

## RECOVERY OF PETROL FROM END-OF-LIFE VEHICLES

This guidance has been developed by the Waste Industry Safety and Health (WISH) Forum to help control safety and health risks in the waste management industry associated with recovery of petrol from end-of-life vehicles (ELVs).

Recovering and storing petrol from end-of-life vehicles presents a significant risk of fire and explosion. This guidance is aimed at vehicle dismantlers, and it advises on the fire and explosion hazards from handling and storing recovered petrol and how to control the risks.

The Health and Safety Executive (HSE) was consulted in the production of this publication. It endorses the sensible, proportionate, reasonable and balanced advice to owners on managing the risk from this guidance during the waste-related activities as set out in the guidance.



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**Disclaimer and WISH**

## 1. Introduction

The Waste Industry Safety and Health (WISH) Forum has prepared this guidance with the end-of-life vehicle (ELV) industry.

The guidance is intended to help vehicle dismantlers reduce fire and explosion risks when recovering and storing petrol from vehicles undergoing disposal in accordance with the Directive 2000/53/EC and its subsequent reuse or collection by an authorised waste disposal company.

It does not cover health risks or the environmental legislation relevant to businesses working with ELVs. For those requirements see Control of Substances Hazardous to Health Regulations 2002 (COSHH).

This guidance applies to all new and existing ELV installations. Where removing petrol from vehicle fuel tanks is not necessarily an ELV activity (eg, where mis-fuelling has occurred, or vehicle repair requiring petrol removal is necessary) then see the HSE leaflet *Safe use of petrol in garages*.

It is not intended to apply to diesel-fuelled ELVs, or ELVs with alternative vehicle fuels, such as LPG, Compressed Natural Gas (CNG), Compressed Hydrogen (CH<sub>2</sub>); or propulsion systems, such as battery, fuel cell etc

Diesel-fuelled ELVs do not pose the same level of fire and explosions hazards as petrol. However, 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. See also *Health and safety in motor vehicle repair and associated industries* for other hazards associated with disposal of diesel-fuelled ELVs.

Where ELVs with alternative vehicle fuels are encountered, the advice of the supplier or relevant trade association should be sought. For LPG-fuelled vehicles the relevant trade association is the UKLPG. They have issued *Emptying, purging and scrapping vehicle LPG tanks* which identifies companies with facilities to carry out this work. See also *Depolluting End-of-Life Vehicles: Guidance for Authorised Treatment Facilities*.

## 2. What the law requires

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) apply to workplaces where flammable substances are present, used, or produced. DSEAR provides a hierarchy of safeguards to eliminate control or mitigate the risk of fire and explosion that may be associated with petrol recovery and storage. Advice on compliance with DSEAR is provided in *Dangerous Substances and Explosive Atmospheres. Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance* (the DSEAR ACOP).

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DSEAR requires employers to assess the risks of fires and explosions that dangerous substances in the workplace may present and to eliminate or reduce them as far reasonably practicable (to protect employees and other people who may be put at risk, such as visitors to the workplace and members of the public). See [www.hse.gov.uk/risk/theory/alarpglance.htm](http://www.hse.gov.uk/risk/theory/alarpglance.htm) for an explanation of 'reasonably practicable'.

The Provision and Use of Work Equipment Regulations 1998 (PUWER) require that equipment provided for use at work is:

- Suitable for the intended use
- Safe for use
- Maintained in a safe condition and, in certain circumstances inspected to ensure this remains the case
- Used only by people who have received adequate information, instruction and training
- Accompanied by suitable safety measures, eg protective devices, markings, warnings

In addition, the HSE leaflet *Buying new machinery: A short guide to the law and your responsibilities when buying new machinery for use at work* provides a short guide to the law and responsibilities for those buying new machinery for use at work.

PUWER is complemented by the Supply of Machinery (Safety) Regulations 2008 and the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (EPS). These regulations apply to those supplying plant and equipment to ensure it meets essential health and safety requirements. The HSE leaflet *Supplying new machinery* provides a short guide to the law and responsibilities for those supplying new machinery for use at work.

Where employers operating or in control of the ELV facility constructs work equipment for use in the ELV facility, or directly import this from outside the EU, they become responsible for complying with the supply of work equipment legislation.

## **Other legislation that may apply**

The premises will be subject to requirements for general fire precautions. In England and Wales this is covered by the Regulatory Reform (Fire Safety) Order 2005 and in Scotland, the Fire (Scotland) Act.

The Petroleum (Consolidation) Regulations 2014 (PCR) also applies at workplace premises where the recovered petrol is directly dispensed from a static storage tank into the fuel tank of a motor vehicle using a pump or a dispenser, irrespective of whether the petrol is for sale or not.

If you undertake this activity you will need to obtain a Petroleum Storage Certificate from the Petroleum Enforcing Authority (PEA). A full list of PEAs is available online at [www.apea.org.uk](http://www.apea.org.uk).

A Petroleum Storage Certificate is only required for those parts of the premises associated with the storage and direct dispensing of petrol into motor vehicles.

The PEA is responsible for enforcing DSEAR in those parts of the premises to which a certificate applies. The Health and Safety Executive (HSE) is usually responsible for enforcing DSEAR elsewhere on the premises.

## 3. Fire and explosion risks from petrol

Petrol is an extremely flammable volatile liquid. It will give off significant volumes of flammable vapours, even at very low temperatures (down to about -40 °C) and will readily catch fire if an ignition source is present. At concentrations between 1% and 8%, it forms an explosive atmosphere that, if ignited, will produce a flash fire or explosion, especially when confined. At concentrations above 8%, petrol vapour can burn where it meets with air; eg at an opening or vent on a vessel or enclosure containing petrol vapour.

