

# The safe recovery of petrol from end-of-life vehicles



## INTRODUCTION

1 The Health and Safety Executive (HSE) has prepared this guidance in association with the end-of-life vehicle (ELV) industry. It provides advice on the safe removal, storage and disposal of petrol from vehicles that are being disposed of in accordance with the End-of-Life Vehicle Directive.

2 This guidance contains general advice for vehicle dismantlers that, if followed, will mean that you are normally doing enough to comply with the relevant health and safety legislation. Under health and safety law, all employers are required to carry out site-specific risk assessments to ensure the actual hazards and circumstances prevailing at their premises are properly considered, and that appropriate control measures are put in place. This guidance will help in your assessment of the risks arising from handling and storing petrol and it also gives advice on how to control those risks.

## SCOPE

3 This guidance deals with the fire and explosion hazards arising from the extraction and storage of petrol from ELVs, and its subsequent disposal through reuse or collection by an authorised waste disposal company. This guidance is mainly aimed at large-scale facilities and does not cover manual extraction procedures using a pick and bucket, which are generally considered to be unsuitable methods for both safety and environmental reasons. Some parts of the guidance will be relevant to low-throughput/small-scale activities, where petrol is withdrawn from existing fuel tank openings using conventional equipment such as 'fuel retrievers'.

4 The guidance does not cover other safety hazards arising from work with ELVs or the health hazards arising from petrol and other materials found in motor vehicles. Guidance on health and other safety hazards can be found in the documents listed in the reference section.

5 This guidance does not include measures to protect the environment from petrol or petrol vapours that may be released from ELVs. The Environment Agency and the Scottish Environment Protection Agency have published separate guidance<sup>1</sup> dealing with environmental concerns and requirements.

6 The recovery and handling of other fuels, such as liquefied petroleum gas (LPG), compressed natural gas (CNG), and explosive devices used to inflate air bags, are outside the scope of this guidance. The guidance is not specifically aimed at diesel fuel although the same standards that are used for petrol can be applied to the removal and storage of diesel. Where diesel fuel is likely to be contaminated or mixed with petrol it should be handled and stored according to the recommendations in this guidance.

7 This guidance does not cover the hazards associated with working with petrol in the motor vehicle repair industry. Advice on this is provided in the HSE leaflet *Safe use of petrol in garages*.<sup>2</sup>

8 All new installations should be designed and operated according to this guidance and, as far as reasonably practical, it should be followed at existing installations. However, it is not intended to preclude the use of alternative designs, materials and methods as long as they provide an equivalent level of safety and meet the requirements of the regulations.

## LEGISLATION

9 This guidance will enable employers to fulfil their statutory obligations with respect to the fire and explosion hazards of petrol arising from the following sets of regulations:

- the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR);<sup>3</sup>
- the Management of Health and Safety at Work Regulations 1999 (the Management Regulations);<sup>4</sup>
- the Health and Safety at Work etc Act 1974 (HSWA).<sup>5</sup>

10 In addition to the above legislation, the Petroleum (Consolidation) Act 1928 (PCA)<sup>6</sup> will also apply at premises where the recovered petrol is dispensed into other motor vehicles. In this respect, ‘dispensing’ is defined by DSEAR as ‘the manual or electrical pumping of petroleum-spirit from a storage tank into the fuel tank of an internal combustion engine, whether for the purposes of sale or not’.

11 HSE are normally responsible for enforcing the legislation detailed in paragraph 9 above, unless you intend to transfer the recovered petrol directly from a storage tank into the fuel tank of a motor vehicle using a pump or a dispenser. In these circumstances, whether the petrol is for private or work use, the PCA will also apply and you will need to obtain a licence from the local Petroleum Licensing Authority (PLA). The Petroleum Licence may detail specific conditions relating to the fire and explosion risks from petrol during storage and dispensing activities. A Petroleum Licence is not required, and specific notification to HSE or the PLA is not necessary, for the petrol extraction process or for other storage activities that do not involve the direct transfer of petrol from a fixed tank with a pump into motor vehicles.

12 As well as issuing Petroleum Licences, the PLAs are also responsible for enforcing DSEAR, but only for those parts of the premises to which that licence applies. The PLAs are the County Councils, Unitary Authorities or the Fire and Rescue Services in the former Metropolitan Authorities. For further information on who is responsible for petroleum licensing in any particular area contact your Local Authority or Local Council. A full list of PLAs is also available online at [www.a pea.org.uk](http://www.a pea.org.uk)

13 Legal requirements and guidance are detailed in the reference section and should be read in conjunction with this guidance.

## FIRE AND EXPLOSION HAZARDS

### Properties of petrol

14 Petrol is an extremely volatile liquid, which gives off flammable vapours at very low temperatures - down to about minus 40°C. When mixed with air, these vapours can form a flammable atmosphere that will readily burn or explode if an ignition source is present. A mixture containing between about 1% and 8% of petrol vapour is flammable.

15 Petrol vapour is heavier than air. It does not disperse easily in still air conditions and tends to sink to the lowest level within its surroundings. It may accumulate in tanks, cavities, pits or other depressions. Accumulations of vapour in enclosed spaces or other poorly ventilated areas can persist for a long time, even where there are no visible signs of the liquid itself.

16 Flammable vapours will be released when petrol is handled, extracted from vehicles, transferred between storage tanks, drums or cans, and whenever petrol is spilt or exposed to the air. A flammable atmosphere will exist above the liquid in tanks or cans and will even remain in such containers for long periods after they have been emptied of any liquid.

17 Petrol can be particularly hazardous if it is spilt onto clothing, as it lingers in the fibres of the material for a long time - even after any visible signs of the spill have disappeared. Such contaminated clothing is easily ignited by common ignition sources such as smoking materials, naked flames or sparks, giving rise to a serious fire that often results in fatal or major injuries.

18 Petrol floats on water and, if spilt or leaked into the ground, can be carried long distances by watercourses, ducts, drains or groundwater. This can lead to a fire or explosion hazard some distance from where the actual petrol was released.

