

Australian Standard<sup>®</sup>

**Refined petroleum products—Vehicle  
bottom loading and vapour recovery**



This Australian Standard® was prepared by Committee ME-057, Road Tank Vehicles for Dangerous Goods. It was approved on behalf of the Council of Standards Australia on 17 March 2009.

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The following are represented on Committee ME-057:

- Air Liquide Australia
  - Australian Chamber of Commerce and Industry
  - Australian Industry Group
  - Australian Institute of Petroleum
  - Bitumen Users Group
  - Department of Consumer and Employment Protection, WA
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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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**Refined petroleum products—Vehicle  
bottom loading and vapour recovery**

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## PREFACE

This Standard was prepared by Standards Australia Committee ME-057, Road Tank Vehicles for Dangerous Goods. It is based on the Australian Institute of Petroleum (AIP) CP 6, *Vehicle bottom loading and vapour recovery*, which has been withdrawn.

The purpose of this Standard is to ensure that all tank vehicles fitted for bottom loading and vapour recovery are compatible and can be safely loaded at fill stands equipped for bottom loading, including those equipped for vapour recovery. This Standard also covers unloading into receiving tanks.

This Standard is intended to apply in conjunction with, but not take precedence over, regulatory requirements issued by statutory authorities having jurisdiction over environmental matters and the storage and handling of dangerous goods.

Individual companies may have requirements and procedures that are additional to those set out in this Standard.

Statements expressed in mandatory terms in notes to Figures are deemed to be requirements of this Standard.

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## STANDARDS AUSTRALIA

## Australian Standard

**Refined petroleum products—Vehicle bottom loading and vapour recovery**

## SECTION 1 SCOPE AND GENERAL

**1.1 SCOPE**

This Standard provides requirements and recommendations for use by the refined petroleum industry in terms of vapour recovery equipment for vehicles equipped for bottom loading and for vehicle fill stands designed for bottom loading and having vapour recovery facilities. It covers the design and operation of vapour recovery equipment on vehicles and fill stands.

The purpose of this Standard is to ensure that all tank vehicles fitted for bottom loading and vapour recovery are compatible and can be safely loaded at fill stands equipped for bottom loading, including those equipped for vapour recovery. It also covers unloading into receiving tanks.

It is intended to be used in conjunction with regulations relating to environmental matters and the storage and handling of dangerous goods.

**1.2 APPLICATION**

This Standard applies to the following:

- (a) Product connections for loading.
- (b) Vapour connections.
- (c) Overfill protection systems.
- (d) Interlocks on the fill stand.
- (e) Requirements when unloading.
- (f) Requirements when vapour recovery is not required.

This Standard covers those elements that need to be standardized in order to achieve safe operation.

**1.3 REFERENCED DOCUMENTS**

The following documents are referred to in this Standard:

AS

2809 Road tank vehicles for dangerous goods

2809.1 Part 1: General requirements for all road tank vehicles

2809.2 Part 2: Road tank vehicles for flammable liquids

US DEPARTMENT OF DEFENSE

MIL-C-27487 Coupling halves, quick-disconnect, cam-locking type

**1.4 DEFINITIONS AND ABBREVIATIONS**

For the purposes of this Standard, the following definitions apply:

**1.4.1 Adaptor**

The male part of a connection between a pipe and a hose.

**1.4.2 ADG Code**

The Australian Dangerous Goods Code, published by the National Transport Commission.

**1.4.3 AIP**

The Australian Institute of Petroleum.

**1.4.4 API**

The American Petroleum Institute.

**1.4.5 Approved**

Approved by the purchaser.

**1.4.6 Coupler**

The female part of a connection between a pipe and a hose.

**1.4.7 Shall**

Indicates that a statement is mandatory.

**1.4.8 Should**

Indicates a recommendation.

**1.4.9 Switch loading**

The loading of a low vapour pressure product into a compartment that previously contained a high vapour pressure product.

**1.4.10 VR**

Vapour recovery.

**1.4.11 VT**

Vapour transfer.

**1.5 ROAD TANK VEHICLES**

Vehicles shall comply with AS 2809, Parts 1 and 2.

## SECTION 2 PRODUCT CONNECTIONS FOR LOADING

### 2.1 SCOPE OF SECTION

This Section sets out requirements for adaptors and couplers used when loading product.

### 2.2 ADAPTOR SPECIFICATION

Adaptors fitted to vehicles shall be self-sealing 100 mm API industry standard adaptors as shown in Figure 2.1.