Flammable vapours are released whenever petrol is handled, extracted from vehicles, transferred between tanks, drums, cans and other vessels and whenever it is spilt or left open to the air. Petrol vapour will form above the liquid in vessels containing petrol and will persist for a long time, even where there are no visible signs of any liquid.

Petrol vapour is heavier than air and does not disperse easily in still air conditions. Escaping vapours will tend to sink to the lowest level of the surroundings and can readily accumulate in inspection pits, cellars and other low level and subterranean cavities and depressions that are poorly ventilated.

Petrol floats on water and, if spilt or leaked into the ground, it 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. Petrol itself has negligible solubility in water, but where it contains ethanol, the ethanol will readily mix with water.

Petrol can be particularly hazardous if 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 ignited easily by common ignition sources such as smoking materials, naked flames or sparks, giving rise to a serious fire that can often result in fatal or major injuries.

Examples of factors contributing to or causing past incidents include:

- Lack of awareness of the properties of petrol
- Operator error, due to lack of training or supervision
- Handling petrol in areas where people unaware of the activity may introduce sources of ignition

- Inadequate control of ignition sources:
  - The obvious, such as smoking materials, naked flames and hot surfaces
  - The not so obvious, including static electricity and tools or other equipment that may cause sparks if rubbed or knocked against metal, concrete or brick
- Using unsuitable electrical equipment in potentially explosive atmospheres
- Welding or hot work on, or too close to, petrol containers, fuel lines or in areas where vapours may have accumulated
- Exposing plant, etc containing petrol to heat from fire or another source of heat
- Inadequate or poor storage facilities
- 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 or drip trays
- Inadequate design, installation or maintenance of equipment
- Dismantling or disposing of petrol containers
- Misusing petrol, eg as a cleaning agent, to burn waste materials or brighten fires
- Horseplay involving petrol

### 3.1 Assessing the fire or explosion risks from petrol and deciding if the precautions are sufficient

Regardless of Petroleum Storage Certification status you still need to carry out your own assessment to ensure the measures taken to control the risks of fire and explosion from handling, storing and dispensing petrol continue to be appropriate to your circumstances. See also *The Petrol Filling Stations Guidance on Managing the Risks of Fire and Explosion (The Red Guide)*. For further information and guidance on risk assessments visit [www.hse.gov.uk/risk](http://www.hse.gov.uk/risk). DSEAR requires that control measures should be applied in the following priority order to protect people who may be affected by a fire or explosion in the workplace:

- Eliminate or reduce the quantity of petrol present to a minimum
- Avoid or minimise releases of petrol or its vapour
- Control at source any releases of petrol or its vapour
- Prevent the formation of flammable concentrations of petrol vapour, eg by the providing adequate ventilation

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- Collect, contain and remove any releases of petrol to a safe place
- Avoid ignition sources and other adverse conditions – which includes:
  - Identifying areas in the workplace where a potentially explosive atmosphere may occur and taking special precautions to exclude ignition sources from these areas
  - Keeping process and storage areas where petrol may be present clear of combustible materials and rubbish (eg oily rags, oil, grease, cartons, long grass and other vegetation)
- Keep petrol away from incompatible substances, eg oxidising materials that could increase the risk of an incident

After deciding what controls are needed to prevent an incident, further appropriate measures should also be taken to minimise the effects of a fire or explosion. These include:

- Ensuring the number of people potentially exposed to any fire or explosion involving petrol is kept to a minimum
- Preventing any fires or explosions involving petrol from spreading to other plant and equipment or to other parts of the workplace
- Venting plant and equipment in which a petrol vapour explosion may occur to a safe place or ensuring it is safely contained or suppressed
- Providing people with suitable personal protective equipment (eg antistatic footwear) and cleaning facilities
- Providing arrangements to deal with accidents, incidents and emergencies
- Ensuring written procedures for normal and emergency operations are available to staff working with petrol or petrol equipment
- Informing, instructing and training employees
- Identifying and labelling pipes and vessels containing petrol; and
- Where the workplace is shared, co-ordinating the control measures taken

## 3.2 Recording your findings and action taken

If you employ five or more employees, you should record the significant findings of your assessment. This should include:

- Verification that the plant and equipment, the building/structure housing them and any areas where petrol may be present are suitable for use with petrol

- Details of the hazardous areas, including diagrams showing their location, where potentially explosive atmospheres may occur (horizontally and vertically) and their classification in terms of zones

Even if you have less than five employees, it is useful to prepare and keep these diagrams. They will help you to determine the suitability of any new plant and equipment that you introduce into your workplace and that the maintenance regimes required for this are appropriate.

Where you plan to introduce changes to your workplace, such as changing the work equipment, processes, or quantities of petrol (and any other dangerous substances) to be handled, you should reassess your controls and improve them if they are no longer sufficient.

## 4. Hazardous areas

The first approach to safety where a flammable material such as petrol is present is to minimise the likelihood of any potentially explosive atmosphere forming by controlling how it is stored, handled and used. However, it is still likely that a potentially explosive atmosphere can form under normal and/or foreseeable fault conditions.

This section is intended to help vehicle dismantlers determine the nature and extent of the hazardous areas for the various operations involving petrol that can be encountered at an ELV.

### 4.1 Hazardous area classification

Identifying those areas in the workplace where a potentially explosive atmosphere may occur is called Hazardous Area Classification (HAC). Further guidance on HAC is available in *Explosive atmospheres: Classification of hazardous areas (zoning) and selection of equipment* and in several publications.