### Causes of accidents

19 Fires and explosions are likely to occur when petrol or its vapour is released and comes into contact with a suitable ignition source or, alternatively, when a heat or fire source comes into contact with a storage container or tank. Common causes or contributory factors of such incidents include:

- lack of awareness of the properties of petrol;
- operator error, due to lack of training or supervision;
- inadequate or poor storage facilities;
- inadequate control of ignition sources, including static electricity;
- electrical equipment unsuitable for flammable atmospheres;
- welding or burning on or close to petrol containers, fuel lines or in areas where vapours may have accumulated;
- decanting petrol in storage areas;
- decanting or handling petrol in enclosed spaces where the vapours cannot readily disperse;
- draining petrol tanks over vehicle inspection pits;
- inadequate design, installation or maintenance of equipment;
- exposure to heat from a nearby fire;
- dismantling or disposing of petrol containers;
- misuse of petrol, eg to burn waste materials or brighten fires;
- horseplay involving petrol; and
- handling petrol in areas where other people, unaware of the activity, may introduce sources of ignition.

## RISK ASSESSMENT

20 A risk assessment is nothing more than a careful examination of how your work activity could cause harm, so that you can decide whether you have enough precautions in place to ensure people's safety or whether you need to do more. Your risk assessment will help you determine whether you have sufficient control measures in place to control the risk to as low a level as is reasonably practicable.

21 This guidance refers to 'risk' and 'hazard', which are precisely defined in the legislation listed above. In the context of this guidance, a hazard is anything that can cause harm. Risk is the likelihood, great or small, that a person, either on or off the site, will be harmed by the hazard.

22 A risk assessment must be carried out before any new process is introduced into the workplace. Under DSEAR, you are also required to carry out a risk assessment for existing processes, if you have not already carried out a detailed assessment under the Management Regulations. The risk assessment should assess the risks from fire and explosion arising from dangerous substances such as petrol. If you have five or more employees you must keep a record of the significant points of your risk assessment which will include:

- the measures you have taken to eliminate or reduce risk;
- sufficient information to show that the workplace and work equipment will be safe from the risk of fires and explosions during operation and maintenance; and
- details of any hazardous areas (see paragraph 27). Note that hazardous area diagrams need to be kept even if you have less than five employees.

23 The HSE leaflets *Managing health and safety: Five steps to success*<sup>7</sup> and *Five steps to risk assessment*<sup>8</sup> give general guidance. More detailed advice on carrying out a risk assessment under DSEAR is given in the Approved Code of Practice (ACOP) to the regulations.<sup>9</sup> The following five steps provide a systematic approach to identifying hazards and managing risks during the extraction and storage of petrol from ELVs.

- **Step 1: Identify** – take a fresh look at your site, its design and operation, and identify where a fire and explosion hazard may exist.
- **Step 2: Consider** – take into account what could go wrong and who may be affected.
- **Step 3: Evaluate** – look at your findings and decide if the existing precautions are enough to prevent anything going wrong or to reduce the consequences if something unexpected does happen, or if you need to do more.
- **Step 4: Record** – make a note of your findings.
- **Step 5: Review** – consider when you next need to review your assessment.

24 The remaining sections of this guidance will help you to identify many of the hazards associated with the handling and storage of petrol and give guidance on how you can reduce the risks.

## CONTROL MEASURES

### General principles

25 In deciding upon the design and installation of equipment and appropriate operating procedures, DSEAR requires you to apply a number of control measures. These measures need to be considered and applied in the following priority order, subject to reasonable practicability and the findings of the risk assessment, and they should be appropriate to the nature of the activity or operation. This means that you should consider the application of the measures set out in paragraph 25(1) in so far as they are appropriate, before those in paragraph 25(2) and so on, until the risk of a fire or explosion is reduced to be as low as is reasonably practicable. The control measures are:

- 1 reduce the quantity of petrol to a minimum;
- 2 avoid or minimise releases of petrol or its vapour;
- 3 control releases of petrol at source;
- 4 prevent the formation of flammable concentrations of vapour;
- 5 collect, contain and remove any releases to a safe place;
- 6 avoid ignition sources and other adverse conditions;
- 7 segregate incompatible substances.

26 Having decided on measures to minimise the occurrence of a fire or explosion, you also need to consider whether it is still possible for them to occur, and what additional measures you may need to put in place in order to mitigate their consequences. Examples of measures to limit harm to employees from a fire or explosion are detailed in DSEAR and include:

- reduce the number of employees exposed to a minimum;
- prevent fires and explosions from spreading to other plant and equipment or to other parts of the workplace;
- provide plant and equipment that can safely contain or suppress an explosion, or vent it to a safe place; and
- provide suitable personal protective equipment.

### Hazardous areas

27 'Hazardous area' is a term used to define those parts of a site or factory where flammable concentrations of vapours or gases may occur, and where special precautions are necessary to control ignition sources. However, the first approach to safety at any site involving a flammable material such as petrol, is to control its storage and use, so as to minimise the type and extent of any hazardous area.

28 The type and extent of any potential hazardous areas should be minimised firstly by establishing controls that limit or prevent any releases of petrol or its vapour, and then by applying ventilation measures, as appropriate, to disperse and dilute any releases that could occur. Those places where flammable concentrations of vapours can still arise, under either normal conditions or during foreseeable faults, are deemed to be hazardous areas. It is necessary under DSEAR to determine their size or extent and then to classify them into zones according to how frequently any releases can occur. This procedure is referred to as hazardous area classification. Places where vapours occur continuously or very frequently are given the highest rating of Zone 0; whereas places where vapours occur only infrequently, following an operational or mechanical mishap, are given the lowest rating of Zone 2. Zone definitions and further explanation are given in DSEAR and in the documents detailed in the reference section. A warning sign, as indicated in Figure 1, should normally be provided to indicate the presence of any hazardous areas.

**Figure 1** Hazardous-area warning sign

29 Ignition sources should be excluded from all hazardous areas, and only equipment that has been certified as meeting a particular ignition-protected standard can be brought into any particular zone. Equipment with potential ignition sources that has been supplied for use in hazardous areas after June 2003 must meet the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996<sup>23</sup> (EPS), and carry the explosion-protection symbol 'Ex' as shown in Figure 2. Note that the EPS Regulations implement the European ATEX Directive (94/9/EC) in the UK, and that compliant equipment is frequently referred to as 'ATEX equipment'. The site operator will also need to ensure that a competent person has assessed the equipment and operating procedures within hazardous areas, and that work activities can be carried out safely before the equipment is brought into use.