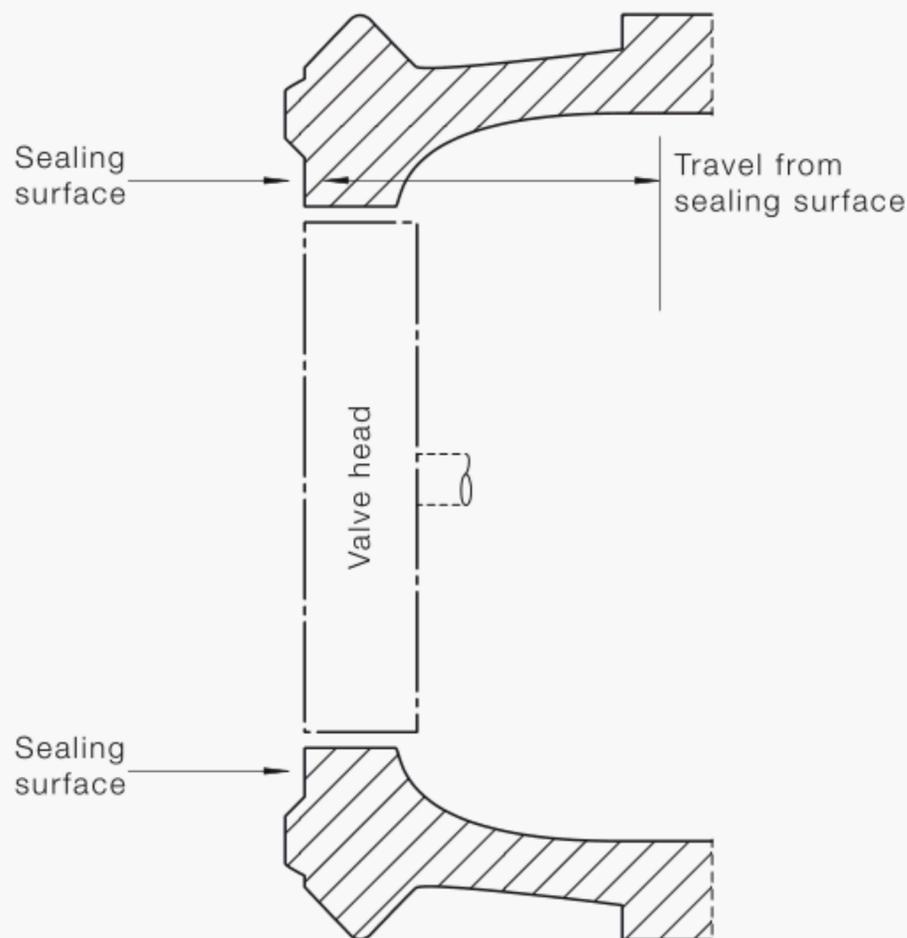


FIGURE 2.1 TYPICAL 100 mm STANDARD TANK VEHICLE ADAPTOR

### 2.3 COUPLER SPECIFICATIONS

The following requirements apply to couplers:

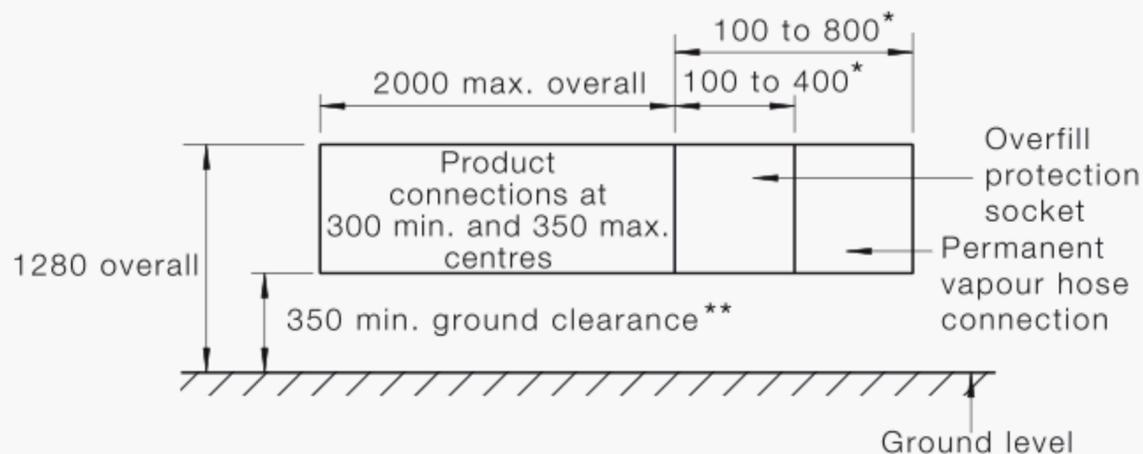
- (a) The coupler fitted to the fill stand shall be a self-sealing 100 mm API industry standard coupler to mate with the industry adaptor.
- (b) The loader coupler shall accommodate adaptors mounted at any slope between  $0^\circ$  and  $25^\circ$  downwards from horizontal.
- (c) The coupler adaptor shall be interlocked so that it cannot be opened or closed unless it is connected.

## 2.4 LOCATION OF ADAPTORS

Adaptors shall be located on the tank vehicle generally as illustrated in Figure 2.2.

### NOTES:

- 1 Figure 2.2(a) illustrates the connection envelope of fittings, not including handles.
- 2 Figure 2.2(b) illustrates the angle of connections (dry break to loading arm).
- 3 Figure 2.2(c) illustrates the recommended distances from underrun protection to ground and dry break fittings (these distances can be minimized if a gate facility is operated to ensure unimpeded access).

