practice 1004 *Bottom loading and vapour recovery for MC-306 tank motor vehicles* seventh edition, November 1988.<sup>12</sup>

2 To mate with its loading couplers, the tank vehicle adaptor must have the basic configuration shown in Figure 1. In the open position, the adaptor must have a clear, unobstructed opening 50.8 mm (2 inches) in depth, measured from the outer face or closure of the valve. If a poppet device is used, the adaptor poppet must have a travel of 50.8 mm, measured from the sealing surface, as shown in Figure 1. The front face of the adaptor poppet must be flat within 0.102 mm (0.004 inches), excluding the corner radius. No fastening device shall protrude above the general plane of the adaptor face.



**Notes**

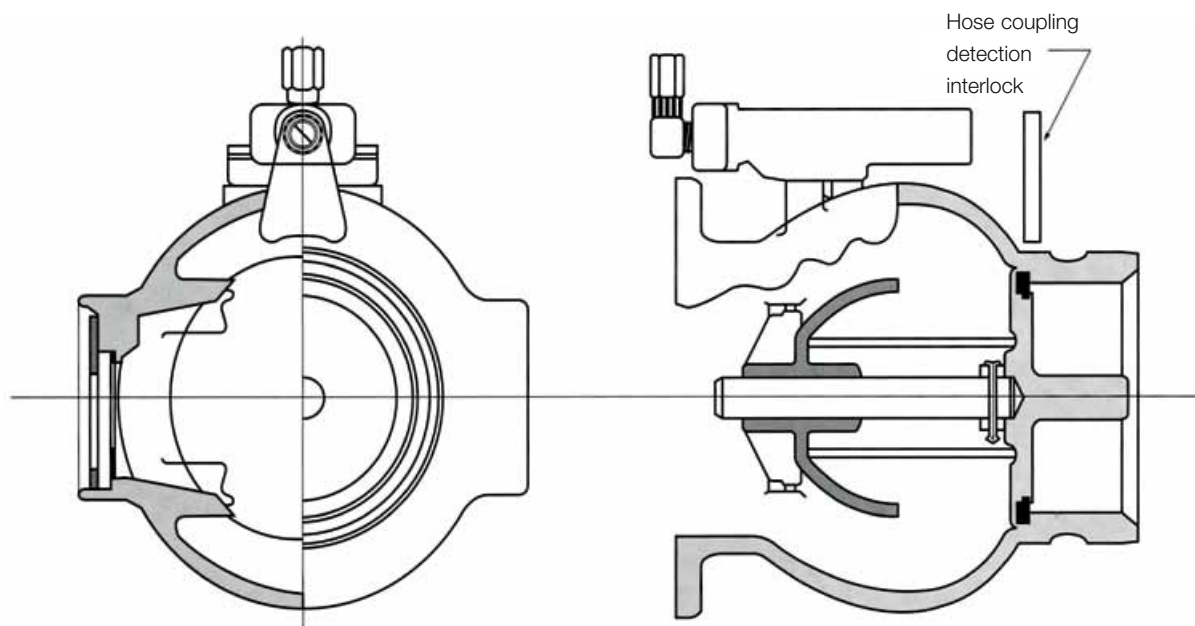
- |  |   |
|--|---|
| <p>1 The breaking of all corners required, not to exceed 0.125 inch radius</p> <p>2 The details of the adaptor body and internals other than shown on the drawing or outlined as standard criteria to be determined by manufacturer</p> <p>3 Valve head to be flush with sealing surface ±0.015 inch</p> | <p>4 63 micro finish on sealing surface</p> <p>5 Couplers must be capable of mating with maximum dimensions shown</p> <p>6 Modification of the adaptor to allow for connection interlocks must not affect the strength or security of the coupling design</p> |
|--|---|