**Figure 2** Explosion-protection symbol

30 Any equipment that has been assessed by the supplier as not having its own potential ignition source does not need to meet the requirements of the EPS Regulations, and must not be marked with the 'Ex' symbol. For example a slow-turning pneumatic motor may not be capable of generating a spark or hot surface that could ignite petrol vapours, and the supplier may have made an assessment that their particular equipment does not need to comply with the EPS Regulations.

31 The paragraphs below give details of the likely zones that may occur in areas where petrol is stored and handled. An international standard, available as BS EN 60079-10,<sup>10</sup> explains the basic principles of area classification. Additional advice and examples are contained in a variety of guidance and codes.<sup>11, 12, 13, 14</sup>

### Separation distances

32 Measures to control fire hazards often include separation distances that, although they may include consideration of hazardous areas, are not necessarily the same. Separation distances provide:

- protection for the petrol from fires that may occur elsewhere, either on other parts of the premises or off-site;
- protection for people, plant and other dangerous substances from a fire involving the petrol, both inside and outside the premises.

33 Separation distances may not provide complete protection from a fire involving petrol storage facilities, but they should allow people to be evacuated, and allow sufficient time for fire-fighting equipment and emergency procedures to be mobilised.

## STORAGE FACILITIES

### Types of storage facilities

34 You may store petrol in cans, drums, underground tanks or above-ground tanks. Tanks may be single-skin or double-skin and additionally, above-ground tanks may be fabricated with built-in fire protection. The type of storage installation required will depend on the circumstances arising at the site, and during your risk assessment you will need to take into account a variety of factors including:

- separation to buildings, boundaries and other site activities;
- separation to any dispensing activities;
- leak prevention;
- secondary containment;
- site security; and
- quantities of petrol to be stored.

### Can and drum stores

35 Cans and drums can provide an adequate means of storing petrol. When considering this method of storage, you will need to take into account the method by which the petrol will be finally used or disposed of, and whether the use of small containers increases the overall risks and handling problems during their filling and emptying.

36 The total amount of petrol that can be stored together in cans or drums will depend on the individual circumstances. The following paragraphs provide advice on dedicated storage areas or storerooms for up to 1000 litres (ie 100 x 10 litre containers) of petrol. Where you need to store larger quantities than this you should consider installing tanks or referring to the more detailed advice in the HSE guidance document *The storage of flammable liquids in containers*.<sup>12</sup> You should not store more than 50 litres of petrol within a workroom, and then only when it is kept in a properly labelled metal cabinet or bin with spillage retention.

37 Containers should, where reasonably practicable, be stored in the open air at ground level (singularly or in stacks). This enables leaks to be quickly seen and any vapours to be easily dispersed. They should not be stored on the roof of a building.

38 Where the best option of storing containers outside is not reasonably practicable, they may be kept in suitable storerooms, preferably separate buildings specifically designed for the purpose.

39 Other activities, including filling and emptying containers, must not be carried out in the designated storage area. This is to prevent other activities that are a higher risk causing a fire, which then spreads to involve the larger quantities in storage.

### *Outdoor storage*

40 Petrol containers should be stored well away from other processes and storage areas. For quantities of petrol up to 1000 litres, the minimum separation distance to occupied buildings, site boundaries, process areas, other flammable-liquid storage tanks, and fixed-ignition sources is 2 m. For other high-risk activities, such as those using heavy mobile plant or oxyacetylene cutting equipment, the separation distance should be at least 4 m. For larger quantities of petrol these distances will need to be increased and reference should be made to HSE publication *The storage of flammable liquids in containers*.<sup>12</sup>

41 The separation distance can be reduced if either:

- a firewall, built to a 30-minute fire-resisting standard and at least 2 m high, is provided. In order to ensure adequate protection, the firewall should either extend 2 m either side of the containers, or extend 2 m towards them, forming short 'wings' at the ends of the wall; or

- the walls of any buildings within 2 m of the stack are built to a 30-minute fire-resisting standard. Further information on fire-resistant structures is contained in the *Control and mitigation measures* ACOP.<sup>15</sup>

42 A firewall should only be provided on one side of the storage facility so as not to limit natural ventilation.

43 The storage area should be constructed as an impervious surface and enclosed with a sill or low bund wall that will contain a volume that is at least 110% of the capacity of the largest container. Note that environmental requirements may mean that a larger containment capacity is needed. You may need to provide ramps over the sill to allow for easy access.

44 The surface of the storage area should be slightly sloping so that any petrol leaks or rain water are directed to flow away from the containers. You may need to provide means for removing excess rainwater.

45 The storage area should be secure, both during normal working hours and at night, so as to prevent any unauthorised access to the petrol. A welded mesh, palisade or chain link fencing 1.8 m high will provide sufficient security, but this will not be required if the storage area is in a secure site and in a part of the premises where the general public do not have access. Any enclosed area around petrol containers should not limit the means of escape in the event of a fire, and the travel distance from any part of the storage area to its exit should not exceed 24 m. If the travel distance exceeds 24 m, a second exit will be required.

46 A hazardous area of Zone 2 classification will normally exist within the storage area and for 1 m beyond the sill or bund wall. You should exclude all sources of ignition from this area, as well as any combustible materials such as vegetation and rubbish.

#### *Indoor storage*

47 Where it is not reasonably practical to provide outdoor storage, you may keep containers within a specially-designed building. The building should be predominately constructed of non-combustible materials (also defined as having a 'low risk' with respect to their reaction to fire in the *Control and mitigation measures* ACOP)<sup>15</sup> and be located at least 2 m from occupied buildings, site boundaries, process areas, other flammable-liquid storage tanks and fixed ignition sources. For quantities greater than 1000 litres of petrol, increased distances will be required and reference should be made to HSE publication *The storage of flammable liquids in containers*.<sup>12</sup>

48 The separation distance can be reduced if the building is constructed to a 30-minute fire-resisting standard (see paragraph 41).

49 Buildings should be provided with a good standard of ventilation to disperse any petrol vapours. This can be achieved with fixed, permanent openings at high and low level in opposite walls, with a total area equivalent to 1-3% of the total area of the walls and roof. Openings should not normally be installed in any walls that are required to be fire-resisting. Where sufficient openings cannot be installed, it may be necessary to provide mechanical exhaust ventilation to achieve the recommended ventilation rate of five air changes per hour in the store.