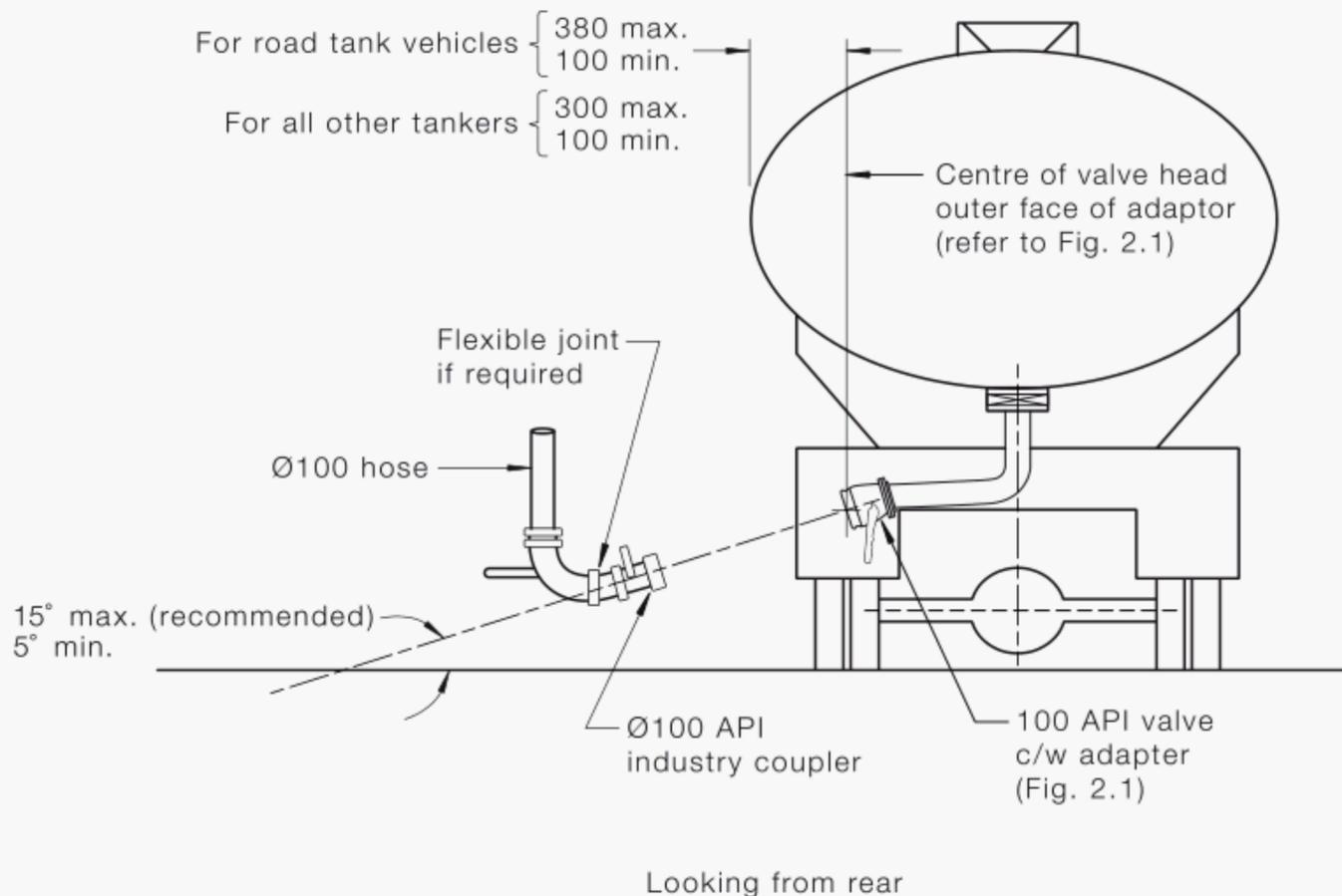


\* Position within envelope so no interference occurs when hose is in use

\*\* To comply with AS 2809

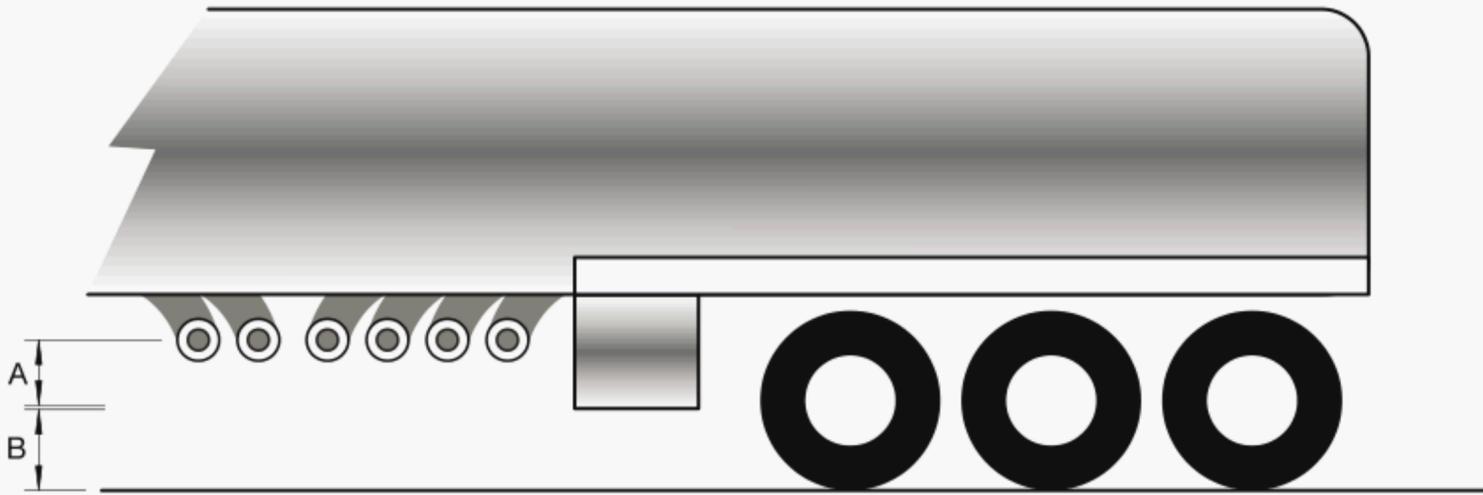
NOTE: Envelope of outer surfaces of fittings does not include handles.