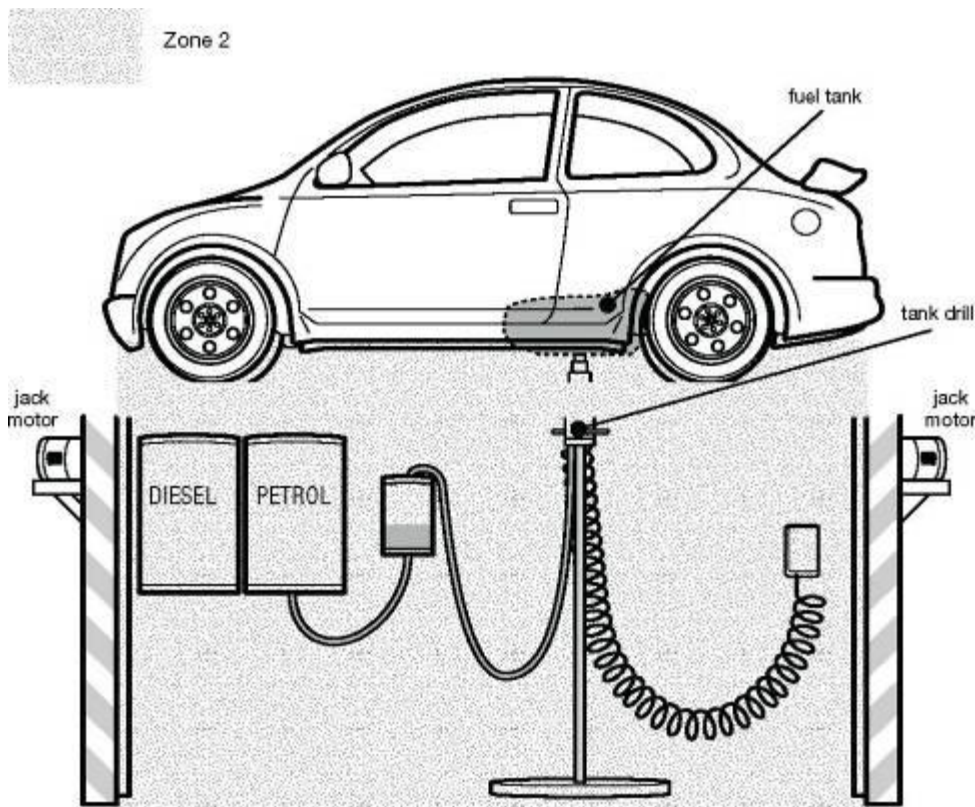
Hazardous areas are classified into Zones according to the frequency and duration of a potentially explosive atmosphere:

- **Zone 0** is a place where a potentially explosive atmosphere is continuously or frequently present, or present for substantial periods
- **Zone 1** is a place where a potentially explosive atmosphere is likely to occur occasionally during normal operating conditions
- **Zone 2** is a place where a potentially explosive atmosphere may arise due to foreseeable fault conditions or, while unlikely during normal operating conditions, it could possibly occur – but if so it will only last for a short time



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For large all-purpose vehicle depollution rigs, provided with a full-size drip tray for spillage retention, in a well-ventilated location, the Hazardous Area will typically be Zone 2 for the space enclosed by the rig and the vehicle (see Figure 1). Within this space, there may be localised Zone 1 Hazardous Areas, eg at the extraction point. A rig without a drip tray would be a Zone 2. 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.



**Figure 1** Nominal extent of Zone 2 arising from petrol extraction

A warning sign, as in Figure 2, should normally be posted at the entry points of places classified as hazardous areas. Where there are both classified and unclassified areas in the premises, this is particularly important to warn people entering the buildings, or the hazardous areas within buildings, that special precautions are required.

**Figure 2** Hazardous area warning sign



## 4.2 Sources of ignition

These special precautions for hazardous areas specifically require the exclusion of potential ignition sources from them. Only equipment, whether fixed or portable, mechanical or electrical, certified as being suitable for the particular Zone (or exceeding those requirements) should be used in that Zone.




As there is significant variety in the portable work equipment available (such as electric drills, lead lights, pneumatic torque wrenches, power washers, portable heaters, fans, etc) you should ensure you have sufficient controls in place to prevent unsuitable portable appliances from being used in a hazardous area.

Since June 2003, all electrical and mechanical equipment for use in classified Zones must comply with the EPS. This is often referred to as 'ATEX-certified equipment' and suitable items will carry the explosion protection symbol 'Ex' in a hexagon as shown in Figure 3.

**Figure 3** Equipment Explosion protection symbol



For petrol, suitable equipment will be marked as follows:

- for Zone 0:  II 1 G
- for Zone 1:  II 2 G
- for Zone 2:  II 3 G

EPS also applies to mechanical equipment that is a potential source of ignition. Such equipment should comply with the requirements of BS EN 13463-1. This requires marking similar to ATEX-certified electrical equipment to confirm the Zone, Gas Group and Temperature Class it is suitable for.

Where a supplier has assessed their equipment (eg as part of their duties under the Supply of Machinery (Safety) Regulations 2008) and concluded that it is not a potential ignition source, it does not need to comply with EPS marking requirements. For example, the supplier of a slow-turning pneumatic motor, will assess it and conclude that his motor cannot ignite an explosive atmosphere so the equipment does not need to be marked with the 'Ex' symbol.

Pre-2003 electrical equipment will have other markings to indicate its suitability for use in different hazardous atmospheres, eg in accordance with BS 7117. An electrical contractor should be able to help with interpretation if necessary. For pre-2003 mechanical equipment you will need to consider its potential to cause ignition, eg by hot surface, or spark.