50 The storage area should be constructed with an impervious surface and a low sill that will contain a volume that is at least 110% of the capacity of the largest container. Note that environmental requirements may mean that a larger containment capacity is needed. You may need to provide ramps over the sill to allow for easy access.

51 A hazardous area of Zone 2 classification will normally exist within the storage building. All sources of ignition should be excluded from this area.

52 It is preferable for the roof of the building to be constructed of lightweight materials that would relieve excess pressure in the event of an explosion.

53 The standard of security required for the building will depend on the overall site security, but it should prevent any unauthorised access to the petrol.

#### *Design and construction of containers*

54 All containers should be designed and constructed to standards suitable for their purpose. They should be robust and have well-fitting lids or tops to prevent leakage of liquid or vapour.

55 Cans and drums should normally be made from metal, although 5-litre plastic containers designed to the Petroleum Spirit (Plastic Container) Regulations<sup>16</sup> can also be used. Plastic containers will, however, fail more quickly than metal ones in the event of a fire. Where plastic containers are used, it is recommended that the separation distance (given in paragraph 40) from an outside store to buildings, site boundary etc should be increased from 2 m to 4 m. Plastic containers can also degrade in sunlight and should not be used in outdoor stores without suitable shading.

56 Where petrol is disposed of in containers off site, you should remember that the number of plastic containers that can be legally carried in vehicles as supplementary fuel, or stored by the public, is limited to two.

57 You should ensure that all containers are clearly labelled so that people are aware of their contents and hazards. Petrol cans should normally be labelled 'Petroleum spirit' and 'highly flammable'.

#### **Underground storage tanks**

58 Installing tanks underground provides effective fire protection, particularly at sites that have limited space or where there is access by the general public. This is the preferred option for petrol filling stations, but underground tanks and pipes have a history of causing leaks that can be difficult to detect until a hazardous situation has arisen. For this reason, underground tanks and pipes need to be provided with an effective leak-prevention or detection system.

59 An effective leak-prevention system consists of a double-skin tank with a system to continually monitor the interstitial space between the inner and outer tank. An effective leak-detection system requires an accurate contents gauge that routinely monitors the tank's contents during quiet periods, when petrol is neither being charged to nor withdrawn from the tank. An alternative method is a statistical inventory reconciliation system that makes accurate comparisons with the actual tank contents and the theoretical volume, determined by calculations from the known quantities charged to or dispensed from the tank.

60 Underground tanks should be provided with an effective means to prevent them from being overfilled. A suitable means is to provide the tank with a high-level trip that is set to activate an alarm and to stop the transfer pump from the depollution rig.

61 The distance from any underground tank to any building should be at least 2 m, and the distance to any basement or pit should be at least 6 m. Connection points for emptying (or filling) tanks should be located at least 4 m from sources of ignition, occupied buildings or the site boundary.

62 Detailed advice on the design and installation of underground storage tanks for petrol is contained in the IP/APEA 'Blue Book'.<sup>14</sup>

#### **Above-ground storage tanks**

##### *Single-skin tanks*

63 Above-ground single-skin tanks provide a satisfactory means of storage, so long as they are correctly designed and installed, and there is sufficient space to meet the required separation distances and bunding requirements.

64 Tanks should be designed and installed to a recognised national or international standard, for example BS 2594<sup>17</sup> or DIN 6623-1.<sup>18</sup>

65 You should site tanks in a well-ventilated position that is separated from the site boundary, occupied buildings, sources of ignition, process areas, other flammable materials and dispensing equipment. The table below gives minimum recommended separation distances.

**Table 1** Minimum recommended separation distances for storage tanks

Tank capacity (litres)	Separation distance (metres) (See note 1)				
	To buildings, boundary, process areas and fixed ignition sources	Petrol dispensers (see note 4)	LPG cylinders (> 50 kg total capacity)	LPG vessels (up to 135 m <sup>3</sup> )	Other flammable liquid or petrol tanks (see note 3)
Up to 1000	1 (see note 2)	4	3	6	1
1000-5000	4	4	3	6	4
5000-30 000	6	4	3	6	6

#### Notes

1 Distances are measured from the nearest point of the tank surface.

2 But at least 2 m from doors, plain glazed windows, ventilation or other openings and means of escape.

3 Reduced distances are possible, but then the tanks are considered as a group and their contents aggregated to give a total quantity for use as the tank capacity in column 1.

4 This distance may be reduced if additional control measures are provided – see paragraph 101.

66 The separation distance can be reduced if either:

- a firewall, built to a 30-minute fire-resisting standard and at least 2 m high, is provided. The firewall should extend 2 m either side of the tank or 2 m from the sides of the feature to be protected; or
- the walls of any buildings within 2 m of the tank are built to a 30-minute fire-resisting standard. Further information on fire-resisting structures is contained in the *Control and mitigation measures* ACOP.<sup>15</sup>

67 Single-skin tanks should be provided with a liquid-tight bund that has sufficient volume to contain 110% of the capacity of the largest tank. Bund walls should not be higher than 1.5 m and at least 1 m from the tanks. They should be constructed with sufficient strength to contain any spillage or fire-fighting water. Bunds also have to comply with the Control of Pollution (Oil Storage) Regulation 2001. Information on these and other references can be found in *Above Ground Oil Storage Tanks* PPG2.<sup>19</sup>

68 You should not allow surface water to collect in the bund. Sloping the bund floor will allow the water to be pumped over the bund wall.

69 A hazardous area of Zone 2 classification will normally exist within the banded area. All sources of ignition should be excluded from this area.

70 The storage area should be secure, both during normal working hours and at night, so as to prevent any unauthorised access to the petrol. A welded mesh, palisade or chain-link fencing 1.8 m high will provide sufficient security, but this will not be required if the storage area is in a secure site and in a part of the premises where the general public do not have access. Any enclosed area around petrol tanks should not limit the means of escape in the event of a fire, and the distance from any part of the storage area to its exit should not exceed 24 m.

71 Tanks should be provided with accurate contents gauges and a suitable means to prevent the tank from being overfilled. A suitable means is to provide the tank with a high-level trip that is set to activate an alarm and to stop the transfer pump from the depollution rig.