(a) Truck connection location envelopes



(b) Cross-section

FIGURE 2.2 (in part) TANK CONNECTION LOCATIONS

**Legend**

A = 240mm (to fit loading as attachment)

B = 400mm\* (to allow slops bucket to fit)

\*Hinged bar may be used to lessen distance

A = Depth from API to underrun

B = Depth from underrun to ground

(c) Underrun protection clearance

DIMENSIONS IN MILLIMETRES

FIGURE 2.2 (in part) TANK CONNECTION LOCATIONS

## SECTION 3 VAPOUR RECOVERY CONNECTIONS

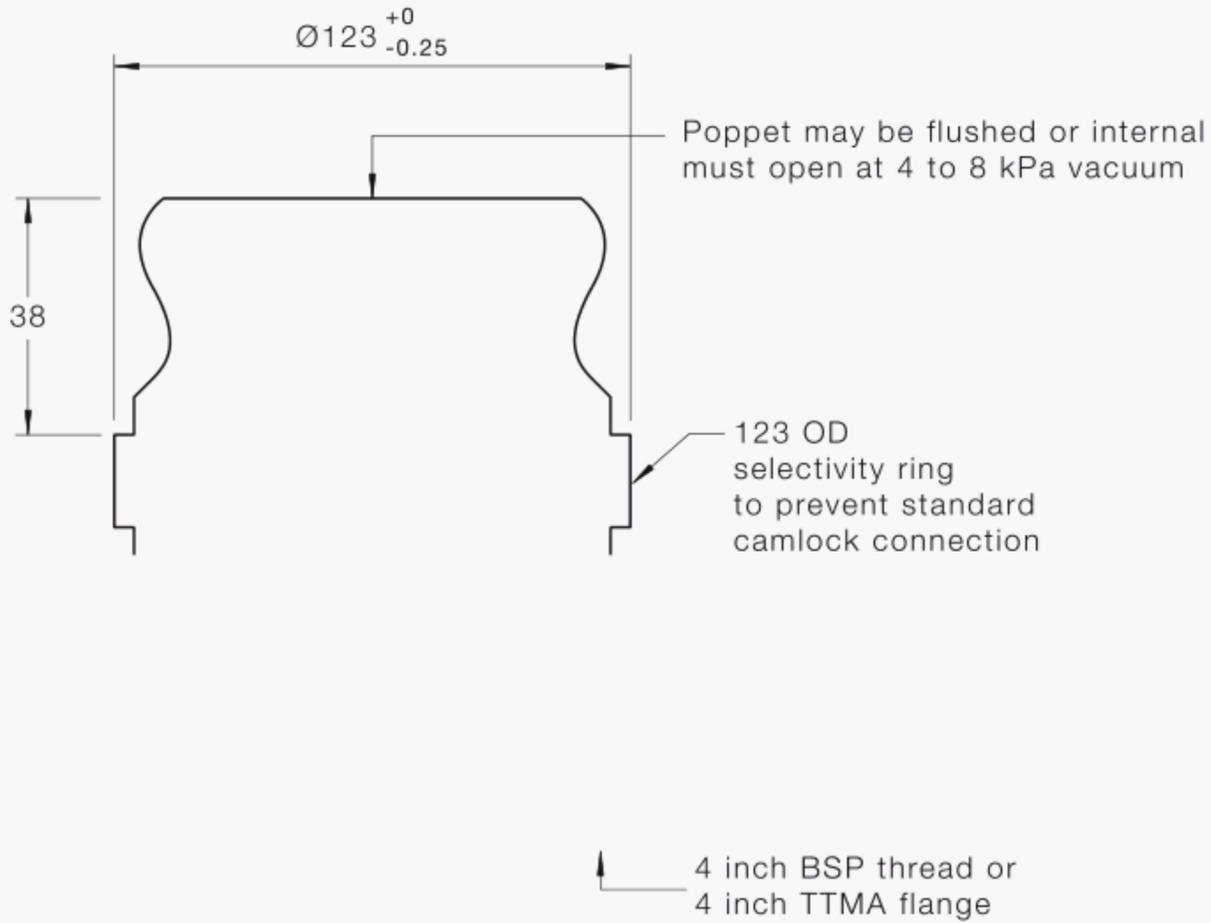
### 3.1 SCOPE OF SECTION

This Section sets out requirements for vapour recover connections, including adaptors, couplers, hoses and piping.