## 5. Principles of safe petrol extraction

Extracting petrol from a vehicle fuel tank is potentially very hazardous. The key precautions aim to minimise:

- The release of petrol, as a liquid or vapour, during normal operation and foreseeable fault conditions (including operator error)
- Flammable concentrations of vapour forming
- Its potential ignition
- The spread of any incident

To minimise the risk of spills and limit the escape of petrol vapours, 'depollution equipment' employing suction-based techniques should be used for the safe and controlled removal of petrol from fuel tanks.

On no account should a fuel tank be pierced, eg with a pickaxe, chisel or implement that in any way risks 'frictional ignition' (from heat and/or sparks created by the materials rubbing together) or uncontrolled spillage. Nor should petrol be allowed to cascade out under gravity into an open-topped container or bucket.

Extracting petrol from existing fuel tank openings (eg by cutting/disconnecting the fuel line and connecting this to the fuel extraction equipment) removes the risk of frictional ignition. However, this may be insufficient by itself to remove all the petrol from the fuel tank and further procedures should be taken to ensure it is all safely removed.

An alternative acceptable technique is penetrating the fuel tank base with a purpose-designed, enclosed tool allowing the petrol to be sucked out. This enables the fuel tank to be emptied in a single operation. The tool design should ensure it does not present a frictional ignition risk or allow leakage. Whichever method is used, you should ensure the equipment is properly designed, installed and operated to minimise the fire and/or explosion risk.

## 5.1 Essential precautions for petrol extraction

To prevent leaks you should:

- Ensure that the drilling components and sealing mechanism cannot pull out of the fuel tank under their own weight if they are left unsupported (this may involve operational procedures to disconnect heavy motor units from the drill)
- Clearly mark forward and reverse controls on drills to minimise the risk of incorrect operation and the possibility of forming incomplete holes that cannot be sealed by the tank penetration mechanism
- Clearly mark the required operating pressures or vacuums to ensure correct operation
- Ensure procedures are in place to avoid the suction cowl being lowered before the fuel tank is emptied
- Ensure any filters in the fuel extraction system are properly maintained to guard against their blockage

To prevent flammable concentrations of petrol vapour forming you should:

- Ventilate the fuel extraction equipment and the area in which it is located well, with substantially unrestricted air movement
- Ensure the equipment is located outdoors (where its design is suitable), in open-sided buildings, or close to the open doors provided for vehicle access to achieve satisfactory levels of ventilation
- Where this is not possible, provide substantial and sufficient openings (which may be louvered or covered with a metal mesh) at high and low level in the building walls to provide an equivalent degree of ventilation and unrestricted air movement. Alternatively, you may provide or supplement the ventilation with properly designed mechanical exhaust ventilation that ensures low level vapour extraction from around fuel extraction equipment
- Ensure that any electric motor(s) for the exhaust fan(s) located in a Hazardous Area is (are) suitable and that no fan motors are fitted in exhaust ducting
- Ensure that any exhaust ducting installed is of fire-resisting (ie metal) construction

Note that you also need to ensure that the design and operation of the fuel extraction equipment and the ventilation are sufficient to keep the potential exposure of operatives to petrol vapour as low as is reasonably practicable in accordance with COSHH.

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To collect, contain and remove any releases of petrol to a safe place you should:

- Provide all areas where petrol is handled, or where potential leaks or spills can occur, with a means for controlling spills and preventing them spreading to other non-hazardous areas – recessed and gridded drip trays may be used (to capture and contain any minor spillage), but ensure that petrol and other liquids are not allowed to accumulate in them
- Provide an inert, absorbent material – such as sand, vermiculite or a proprietary material – to aid the prompt treatment and safe disposal of any petrol spills or leaks
- Change frequently any absorbent mats used in accordance with the supplier's instructions, or against a schedule established from known use and spillage patterns

To avoid ignition sources you should:

- Ensure the tank penetration mechanism does not create sparks or frictional heating capable of igniting petrol vapours;
- Ensure that all potential ignition sources are excluded from the vehicle petrol extraction equipment Hazardous Area, in particular:
  - Pickaxes and similar implements are excluded and are not used for puncturing tanks
  - Cutting equipment, such as oxy-acetylene and disc cutters are excluded
  - Drills, pumps and lights (including inspection lamps and torches) are suitable for use in the Hazardous Area and remain so, especially following maintenance of repair
  - Earth bonding is provided for the vehicle petrol extraction equipment and vehicle
  - Antistatic footwear is provided and worn
  - Smoking is prohibited

To avoid any incident spreading you should:

- Locate the petrol extraction operation to ensure that, in the event of an incident, it will not immediately spread to affect other parts of the site
- Where the extraction operation is carried out in a building (unless this is solely dedicated to the activity), separate the area in which the activity takes place from other parts of the building by physical barriers (walls, ceilings, doors) of fire-resisting construction. Ensure that the extraction plant and equipment does not obstruct or interfere with escape routes or access to fire exits
- Design and site the petrol extraction equipment to allow safe means of ingress and egress from the working areas and provide handrails at all raised working platforms or gantries to prevent falls

- Ensure that there is a clear route around the extraction plant and equipment and there are no places where people can be trapped by a fire
- In addition to any other fire extinguishers needed to comply with general fire precautions law, provide at least two dry powder fire extinguishers complying with BS EN 3-10:2009, each with a minimum capacity of 9 kg (233 B rating or greater) in a conspicuous position readily accessible for use where the petrol extraction is taking place

## 6. Storing extracted petrol

The information in this section will help you to design suitable storage arrangements. The main options for safely storing extracted petrol are in suitable cans, drums or tanks. The method appropriate for your facility will depend on the circumstances of your site and operation, taking account of:

- Quantities of petrol to be stored
- Other activities on site
- Separation distances from buildings, boundaries and other site activities (including petrol extraction and dispensing, where they take place on site)
- Preventing leaks and 'secondary' containment
- Site security

### 6.1 Separation distances

Separation distances are important to protect the stored petrol from potential ignition sources, including heat from a nearby fire, and to reduce the effect of a fire involving the petrol on nearby buildings, etc.