72 Any filling or discharge connections for the tank should be positioned so that any flexible hoses to tankers are kept short and so that operators do not have to enter the bund to make the connections. You may need to locate the connection points outside the bund wall and provide them with their own catchment areas to control any spills that might occur during disconnection procedures.

73 A vent to atmosphere should be provided on each petrol tank. Unless the tank is manufactured to be explosion-proof to a suitable national or international standard, the vent pipe should be fitted with a flame arrestor or pressure/vacuum valve. The vent-discharge height should be at least 3 m above the ground, preferably 5 m, to ensure adequate dispersion of the petrol vapours. The area within 3 m of the vent discharge is normally classified as a Zone 1 hazardous area.

74 Vehicles or heavy site equipment can easily damage bund walls. Crash barriers or bollards should be provided to protect bund walls if they are situated in vulnerable positions.

#### *Double-skin tanks*

75 Double-skin tanks provide a satisfactory method of storage, and their installation requirements should generally meet the same standards as for single-skin tanks. Differences in their installation standards are detailed in the following paragraphs.

76 Tanks should be designed and installed to a recognised national or international standard, for example DIN 6623-2.<sup>18</sup>

77 Double-skin tanks will not require bunding for safety, but environmental legislation does require all ancillary equipment on double-skinned tanks - such as valves, fill connections, sight-tubes or taps - to be provided with secondary containment. This is most easily achieved by providing a bund around the complete tank system - see PPG2.<sup>19</sup>

78 Double-skin tanks will require accurate contents gauges and a suitable means to prevent the tank from being overfilled. A suitable means is to provide the tank with a high-level trip that is set to activate an alarm and to stop the transfer pump from the depollution rig.

79 Where vehicles or heavy site equipment could damage the tanks, you will need to provide them with mechanical protection such as crash barriers or bollards.

80 If a double-skin tank is located in a bund, there will be a Zone 2 hazardous area within the bund wall. Additionally, there will be hazardous areas created by releases from the vent pipe and any fill or discharge connections to the tank. The area within 3 m of the vent discharge is normally classified as a Zone 1 hazardous area. The hazardous areas resulting from connection points will be classified as Zone 1, and will be either 3 m in diameter or equal to the size of the catchment area, whichever is the smaller.

#### *Explosion-protected vessels*

81 Explosion-protected vessels are tanks or containers designed and tested to be able to safely contain their contents and the blast pressures following an explosion from an ignition of petrol or other hydrocarbon vapours inside the vessel. Potential hazards taken into account in the design include common ignition sources such as static sparks, as well as flames propagating through the pipework or fire engulfment that would heat the tank surfaces to above the auto-ignition point of the stored fuel. There are no European Standards for these vessels, but they are manufactured and tested to the German standards DIN 6623<sup>18</sup> or DIN 6624.<sup>20</sup>

82 The robust design and lack of any bottom openings of an explosion-protected double-skin vessel does provide a degree of fire protection when compared to traditional single-skin tanks. While not tested to the standards of a fire-protected tank (see paragraph 83) some relaxation in the separation distances for dispensing operations detailed in paragraph 101 is acceptable. No specific separation between the tank and containers is required when

dispensing directly from an explosion-protected vessel into containers. When dispensing into vehicles, a separation distance of 2 m between the tank and the vehicle is recommended in order to provide protection from the ignition sources of the vehicle, and also to allow for the installation of crash barriers, curbs or bollards to guard the tank from physical damage.

***Fire-protected tanks***

83 Fire-protected tanks are normally double-skin tanks coated with passive fire-protection materials that can provide up to four hours fire resistance. Passive fire-protection materials include cementitious materials (such as concrete or vermiculite cement) and intumescent epoxy coatings. There are no British or European standards for these vessels but they are commonly designed to American standards such as UL 2085.<sup>21</sup> The level of fire resistance required should be determined by a specific risk assessment for the particular application.

84 Fire-protected tanks can be used in most above-ground situations and, because of their additional fire protection and security, do not need to comply with the separation distances for single-skin or double-skin tanks detailed in paragraph 65. The use of double-skin construction, integral spill retention, and a means to prevent overfill also removes the requirement for bunding. Because of their impact resistance, concrete encased tanks would not normally require bollards or crash barriers to provide additional mechanical protection from vehicles and heavy plant.

85 The vents for fire-protected tanks should be installed to the same standard as for single-skin or double-skin tanks. The vent will give rise to the same hazardous areas as detailed in paragraph 73.

## VEHICLE DEPOLLUTION

### Equipment

86 Extracting petrol from a vehicle fuel tank is a potentially hazardous operation. You will need to ensure that any equipment is designed and operated to minimise releases of petrol or vapour during normal operation and in case of mechanical failure or operator error. The equipment must also be provided with adequate ventilation to disperse any petrol releases and be designed to control any ignition sources.

87 Equipment supplied specifically for extracting petrol and other pollutants from vehicles must be designed so as to comply with the essential health and safety requirements of various European Directives and the associated national legislation. These include:

- the Supply of Machinery (Safety) Regulations 1992;<sup>22</sup>
- the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996.<sup>23</sup>

88 The equipment should also be designed to allow safe means of ingress and egress from the working areas, and any raised working platforms or gantries should be provided with handrails to prevent falls.

89 If you, as an employer, construct a depollution rig for your own use, then you will take on the duties of the supplier and will need to comply with the above legislation. HSE leaflets *Supplying new machinery*<sup>24</sup> and *Buying new machinery*<sup>25</sup> provide guidance for manufacture and supply of work equipment.

90 DSEAR places duties on employers to select appropriately designed equipment, and to ensure that it is correctly assembled and installed, and takes into account other work activities that may be connected or taking place in the same workplace. Features to take into account in selecting, designing and installing depollution rigs are discussed in the following paragraphs.

### Petrol extraction

91 Ideally, you should extract petrol from existing fuel-tank openings to minimise the risk of spills and frictional ignition sources. However, in developing suitable methods, it has been found that such extraction processes can be inefficient and do not always remove all of the petrol. Consequently, some processes involve penetrating the tank base to extract the fuel. Your extraction procedure should ensure that:

- where reasonably practicable, the tank penetration mechanism cannot be operated unless the fuel extraction is operating;
- there is a clear indication of the necessary operating pressures or vacuums for safe use of the equipment;
- the tank penetration mechanism does not create sparks or frictional heating capable of igniting petrol vapours;
- drilling components cannot pull out from the tank under their own weight if they are left unsupported (this may involve operational procedures to disconnect heavy motor units from the drill);
- forward and reverse controls on drills are clearly indicated, to minimise incorrect operation and to prevent partly formed drill holes that cannot be sealed.