**Figure 1** API adaptor nose

## Appendix 2 - Specification for the 101.6 mm male cam and groove adaptor

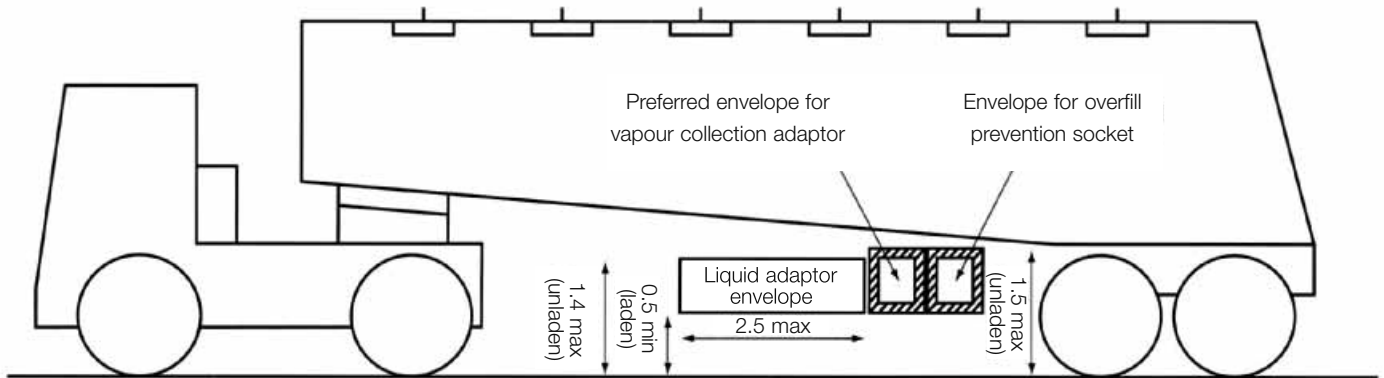
1 This appendix reproduces the specification for the 101.6 mm male adaptor as required by paragraph 22 and given in section 4.1.1.2 of API Recommended Practice 1004 *Bottom loading and vapour recovery for MC-306 tank motor vehicles* seventh edition, November 1988.<sup>12</sup>

2 The vapour recovery adaptor must be a 101.6 mm cam and groove, quick-coupling type conforming to US Military Specification MIL-C-27487 (see Figure 2). To avoid the possibility of connecting a product loading line to the vapour system, a bottom-loading adaptor must not be used for recovery of vapours.



**Figure 2** Typical 4 inch vapour collection adaptor

## Appendix 3 - Location envelope on the road tanker for the couplings



*All dimensions in metres*

**Figure 3** Road tank vehicle equipped for bottom loading and vapour collection

## References

- 1 *Carriage of Dangerous Goods by Road Regulations 1996* SI 1996/2095 HMSO ISBN 0 11 062926 4
- 2 *Carriage of Dangerous Goods by Rail Regulations 1996* SI 1996/2089 HMSO ISBN 011 062919 1
- 3 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 *Official Journal of the European Communities* Vol 37, No L365,24-33
- 4 *Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations 1992* SI 1992/743 HMSO ISBN 0 11 023743 9
- 5 *Design and construction of vacuum operated road tankers used for the carriage of hazardous wastes* Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations 1992 Approved Code of Practice LI9 HSE Books ISBN 0 7176 0564 7
- 6 *Design and construction of road tankers used for the carriage of carbon disulphide* Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations 1992 Approved Code of Practice LI7 HSE Books ISBN 0 11 886301 0 (out of print)
- 7 *Design and construction of vented, non-pressure road tankers used for the carriage of flammable liquids* Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations 1992 Approved Code of Practice LI6 HSE Books ISBN 0 11 886300 2
- 8 *Design and construction of vacuum insulated road tankers used for the carriage of non-toxic deeply refrigerated gases* Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations 1992 Approved Code of Practice LI8 HSE Books ISBN 0 11 8857495 (out of print)
- 9 *Approved Carriage List* L90 HSE Books ISBN 0 7176 1223 6
- 10 *Approved Vehicle Requirements* L89 HSE Books ISBN 0 7176 1222 8
- 11 *Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996* SI 1996/2092 HMSO ISBN 0 11 062923 X
- 12 American Petroleum Institute Recommended Practice 1004 *Bottom loading and vapour recovery for MC-306 tank motor vehicles* seventh edition, November 1988

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