### 3.2 REQUIREMENTS FOR ADAPTORS AND COUPLERS

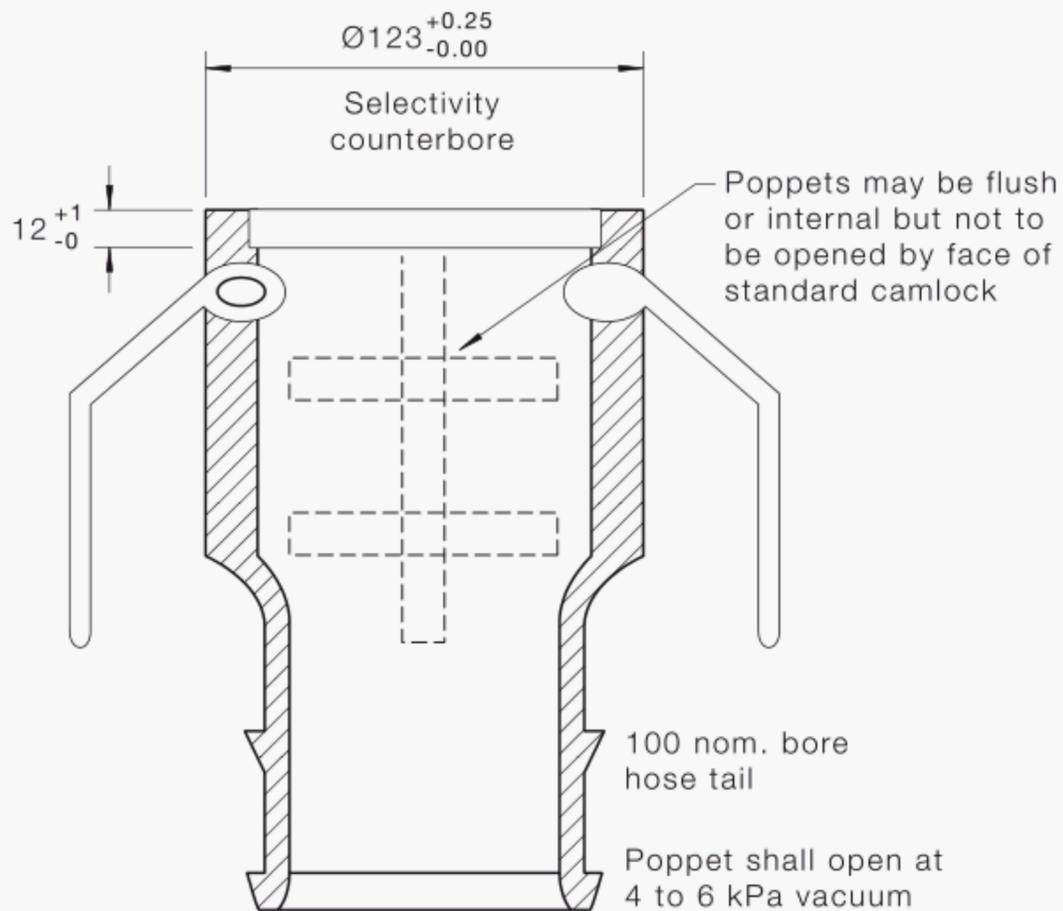
The following requirements apply:

- (a) Adaptors and couplers shall be—
  - (i) 101.6 mm (4 inch) cam and groove quick-coupling type (camlock), conforming to US MIL-C-27487 (NATO type);
  - (ii) self-sealing; and
  - (iii) opening under an external pressure of 4 to 6 kPa to provide vacuum relief.
- (b) Vapour recovery adaptors shall be fitted with an interference selectivity ring in order to prevent wrong connection, as shown in Figure 3.1.
- (c) Vapour recovery couplings shall be over-bored to match the adaptor, as shown in Figure 3.2.
- (d) Pressure drop across the coupled units shall be less than 4 kPa at 6000 L/min flow of free air.
- (e) Couplings shall open automatically when connected, and close when disconnected.
- (f) Any new designs shall be compatible with existing couplers, adaptors and vapour recovery elbows.



DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN

FIGURE 3.1 TYPICAL 100 mm VAPOUR RECOVERY ADAPTOR



Low area around poppet in open position = 4550 m<sup>2</sup>

DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN

FIGURE 3.2 TYPICAL 100 mm VAPOUR RECOVERY COUPLER WITH POPPET PROBE

### 3.3 VAPOUR RECOVERY HOSE AND PIPING

The following requirements shall apply:

- (a) The vapour hose shall be at least 3 m long, and preferably 4 m, permanently mounted to the vehicle vapour collection system within the envelope shown in Figure 2.2(a).
- (b) The dedicated vapour recovery hose shall fit the tail of the 100 mm coupler.
- (c) The dedicated vapour hose shall be 100 mm nominal bore approved vapour recovery hose. The body colour shall be black, with a 50 mm wide yellow helical band at a pitch of approximately 250 mm.
- (d) Vehicles without a permanently mounted hose shall carry a hose compatible with the above items and shall comply with the relevant statutory requirements.
- (e) Vapour recovery piping connected to two or more compartments shall be 100 mm diameter or of equivalent cross-section, to permit simultaneous filling of two compartments at 2500 L/min each.