### Spillage control

92 All areas where petrol is handled, or where potential leaks or spills can occur, should be provided with a means for controlling spills and preventing them spreading to other non-hazardous areas. Recessed and gridded drip trays may be provided, but petrol and other liquids should not be allowed to accumulate within them.

93 An inert, absorbent material, such as sand, vermiculite or a proprietary material, should be provided to aid the prompt treatment and disposal of any petrol spills or leaks.

### Ventilation

94 In order to disperse any releases of petrol that may occur, it is important that good ventilation is provided where the extraction equipment is operated. Installing or locating the extraction equipment in open-fronted buildings, or within buildings close to the open doors provided for vehicle access, will achieve satisfactory levels of ventilation. Where you cannot position the equipment next to open access points, or you wish to keep the access doors closed, you will need to incorporate additional ventilation to give at least six complete air changes per hour in the vicinity of the equipment. This can be provided by mechanical exhaust ventilation (with suitably placed motors or protected electrics) or louvered openings at high and low level near to the equipment.

### Means of escape/fire-fighting

95 When installing equipment inside buildings, you should ensure that you do not obstruct or interfere with any fire exits or escape routes. You should also ensure that there is a clear route around any equipment and there are no places where people can be trapped by a fire. For further information and advice you should consult with your local fire authority.

96 At least two dry-powder fire extinguishers with a capacity of 9 kg (rated as 233B according to BS EN 3)<sup>26</sup> should be available for use at the petrol-extraction equipment. These should be located in a conspicuous position and so they are readily accessible to those working at the petrol depollution rig(s).

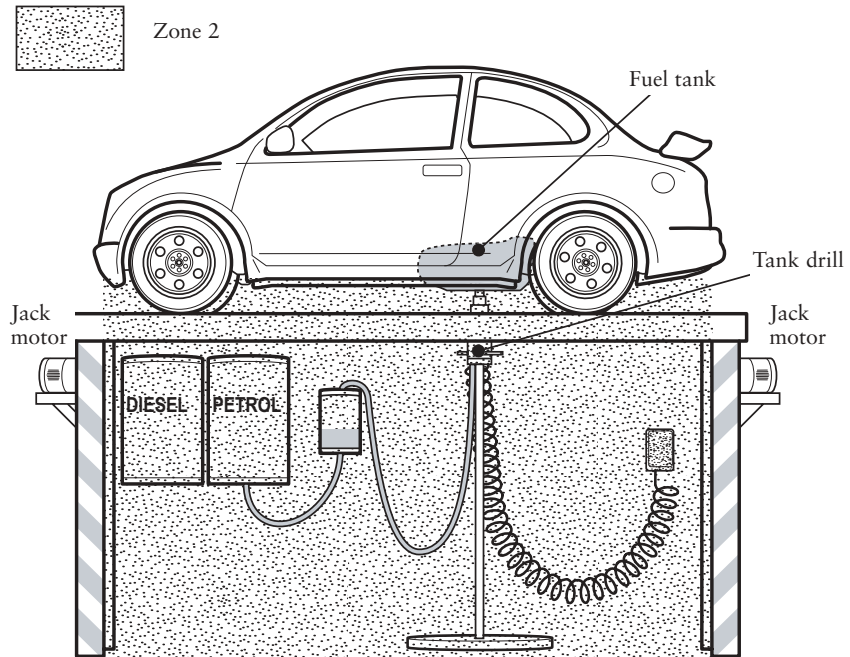
### Control of ignition sources

97 You should exclude all ignition sources from the hazardous area (see paragraph 27) created by the depollution equipment. You should pay particular attention to ensuring that:

- drills have protected electrics or are pneumatically powered;
- pumps have protected electrics or are pneumatically powered;
- lights (including inspection lamps) have protected electrics;
- smoking materials and other obvious ignition sources are excluded;
- anti-static footwear is worn (see paragraph 109); and
- earth bonding is provided.

98 For large all-purpose rigs, provided with a full-size drip tray for spillage retention and installed with adequate ventilation, the space enclosed by the rig and the vehicle should be considered as a Zone 2 hazardous area for operational purposes and for the introduction of other pieces of equipment such as inspection lamps. There may be other localised hazardous areas (either Zone 1 or 2), such as at the extraction point or at the vents, but the supplier will have taken these into account when designing the equipment and should notify you if additional precautions are needed.

Figure 3 Typical hazardous area arising from petrol extraction



99 For other small-scale systems, you will need to determine the hazardous areas by considering the size of likely leaks and spills, the extent to which they are contained by catchment trays and the available ventilation. Such zones should be determined in conjunction with the supplier's information.

**Dispensing equipment**

100 You should locate dispensing equipment in a well-ventilated place outside, and position it so that it is at least 4 m from boundaries, building openings, or places to which the public have access.

101 Dispensers should not be located at the storage vessel unless additional control measures are provided to give protection in the event of a fire. Fire-protected tanks (see paragraph 83) with at least two hours' fire resistance can be installed without any specific separation distance to dispensing equipment or vehicles. Explosion-protected vessels (see paragraph 81) may be installed with an integral pump for dispensing into containers or vehicles, but it is recommended that when dispensing into vehicles, a separation distance of 2 m is maintained between the tank and the vehicle. Where tanks without fire or explosion protection are installed, you will need to provide a designated dispenser area with its own spillage retention, so that the vehicles or containers being filled are at least 4 m from the tank wall.

Table 2 Separation between storage vessels and dispensing operations

	Minimum separation distance (metres)		
	Container filling	Vehicle refuelling	Petrol dispenser (see note 1)
Standard tank	4	4	4
Explosion-protected tank	0	2	2
Fire-protected tank	0	0	0

Note This does not include an appropriately-protected and, where necessary, certified, integral pump that may be installed on an explosion or fire-protected vessel.