Table 1 summarises the minimum separation distances recommended for petrol stored in cans and/or drums and in tanks from occupied buildings, site boundaries, process areas, other storage areas, including flammable liquid tanks, and fixed ignition sources. As indicated in the table, separation distances can be reduced if either:

- The wall(s) of any building(s) adjacent to the storage is a fire-resistant partition that is:
  - Imperforate (no openings)
  - Built to a 30-minute fire-resisting standard
  - At least as high as the tank or stack of containers
  - No less than 2 m high

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- Sufficiently long that the distance from the nearest container around the wall to occupied buildings, site boundaries, etc, provides the minimum separation distance given in Table 1

OR

- A suitable firewall is provided that is:
  - Imperforate (no openings)
  - Built to a minimum 30-minute fire-resisting standard;
  - At least as high as the tank or stack of containers
  - No less than 2 m high
  - Sufficiently long that the distance from the nearest container around the wall to occupied buildings, site boundaries, etc, provides the minimum separation distance given in Table 1
  - On one side of the storage facility only so as not to limit natural ventilation

See the DSEAR ACOP for further information on fire-resistant structures.

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

Petrol quantity	Type of storage	Separation distance (metres) from storage to:			
		buildings, boundary, process areas, other storage areas and fixed ignition sources	fire-wall/fire-resistant partition <sup>2</sup>	vehicle/container refuelling location	petrol dispenser
Up to 1000 litres	Cans and drums (metal) – outdoors	2 <sup>1</sup>	0	4	4
Up to 1000 litres	Cans and drums (plastic) – outdoors	4 <sup>2</sup>	0	4	4
Up to 1000 litres	Cans and drums – indoors	2 <sup>1</sup>	0	2	2
Up to 1000 litres	Above ground tank – single, double-skin and explosion-protected	1 <sup>3</sup>	0	4 <sup>4</sup>	4 <sup>4,5</sup>
1000–5000 litres	Above ground tank – single, double-skin and explosion-protected	4	1	4 <sup>4</sup>	4 <sup>4,5</sup>
5000–30 000 litres	Above ground tank – single, double-skin and explosion-protected	6	1	4 <sup>4</sup>	4 <sup>4,5</sup>
Up to 22 500 litres	Fire-protected tank	2	0	0	0
22 500–45 000 litres	Fire-protected tank	4	1	0	0
Any size	Underground tank	2 <sup>6</sup>	-	0	0

## Notes:

*1 Increase the separation distance to at least 4 m for all containers from particularly high-risk activities, such as those involving the use of oxy-acetylene and similar cutting equipment, or heavy mobile plant.*

*2 Plastic containers will fail more quickly in the event of a fire than metal ones.*

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

*4 For explosion-protected vessels, the separation distance to the petrol dispenser and vehicle refuelling location may be reduced to 2 m and where only containers are filled the separation distance may be 0 m..*

*5 Where the explosion-protected vessel is equipped with an integral pump for dispensing, the required separation distance for petrol dispensers does not apply.*

*6 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.*

Note also that LPG cylinders (up to total quantity of 50 kg) should be a minimum of 3 m and LPG vessels should be a minimum of 6 m from the bund wall of petrol storage areas/surface of un-bunded petrol tanks/activity involving petrol.

## 6.2 Storing petrol in cans and drums

Cans and drums are only likely to be appropriate where limited quantities of petrol are handled because of the risks associated with the number of containers, including their handling, filling, emptying and maintenance.

To store more than 1000 litres of petrol you should install a suitable tank, unless you can demonstrate that is not necessary, in which case you should follow the guidance in *The storage of flammable liquids in containers*.

Where cans and drums are used, they should be of appropriate design and construction for the storage of petrol and have well-fitting lids or tops to prevent liquid or vapour leakage. The containers should be clearly labelled so that people are aware of their contents and hazards, eg 'Petroleum spirit' and/or 'highly flammable liquid'.

Containers to be transported off site should be UN-approved containers for the conveyance of petrol, labelled in accordance with the requirements of The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009.

Cans that can be legally filled at retail petrol-stations, metal and plastic containers, may also be used, however, these are likely to be unsuitable where significant quantities of petrol are recovered. Also, plastic containers can degrade in sunlight, so should not be stored outdoors without suitable shading.



## Outdoor storage of up to 1000 litres of petrol in cans and drums

Storing containers outdoors is the best option. You should:

- Store containers only at ground level (singularly or in stable stacks), preferably outdoors to ensure any petrol vapours are readily dispersed and enable any leaks to be easily seen
- **Not** store containers on the roof of a building
- Separate the storage from buildings, boundaries, fixed sources of ignition, etc in accordance with the distances outlined above in Separation Distances and Table 1
- Construct the storage area with an impervious surface enclosed with a sill or low bund wall that will contain a volume of at least 110% of the capacity of the largest container. Note that a hazardous area of Zone 2 classification will normally exist within the storage area and for 1 m beyond the sill or bund wall and potential sources of ignition should be excluded from this area
- Where plastic containers are used, ensure the bund capacity is at least 110% of the total inventory of plastic containers that may be present. Note that environmental requirements may mean a larger containment capacity is needed and you may also need to provide ramps over the sill to allow for easy access
- Slope the surface of the storage area slightly so that any petrol leaks or rain water flow away from the containers. Note that you may need to provide means for removing excess rainwater
- **Not** carry out any work activities in the storage area or its immediate vicinity that increase the risk of incident, including filling and/or emptying containers
- Store only the extracted petrol in the storage area (it is permissible to store other flammable liquids in containers in the same storage area, but the total quantity of the petrol and flammable liquids should be used to determine the required separation distances, which are detailed in *The storage of flammable liquids in containers*)
- Keep the storage area, and the area within the designated separation distance clear of combustible materials such as rubbish and vegetation and do not use sodium chlorate or similar chemicals as a weed killer
- Secure the storage area, during normal working hours and at night, to prevent any unauthorised access to the petrol
  - A welded mesh, palisade or chain link fencing 1.8 m high will provide sufficient security
  - 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
- Ensure that any enclosed area around petrol containers does not limit the means of escape in the event of a fire

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- Ensure that the travel distance from any part of the storage area to its exit does not exceed 25 m and provide a second exit if necessary to prevent 25 m being exceeded (to meet the general fire precautions requirements)

## Indoor storage of up to 1000 litres of petrol in cans and drums

Small quantities of petrol, not more than 50 litres, may be kept in suitable containers (see above) within a workroom, provided it is kept in a properly labelled fire-resisting cabinet or bin with spillage retention. Where the best option of storing containers outside is not reasonably practicable, they may be kept in suitable storerooms specifically designed for the purpose. You should:

- Provide a dedicated, separate storage building constructed of non-combustible materials (also defined as having a 'low risk' with respect to their reaction to fire in the DSEAR ACOP), preferably with a roof constructed of lightweight materials that would relieve excess pressure in the event of an explosion. Note that a hazardous area of Zone 2 classification will normally exist within the storage building and for 1 m beyond building openings, including doors and ventilation openings, and potential sources of ignition should be excluded from this area
- Separate the storage in accordance with the distances outlined above separation distances and Table 1
- Where lower separation distances apply because the building wall is imperforate and provides a minimum 30-minute fire resistance, typically only one wall should be imperforate to ensure ventilation of the building is not adversely affected
- Provide a good standard of ventilation in the building to disperse any petrol vapours, with fixed, permanent well-dispersed openings (totalling at least 1% of the combined area of the walls and roof) venting to a safe place in the open air at both high level in the walls or roof and at floor level. Note that ventilation openings should not be located in any walls of fire resisting construction provided to reduce the required separation distance
- Where sufficient openings cannot be installed and the building ventilation cannot be shown to be adequate, then provide mechanical exhaust ventilation to achieve the recommended ventilation rate of five air changes per hour
- Construct the storage area 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
- Where plastic containers are used, ensure the bund capacity is at least 110% of the total inventory of plastic containers that may be present. Note that environmental requirements may mean a larger containment capacity is needed and you should to consider providing ramps over the sill to allow for easy access
- Depending on the overall site security, ensure the standard of security provided for the storage building is sufficient to prevent any unauthorised access to the petrol

- Where a separate, dedicated storage building is not reasonably practicable, as an alternative a specially-designed storage room can be constructed within the confines of another building where you should:
  - Separate the storage room from the remainder of the building with internal partitions that provide a minimum 30-minute fire resistance (see the DSEAR ACOP)
  - Locate the storage room on the ground floor
  - Have at least one external wall that is provided with sufficient fixed, permanent well-dispersed openings to ensure adequate ventilation
  - Provide an alternative exit to meet the general fire precautions requirements if the escape travel distance from any part of the storage building/room to the exit is more than 12m

## 6.3 Storing petrol in tanks

Storage tanks may be located above ground, underground or in mounds. Each location has different advantages and disadvantages.

Leaks are more readily detected and contained, and any vapour produced will normally be dissipated by natural ventilation with tanks at ground level, in the open air. Examinations, modifications and repairs are also easier, and corrosion can be more readily identified and controlled.

Underground or mounded tanks give better fire protection and save space. But leakage, resulting from damage or corrosion, may be difficult to detect. This could lead to ground contamination, environmental problems and possible fire and explosion risks to nearby buildings and basements.

You should decide what type of storage is appropriate to your circumstances.

### Storage tank standards

Storage tanks should be designed and constructed to an appropriate national or international standard; eg BS EN 12285-1 for underground tanks and BS EN 12285-2 for above-ground tanks.

Previous standards, eg BS 2594 remain acceptable, as long as you can demonstrate the tank is still suitable.

Tanks should be provided with accurate contents gauges and a suitable means to prevent the tank from being overfilled, such as a high-level trip set to activate an alarm and to stop the transfer pump from the vehicle depollution rig.

Tanks should be separated from buildings, boundaries, fixed sources of ignition, etc in accordance with the distances outlined above in separation distances and Table 1.

Each petrol tank should be vented to the atmosphere with a vent discharge height at least 3 m above the ground, preferably 5 m, to ensure adequate dispersion of the petrol vapours.

Unless the tank is manufactured to be explosion protected to a recognised national or international standard, the vent pipe should be fitted with a flame arrestor or pressure/vacuum valve.

The area within a 2 m radius of the vent discharge is normally classified as a Zone 1 and Zone 2 extending down to ground level.

There will also be hazardous areas created by releases from fill and discharge connections to tank.

The area within a 1 m radius of tank connections points is normally classified as Zone 1 (Zone 2 for vapour connection points) and Zone 2 for 3 m beyond the Zone 1 hazardous area, to a height of 1 m above ground level.

## Underground storage tanks

This is the preferred option for petrol stations as installing tanks underground provides effective fire protection, particularly at sites that have limited space or where there is access by the general public.