## SECTION 4 VEHICLE OVERFILL PROTECTION SYSTEM

### 4.1 SCOPE OF SECTION

This Section outlines requirements for the overfill protection system on the road tank vehicle.

### 4.2 TANK COMPARTMENT SENSING ELEMENT

An approved sensor element, compatible with existing equipment, shall be mounted in each vehicle tank compartment, at a level which will actuate the shutting down on product supply to the compartment, in order to maintain the minimum allowable ullage. This element shall be suitable for product temperatures of at least 7°C.

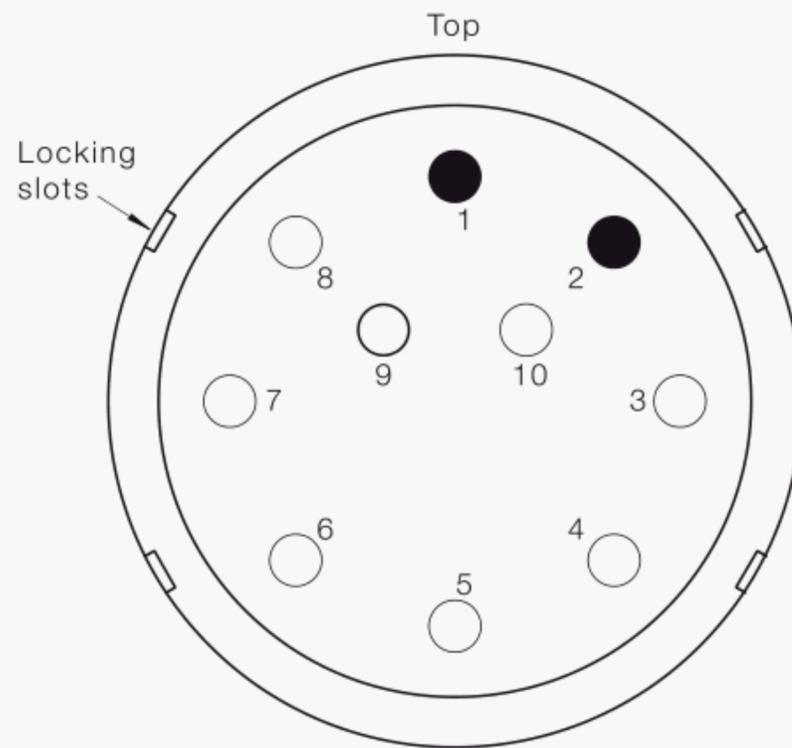
A second element may be provided for product temperatures between 7°C and 120°C.

NOTE: Generally the closure is in two stages. While the signal is instantaneous, the time to close the valve can vary, dependent on the type of valve used. From data provided by the valve manufacturers, the optimum time for closure is approximately 2.5 seconds for such a valve. This would then allow 105 L to enter the compartment at full flow before complete closure of the loading system is achieved. This ullage will be greater than the 3% allowed for compartments of less than 3000 L capacity.

### 4.3 CONNECTION BETWEEN FILL STAND AND VEHICLE

The following requirements apply:

- (a) An approved electrical connection plug shall be fitted to the cable from the fill stand and provided with ten connector positions, seven of which shall be fitted with connector pins.
- (b) An approved socket shall be fitted to the tank vehicle at the location shown in Figure 2.2(a) and labelled 'ELECTRICAL CONNECTION SOCKET'.
- (c) Connector pins corresponding to positions 3 to 8 shall be used, with Position 9 and 10, both being used for the common earth (see Figure 4.1). Connector pins corresponding to positions 1 and 2 shall be left blank.
- (d) A dummy sensor shall be connected to unused pins if there are fewer than six compartments. For example, in a three-compartment truck Pin 3 connects to the sensor in Compartment 1, Pin 4 to Compartment 2, Pin 5 to Compartment 3 and Pins 6 and 7 are each connected to a dummy sensor. Pin 9 and 10 is always the common earth.
- (e) Any new designs shall be compatible with existing equipment.

**NOTES:**

- 1 Pins 1 and 2 are either omitted or not used if provided.
- 2 Pins 3 to 8 connect to sensors in compartments 1 to 6 respectively.
- 3 A dummy sensor shall be connected to unused pins if there are fewer than six compartments (see Clause 4.3(d)).
- 4 Earth for pins 9 and 10 shall independently travel through the tank structure.

**FIGURE 4.1 ELECTRICAL CONNECTION SOCKET CONNECTING PIN LOCATIONS**

## SECTION 5 INTERLOCKS ON THE FILL STAND

### 5.1 SCOPE OF SECTION

This Section sets out requirements for loading system interlocks and overfill protection.

### 5.2 LOADING SYSTEM INTERLOCKS

Loading systems interlocks shall be readied when the connecting plug is fitted to the vehicle electrical connection socket, together with connection of the vehicle vapour hose to the fill stand. This will permit the manual starting of the product loading system.

### 5.3 OVERFILL PROTECTION SYSTEM

The signal generated by the overfill protection system shall shut off product flow to the vehicle.

It should not be possible to re-start flow into an overfilled vehicle, i.e. there should be no provision for manually overriding the overfill protection system.

## SECTION 6 INTERLOCKS ON THE TANK VEHICLE

### 6.1 SCOPE OF SECTION

This Section sets out requirements for interlocks on the tank vehicle.