102 The area up to 4 m from the dispenser will be a Zone 2 hazardous area while dispensing operations are being carried out using a standard 3.6 m hose. All ignition sources should be excluded from this area. Electric pumps and dispensers must be suitably protected, which means that equipment installed after July 2003 must conform to the EPS Regulations<sup>23</sup> (or the ATEX Directive in Europe). Equipment in use before this date should conform to other relevant national or international standards such as BS 7117.

Figure 4 Typical hazardous areas for a dispenser with two standard 3.6 m hoses

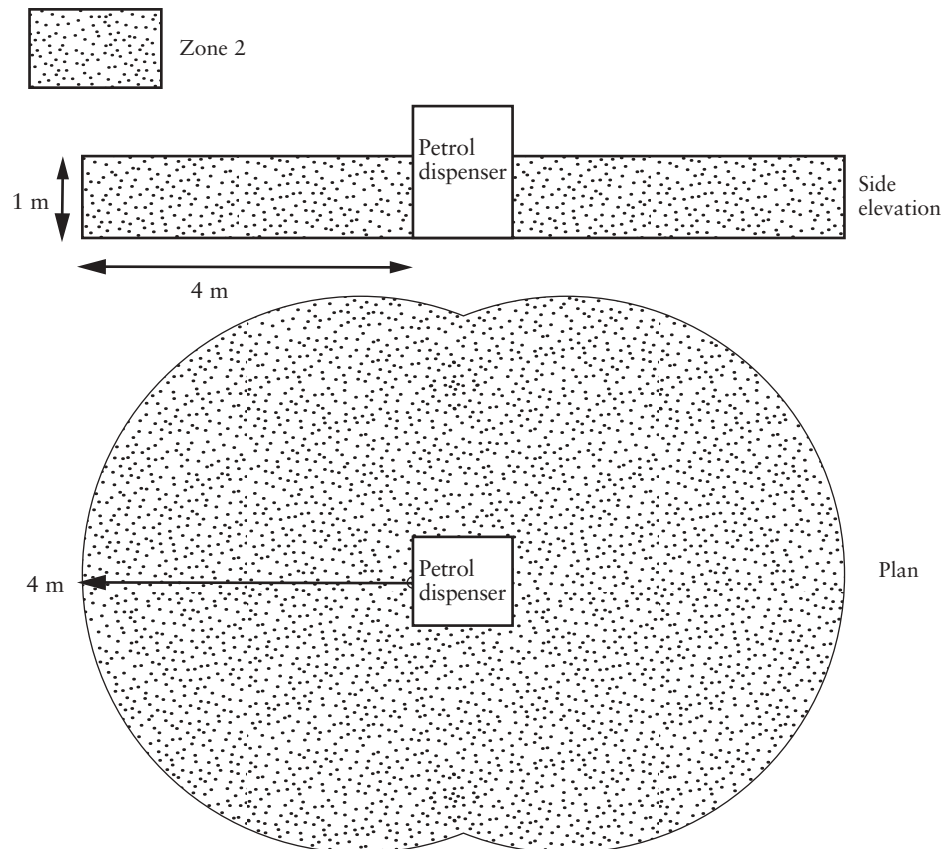
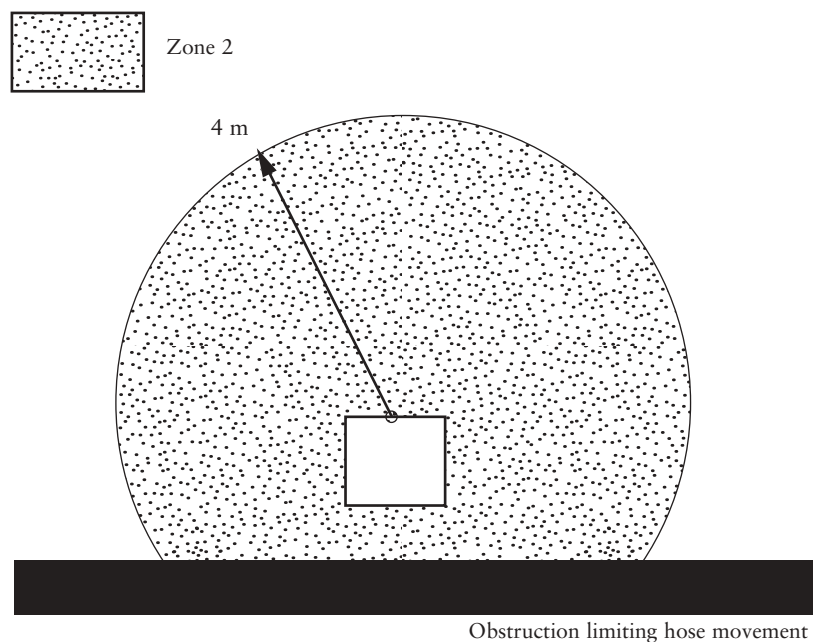


Figure 5 Hazardous area around a dispenser located against a wall



103 Dispensers should be installed in a position to minimise impact from vehicles or mobile equipment used on the site. Bollards or other barriers may be necessary to protect against physical impact from vehicles etc.

104 The ground surface around the dispensing equipment should be impermeable to petrol, and preferably drained to a separator or catchment pit where spills can be collected and disposed of.

105 Drip trays should be provided where petrol is dispensed into portable containers. A spillage-control kit, consisting of an inert, absorbent material (such as sand or a proprietary material), a small shovel and a closed bin for subsequent disposal, should be located near to the dispensing area.

106 An emergency-stop switch to isolate the power to the dispensers should be located at or near to the dispenser(s). The switch should be visible and accessible by people using the dispenser, and labelled 'Petrol Pump - Emergency Stop'.

107 Two dry-powder fire extinguishers, with a capacity of at least 4.5 kg, should be located in a conspicuous position near to the dispensers.

108 Detailed information on the construction and installation of dispensers is contained in the IP/APEA Blue Book.<sup>14</sup>

#### **Personal protective equipment (PPE)**

109 Employees handling petrol or extracting it from vehicles should be provided with and wear anti-static footwear (ie to BS 545127 or BS 7193).<sup>28</sup>

110 Where it is possible for petrol to spill onto the employees' clothing, eg when working below the vehicle petrol tank, they should be provided with fire-retardant/resistant overalls.