But underground tanks and pipes have a history of developing leaks that can be difficult to detect until a hazardous situation has arisen. Therefore underground tanks and pipes need an effective leak - prevention and/or detection system.

A double-skin tank with a system to continually monitor the interstitial space between the inner and outer tank provides an effective leak prevention system.

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 between the actual tank contents and the theoretical volume, determined by calculations from the known quantities charged to or dispensed from the tank.

Detailed advice on the design and installation of underground storage tanks for petrol is contained in the APEA/EI 'Blue Book'.

## Above ground storage tanks

### Single skin tanks

Above-ground single-skin tanks provide a satisfactory means of storage, providing there is sufficient space to meet the required separation distance and bunding requirements. You should:

- Site tanks in a well-ventilated position separated from the site boundary; occupied buildings; sources of ignition; process areas, including the petrol dispenser and dispensing point; and other dangerous and hazardous substances sources. Table 1 summarises the minimum recommended separation distances

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- Provide a liquid tight bund of sufficient volume to contain 110% of the capacity of the largest tank. Note that bund walls should be no higher than 1.5 m, at least 1 m from the tanks and constructed with sufficient strength to contain any spillage or fire-fighting water. Bunds also have to comply with the Control of Pollution (Oil Storage) Regulations 2001. Information on these and other references can be found in *Above Ground Oil Storage Tanks*
- Prevent surface water collecting in the bund – sloping the bund floor will allow water to be pumped out over the bund wall. Note that a Zone 2 hazardous area will normally exist within the bunded area and can extend beyond it. You need to consider the potential size of foreseeable spills from the tank or fittings and where the liquids would accumulate within the bund in order to determine whether and where the hazardous area may extend beyond the bund wall. For pools less than 5 m diameter, the extent of the Zone 2 from the edge of the pool can be assumed to be 3 m
- Locate any filling or discharge connections for the tank 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. Note that 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
- Provide suitable crash barriers or bollards to protect bund walls if they are situated in vulnerable positions (vehicles or heavy site equipment can easily damage them);
- Secure the storage area, during normal working hours and at night, to prevent any unauthorised access to the petrol
  - A welded mesh, palisade or chain link fencing 1.8 m high will provide sufficient security
  - 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
- Ensure that any enclosed area around petrol containers does not limit the means of escape in the event of a fire
- Ensure that the travel distance from any part of the storage area to its exit does not exceed 25 m and provide a second exit if necessary to prevent 25 m being exceeded (to meet the general fire precautions requirements)

## **Double skin tanks**

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.

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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 *Above Ground Oil Storage Tanks*.

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.

If a double-skin tank is located in a bund, there will be a Zone 2 hazardous area within the bund wall. Similarly, as discussed above you should consider whether the hazardous area may extend beyond the bund wall.

## **Explosion protected vessels**

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 of petrol or other hydrocarbon vapours inside the vessel. There are currently no European Standards for these vessels, but they are available; manufactured and tested to the German standards DIN 6623 or DIN 6624-2.

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, some relaxation in the separation distances for dispensing operations over those for other tanks is acceptable. See Table 1.

## **Fire-protected tanks**

Fire protected tanks are normally double-skin tanks coated with passive fire protection materials. These materials include cementitious materials (such as concrete or vermiculite cement) and intumescent epoxy coatings. There are currently no European Standards for these vessels, but they are available; manufactured and tested to the US standard ANSI/UL 2085. Tanks to this standard provide a protection of at least 2 hours fire resistance.

Fire-protected tanks can be used in most above-ground situations and, because of their additional fire protection and security, some reduction in separation distances are acceptable compared to those required for other above-ground storage tanks. See Table 1.

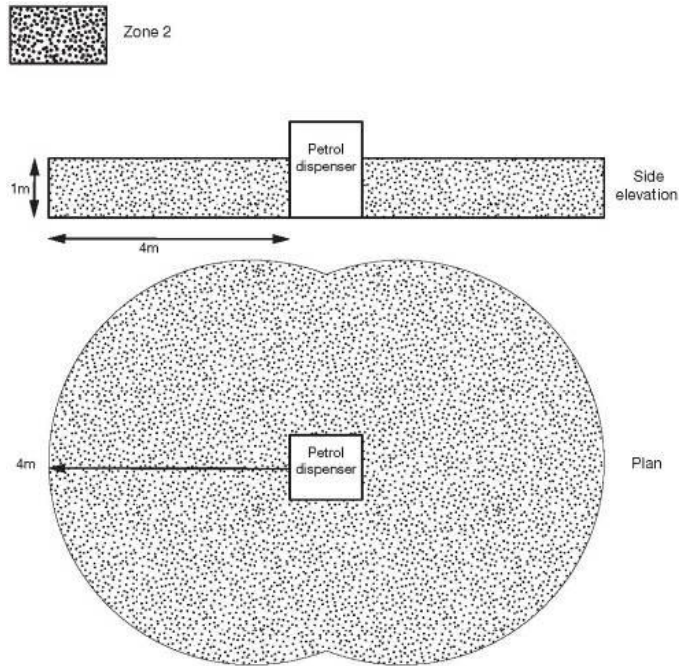
Double-skin tanks with closed secondary containment, a Class1 leak detection system, and robust means to prevent overfill usually (subject to any requirements of the Environment Agency/Scottish Environment Protection Agency) do not need bunding.

Significant impacts can damage the coating, reduce the level of fire resistance and prejudice the integrity of the installation. Therefore appropriate barriers, etc should be provided to protect the installation against any such impacts, eg from vehicles.