### 6.2 VEHICLE DRIVEAWAY PROTECTION

The following requirements shall apply as a minimum:

- (a) The vehicle shall be fitted with a gate over the product valve panel, to ensure that the vehicle brakes remain applied, or some other means provided for immobilizing the vehicle, whenever the gate is raised.
- (b) The design of the gate shall be such that the loading arms cannot be connected unless the gate is raised. It is preferable for the electrical socket connection to be positioned within the envelope of the gate.

### 6.3 COMPARTMENT VAPOUR TRANSFER VALVES

Compartment vapour transfer valves shall be open only whilst the vehicle is being loaded or unloaded, and shall be closed at all other times. They should be opened only when the compartment bottom valves are open.

The following methods may be used to achieve this requirement:

- (a) A rigid mechanical coupling to the compartment bottom valve.
- (b) Actuation by means of a gate over the adaptors.
- (c) Actuation by means of a switch operated when a loading coupler is connected to a loading adaptor on the tank vehicle.

### 6.4 STOWING OF VAPOUR HOSE ON VEHICLE

The vapour hose coupling should be connected to a dummy vapour adaptor when it is stowed on the tank vehicle to hold it in position, but with the poppet closed.

## SECTION 7 UNLOADING WITH VAPOUR RECOVERY

### 7.1 SCOPE OF SECTION

This Section provides requirements for connections and overfill protection for unloading where vapour recovery is required.

### 7.2 PRODUCT CONNECTIONS

#### 7.2.1 Underground storage tanks

The following requirements and recommendations apply to connections for underground storage tanks:

- (a) The product connection shall be a 100 mm tight fill type of adaptor.
- (b) The unloading hose shall be 100 mm nominal size, fitted with an API coupler or camlock (without the self-sealing feature) and at the other end with a 100 mm camlock adaptor.
- (c) The unloading hose should be coupled to an underground receiving tank by means of a 100 mm delivery elbow fitted with a 100 mm camlock adaptor and a coupler to fit the tank adaptor.
- (d) The delivery elbow should have a sight glass.

#### 7.2.2 Above-ground storage tanks

For above-ground storage tanks, the product delivery connection shall be a 100 mm camlock adaptor.

### 7.3 VAPOUR RECOVERY CONNECTIONS

#### 7.3.1 Underground storage tanks

The following requirements and recommendations apply to connections for underground storage tanks:

- (a) The vapour connection shall be a nominal 75 mm tight-fill type of adaptor, fitted with a self-sealing poppet (see Figure 7.1).
- (b) The vapour recovery hose shall be connected to the underground storage tanks by means of a nominal 75 mm vapour recovery elbow (see Figure 7.2).
- (c) The vapour recovery elbow shall have a matching tight-fill coupler at the lower end, fitted with a probe to open the vapour adaptor in the receiving tank, and at the other end a 100 mm self-sealing camlock vapour recovery adaptor.