111 Changing and washing facilities should be provided for employees involved in extracting petrol from vehicles so that they can quickly change out of any petrol-impregnated clothing. Any overalls or clothing that have been contaminated with petrol should be hung up in a well-ventilated place until they are completely dry before they are washed or sent for cleaning.

## GENERAL OPERATIONS

112 All operations should be carried out so as to minimise releases and spills of petrol. Any defects to equipment and hoses causing, or likely to cause, a leak should be reported to the line manager and then repaired before being brought back into service. Any spills or leaks that do occur should be cleared up promptly by the application of sand or other absorbent material. All sand or other material used for clearing up or containing leaks or spills should be disposed of safely, and should not be exposed to a flame or source of ignition.

113 Any employee who has had petrol spilt onto their clothing or overalls should immediately change the contaminated items. Smoking materials or other common ignition sources will easily ignite the clothing for a considerable time after the spill, even when it has apparently dried out.

114 Drip trays under the depollution rig or in dispensing areas should be kept clean and free of any significant spills of petrol. Old oil and petrol that builds up in a drip tray can be ignited quite easily and will then burn very fiercely. The fluid content of a drip tray should be removed and stored as contaminated fuel. Absorbent mats used under depollution rigs should be changed frequently, in accordance with the supplier's instructions or against a schedule established from known use and spillage patterns.

115 As far as possible, you should exclude all ignition sources from hazardous areas. Likely sources of ignition include:

- smoking materials and other naked flames;
- any tools or other equipment which may cause sparks if rubbed or knocked against metal, concrete or brick;
- hot surfaces; and
- fixed or portable electrical equipment not specifically designed for use in hazardous areas.

116 Depollution rigs, dispensers, bunds and other storage areas should be kept clear of combustible material and rubbish (eg oily rags, oil, grease, cartons, long grass and other vegetation).

117 Written procedures for normal and emergency operations should be available to staff working with petrol or petrol equipment. All operational and emergency procedures should be reviewed regularly. You should amend them to take into account any changes or modifications and any practical experience arising from spills or other incidents.

## MAINTENANCE

118 DSEAR requires that you maintain plant and equipment in a safe condition. You should establish an effective inspection and maintenance regime that specifies the scope and frequency of the work, based on instructions from the manufacturer or supplier of the equipment.

119 You should ensure that all inspection and maintenance work is carried out by a competent person. Only compatible replacement parts should be used. Take care to use the correct spare parts when more than one option is available. For example, depollution rigs are provided with a number of pumps for removing all the different fluids from the vehicle. Pump seals that may be suitable for handling water from the coolant system may not be suitable for use with petrol.

120 A competent person is someone (or an organisation) with enough practical and theoretical knowledge, training and actual experience to carry out a particular task safely and effectively. The person should have an understanding of the relevant statutory requirements and an appreciation of the hazards involved. They should be able to recognise the need for specialist advice or assistance when necessary, and to assess the importance of the results of examinations and tests in the light of their purpose.

121 You should establish an inspection and maintenance schedule that includes the following items:

- checking and replacing cutting bits - blunt tools create more frictional heating than sharp tools;
- condition of any flexible pipes, hoses and their connections or joints conveying petrol;
- visual inspection and testing of earthing or bonding arrangements;
- inspection of bunds for the presence of petrol or surface water;
- draining of sumps, catchment pits and bunds;
- evidence of petrol leakage from joints, pumps or pipework;
- checking sight glasses and other vulnerable equipment are not cracked or leaking;
- damage or other defects that might impair safety;
- all the enclosures required to be kept closed actually are closed;
- all electric cables and their glanding appear satisfactory;
- wear or excessive running noise of pumps or other mechanical equipment;
- all electrical equipment tested and inspected in accordance with the Electricity at Work Regulations 1989;<sup>29</sup>
- all interlocks are operational and have not been overridden;
- all leak-detection systems and vapour-detection systems are fully operational;
- correct functioning of the dispenser nozzle and automatic shut-off device;
- inspecting tanks for signs of damage or corrosion;
- checking that all the fire extinguishers are present and that they are all fully charged; and
- checking for accumulations of combustible rubbish in the vicinity of petrol equipment and storage areas.

## INFORMATION AND TRAINING

122 Adequate training and knowledge of the materials and equipment being used is essential for safety during the removal of petrol from vehicles and its subsequent handling. It is also a requirement of DSEAR and the Management Regulations. How much information, training and retraining are needed will be identified from your risk assessment carried out under these Regulations. The training, however, should cover the following:

- the properties and hazards of petrol;
- safe working procedures for safe handling of petrol and operation of depollution equipment and dispensers;
- the dangers of clothing contaminated with petrol and the need to change any contaminated clothing as soon as possible;
- the use of protective clothing;
- housekeeping;
- reporting of faults and incidents, including minor spills and leaks;
- specific instructions on individual plant and processes;
- the dangers from using and storing petrol in unsuitable containers; and
- emergency procedures, including raising the alarm and use of appropriate fire-fighting equipment.

123 There should be written procedures for controlling the risks from handling petrol and these should be used as a basis for training.

## EMERGENCY PROCEDURES

124 You should draw up a procedure for dealing with fires, spills or leaks that includes: raising the alarm;

- calling the fire brigade;
- tackling the fire or controlling a spill or leak (when it is safe to do so);
- shutting down pumps, dispensers and other equipment safely; and
- evacuating the area or site.

## REFERENCES

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[www.environment-agency.gov.uk/commonddata/105385/elvguidance\\_final\\_591023.pdf](http://www.environment-agency.gov.uk/commonddata/105385/elvguidance_final_591023.pdf)
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While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

## FURTHER INFORMATION

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA. Tel: 01787 881165 Fax: 01787 313995 Website: [www.hsebooks.co.uk](http://www.hsebooks.co.uk) (HSE priced publications are also available from bookshops).

British Standards are available from BSI Customer Services, 389 Chiswick High Road, London W4 4AL Tel: 020 8996 9001 Fax: 020 8996 7001 Website: [www.bsi-global.com](http://www.bsi-global.com)

The Stationery Office (formerly HMSO) publications are available from The Publications Centre, PO Box 276, London SW8 5DT Tel: 0870 600 5522 Fax: 0870 600 5533 Website: [www.tso.co.uk](http://www.tso.co.uk) (They are also available from bookshops.)

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