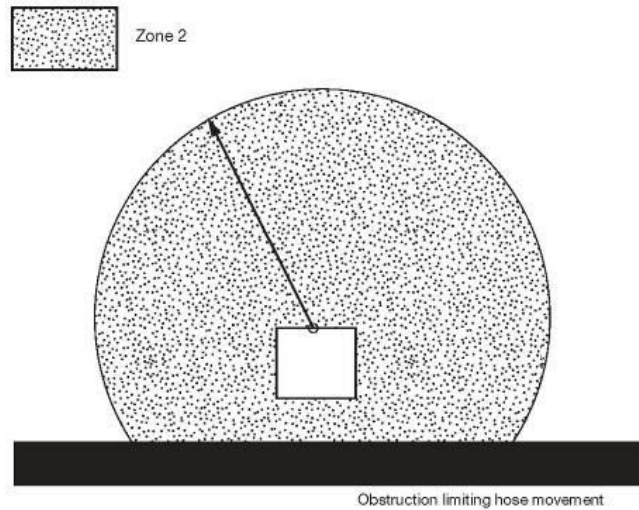
## 7. Dispensing equipment

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
- **Not** locate dispensers at the storage vessel unless additional control measures are provided to give protection if there is a fire; see Table 1 for separation distances from different storage
- Locate dispensers to minimise impact from vehicles/mobile equipment used on the site and provide bollards or other barriers if necessary to protect against physical impact
- Ensure the ground surface around dispensing equipment is impermeable to petrol, preferably drained to a separator or catchment pit where spills can be collected and disposed of
- Provide drip trays where petrol is dispensed into portable containers
- Provide 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, located near the dispensing area
- Locate an emergency stop switch to isolate the power to the dispensers, at or near to the dispenser(s)
- Clearly label the switch 'Petrol Pump Emergency Stop' and ensure it is visible to and readily accessible by people using the dispenser
- In addition to any other fire extinguishers needed to comply with general fire precautions law, provide at least two dry powder fire extinguishers complying with BS EN 3-10:2009, each with a minimum capacity of 4 kg (89 B rating or greater) in a conspicuous position readily accessible to people using the dispenser
- See the *APEA/EI Blue Book* for detailed information on constructing and installing dispensers. Note that 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 (see Figures 4 and 5). All ignition sources should be excluded from this area. Electric pumps and dispensers must be suitably protected



**Figure 4** Nominal extent of Zone 2 for a dispenser with two standard 3.6 m hoses



**Figure 5** Nominal extent of Zone 2 with dispenser adjacent to an impermeate wall, preventing hose movement beyond this



## 8. Personal protective equipment (PPE)

In addition to the PPE for your employees that you decide is required under COSHH, you should provide all employees handling petrol or extracting it from vehicles with anti-static footwear (to BS EN ISO 20345:2011 or equivalent standard) and ensure they wear it.

Where petrol could spill onto the employees' clothing, eg when working below the vehicle petrol tank, you should provide them with fire-retardant/resistant overalls.

## 9. Contaminated clothing

Changing and washing facilities should be provided for employees involved in extracting petrol from vehicles so 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, free of potential ignition sources, until they are completely dry before they are washed or sent for cleaning.

## 10. Maintenance procedures

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 and include at least 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 the earth or bonding arrangements
- Inspecting bunds for the presence of petrol or surface water
- Draining sumps, catchment pits and bunds
- Evidence of petrol leakage from joints, pumps or pipework
- Checking sight glasses and other vulnerable equipment is not cracked or leaking
- Damage or other defects that might impair safety
- All 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
- 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 shutoff device
- Inspecting tanks for signs of damage or corrosion
- Checking that all the fire extinguishers are present and that they are all fully charged
- Checking for accumulations of combustible rubbish in the vicinity of petrol equipment and storage areas

Any defects to plant and equipment resulting in, or potentially likely to result in a leak of petrol should be reported to the line manager and repaired before the item is brought back into service.

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.

## 11. Emergency procedures

You should draw up procedures for dealing with spills or leaks of petrol and any fire should it occur. Such procedures should include:

- Safely removing residual petrol from vehicles, plant and equipment in the event of malfunction
- Shutting down plant and equipment, including pumps and dispensers safely to limit the magnitude and consequences of the incident
- Controlling leaks and spills and how they are to be promptly cleared up by the application of sand or other absorbent material and this disposed of safely
- Raising the alarm and notifying the fire brigade
- Tackling the incident; and
- Evacuating the area or site

## 12. Information, instruction and training

Workers must be given enough information and training to carry out their duties safely and effectively. It is important that those involved have been inducted and trained on safe systems of work. They should be clear about the process to be followed. See the HSE leaflet *Health and safety training: A brief guide to employers* for further information.

## 13. Worker consultation and engagement

Consulting and engaging your workers on health and safety arrangements and working practices is essential in ensuring safe working and is especially important in this industry. Further information on worker involvement can be found at [www.hse.gov.uk/involvement/index.htm](http://www.hse.gov.uk/involvement/index.htm).

## References, further reading and useful links

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HSE's DSEAR website: [www.hse.gov.uk/fireandexplosion/dsear-regulations.htm](http://www.hse.gov.uk/fireandexplosion/dsear-regulations.htm)

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The Waste Industry Safety and Health (WISH) Forum exists to communicate and consult with key stakeholders, including local and national government bodies, equipment manufacturers, trade associations, professional associations and trade unions. The aim of WISH is to identify, devise and promote activities that can improve industry health and safety performance.

## Further information

This guidance is issued by the Waste Industry Health and Safety (WISH) Forum to help control safety and health risks. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance. Some parts of the guidance represent good practice and may go further than the minimum needed to comply with the law.

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