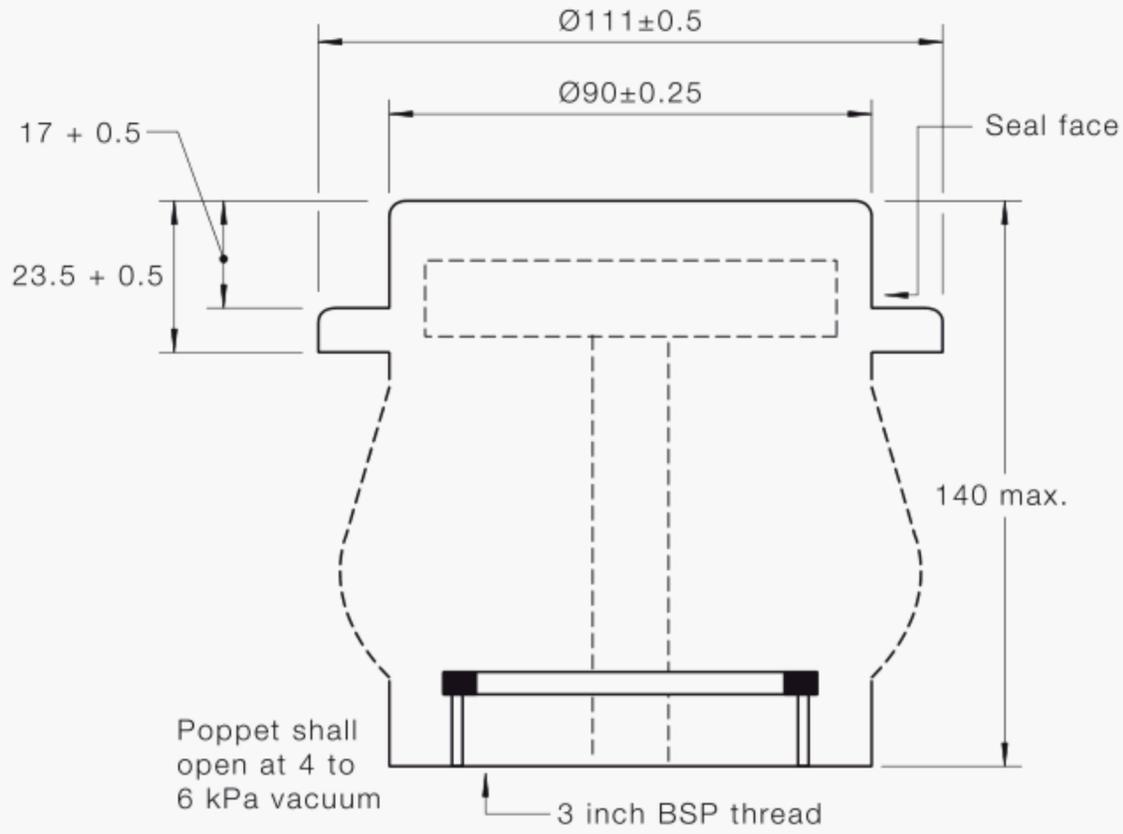
#### 7.3.2 Above-ground storage tanks

For above-ground storage tanks, the vapour connection shall be a 100 mm self-sealing camlock vapour recovery adaptor as shown in Figure 3.1.

### 7.4 OVERFILL PROTECTION FOR THE RECEIVING TANK

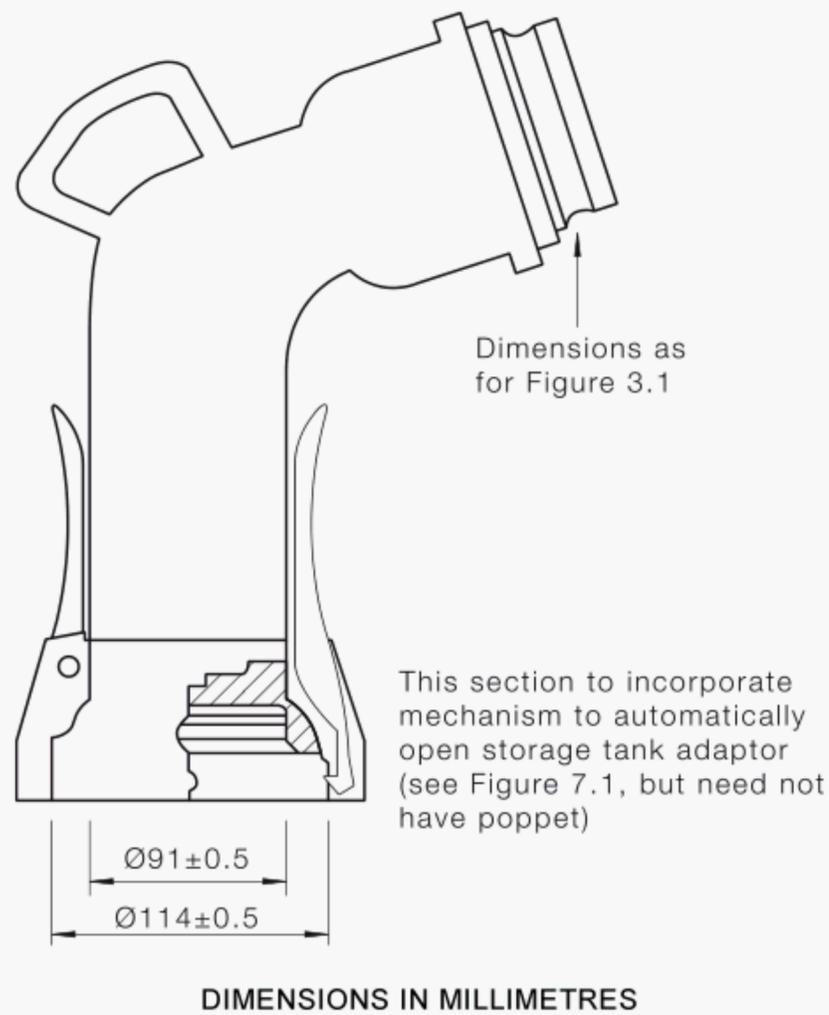
The receiving tanks shall be equipped with a device to—

- (a) prevent product entering the vapour system;
- (b) provide sufficient ullage; and
- (c) accommodate a delivery hose fill of product after it has stopped flow from the vehicle.



DIMENSIONS IN MILLIMETRES UNLESS STATED OTHERWISE

FIGURE 7.1 TYPICAL 75 mm VAPOUR RECOVERY ADAPTOR FOR STORAGE TANKS



DIMENSIONS IN MILLIMETRES

FIGURE 7.2 TYPICAL 75 mm × 100 mm VAPOUR RECOVERY ELBOW

## SECTION 8 UNLOADING WITHOUT VAPOUR RECOVERY

### 8.1 SCOPE OF SECTION

This Section provides requirements for unloading where vapour recovery is not required.

### 8.2 LOADING WITHOUT VAPOUR RECOVERY

Vapour recovery is only required when loading gasoline and designated products at installations above a minimum throughput at locations nominated by legislation. It is not required for loading other products.

To accommodate bottom loading of tank vehicles equipped for vapour recovery in such instances, a 100 mm vapour recovery adaptor shall be provided on the fill stand and fitted to a 100 mm vent pipe that terminates 3 m above the fill stand roof and that discharges upwards.

### 8.3 UNLOADING WITHOUT VAPOUR RECOVERY

The vapour hose may be left stowed on the vehicle and no special precautions are needed, as the tank compartment will vent open and provide vacuum relief when unloading the product.

NOTES

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