



Petrol Filling Stations Guidance on Managing The Risks Of Fire & Explosion (The Red Guide)

This guidance document is constantly under review and will be updated when changes are made to relevant legislation, national standards, and other related guidance. Any amendments that have been made will be listed and referenced in Appendix 8.





PREFACE

This guidance on managing the risks of fire and explosion at petrol filling stations has been compiled and edited by Roger Marris, the Senior Petroleum/Explosives Inspector, of the West Yorkshire Fire and Rescue Service. The guidance was produced in consultation with the Health & Safety Executive and has been reviewed by the Petroleum Enforcement Liaison Group. The Petroleum Enforcement Liaison Group (PELG) is the Health and Safety Executive Advisory Committee comprising representatives of the retail petroleum industry, the petroleum licensing authorities, the Health & Safety Executive and the Environment Agency.

The guidance is aimed at site operators and managers of petrol filling stations to enable them to comply with the relevant health & safety law; in particular their statutory duties under the Dangerous Substances and Explosive Atmospheres Regulations 2002. It will also be useful to others who have an interest in the safe operation of petrol filling stations. Following the guidance is not meant to be prescriptive and site operators are at liberty to use other methods of controlling the risks of fire or explosion. However, if the guidance is followed, site operators will normally be doing enough to comply with the law. The Petroleum Enforcement Liaison Group believes that the guidance represents current good practice and therefore commends its use to the industry.

Petrol filling stations and other facilities where petrol is dispensed as a fuel into the tanks of internal combustion engines are required to be licensed by the relevant Petroleum Licensing Authorities (PLA) who will seek to ensure that the necessary safety standards are observed and maintained. PLA's in carrying out these duties to secure compliance with the law, may refer to this guidance as illustrating good practice.

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Preface



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1 INTRODUCTION

The purpose of this guidance is to assist licensees (employers) in complying with their obligations under the Dangerous Substances & Explosive Atmospheres Regulations 2002 (DSEAR)¹ and the Conditions of Petroleum Licence, to take appropriate measures to control the risks of fire and explosion arising from the storage and dispensing of petrol.

1) This guidance covers: -

- a) the most common fire and explosion hazards associated with the unloading of road tankers, the storage and dispensing of petrol, the commissioning of new and redeveloped filling stations and taking storage tanks and equipment out of use (decommissioning).
- b) how to carry out an assessment to identify and deal with the risks that these activities present; and provides information, advice and examples of good practices on how to manage and control the risks of fires and explosions occurring.

2) This guidance does not cover: -

- a) LPG (autogas)* and LNG. These re-fuelling installations are also covered by DSEAR and you will need to carry out a risk assessment in order to determine the extent of the control measures necessary. The methodology given in this guidance can be followed but will need to be adapted to take account of the hazardous characteristics of the substances and the different technical and engineering aspects of the liquefied gas installations.

**Other than for an overview of hazardous area classification.*

- b) the technical/engineering aspects in any detail as this information is adequately covered by the APEA/IP joint publication 'Guidance for the Design, Construction, Modification and Maintenance of Petrol Filling Stations' (the Blue Guide²). Site operators will, therefore, need to refer to the Blue Guide when following this guidance.
- c) the health risks associated with coming in to contact with petrol/petrol vapour.
- d) environmental issues such as contamination of groundwater, water courses and land.
- e) general fire precautions (means of escape and fire alarms/detection etc) in buildings associated with the filling station.

¹ The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE Books: ISBN 0 7176 2203 7.

Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X.



Section 2 - Applicable Legislation

2 APPLICABLE LEGISLATION

THE PETROLEUM (CONSOLIDATION) ACT 1928³

- 1) Under the provisions of the Petroleum (Consolidation) Act 1928, it is an offence to keep petrol (at a 'petrol filling station') without a petroleum licence being in force. Petroleum licences are granted by the local petroleum licensing authority (PLA). The PLA can be a county council, a (local) district council or in the metropolitan areas of England, the fire & rescue authority. (See Section 3 Page 1)
- 2) The PLA can attach conditions to any petroleum licence as the authority thinks appropriate, to the mode of storage, the nature and situation of the premises in which, and the nature of the goods with which, petroleum-spirit is to be stored and generally as to the safe-keeping of the petroleum-spirit. The conditions take into account the way the petrol is stored, its location, and general principles of safe storage.

Note: See the Note to paragraph 9 (c) in this section (DSEAR).

THE DANGEROUS SUBSTANCES & EXPLOSIVE ATMOSPHERES REGULATIONS 2002⁴

- 3) Main Requirements of DSEAR
- 4) DSEAR is a set of regulations concerned with protection against the risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. The regulations apply to employers and the self-employed.
- 5) The regulations give a detailed definition of 'dangerous substance'. The definition includes any substance or preparation, which because of its properties or the way it is used could cause harm to people from fires and explosions. Petroleum-spirit, LPG and LNG fall within the definition of a 'dangerous substances'.
- 6) DSEAR imposes a requirement on the operators of petrol filling stations to:
 - a) Carry out a risk assessment of any work activities involving 'dangerous substances';
 - b) Provide measures to eliminate or reduce risks so far as is reasonably practicable;
 - c) Provide equipment and procedures to deal with accidents and emergencies;

³ LAC 65/61 'Petroleum (Consolidation) Act 1928 (PCA) - Petrol Filling Stations – Model Conditions of Licence' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector)

⁴ The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE Books: ISBN 0 7176 2203 7.

Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books

- d) Provide information and training to employees; and
- e) Classify places where explosive atmospheres may occur into zones and mark the zones where necessary with a specified “EX” sign at their points of entry.

Note: With respect to the dispensing areas of retail petrol filling stations, it should not be necessary to display the 'EX' sign as the customers should be familiar with the precautions to prevent the ignition of petrol vapour from the traditional warning signs on display.

- 7) DSEAR clarifies the existing requirements to manage fire and explosion risks, which are set out in the Management of Health and Safety at Work Regulations 1999; commonly referred to as the Management Regulations.
- 8) DSEAR is supported by a series of Approved Codes of Practice (ACoP), some of which are referred to in this guidance document. You should be aware of the special legal status of ACoPs. See Appendix 6 'Glossary of Terms'.
- 9) Enforcement of DSEAR is by: -
 - a) Petroleum Licensing Authorities (PLAs) at retail and non-retail petrol filling stations but only in respect of the storage and dispensing of automotive fuels; e.g. petrol and LPG.
 - b) Health & Safety Executive (HSE) or Local Authorities depending on the allocation of premises under the Health and Safety (Enforcing Authority) Regulations 1998. In the main, HSE will enforce at industrial premises and Local Authorities (Environmental Health Officers) elsewhere e.g. in retail premises including petrol filling stations but not in relation to automotive fuels.
 - c) Fire & Rescue Authorities at all premises subject to DSEAR in relation to general fire precautions such as means of escape etc.

Note: As DSEAR now imposes specific statutory duties on employers' to protect against the risks of fire or explosion, the conditions attached to petroleum licences are now limited to matters requiring approval, notification, the type/capacity of containers that may be filled with petrol and the prohibition on the sale of petrol to children.

THE HEALTH AND SAFETY AT WORK ETC ACT 1974 (HSWA⁵)

- 10) This Act places general duty on employers to ensure, so far as is reasonably practicable, the health and safety and welfare at work of their employees. Employers and the self-employed must likewise ensure that their work activities do not put third parties at risk.

⁵ The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd
 Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE
 Books: ISBN 0 7176 2203 7.
 Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books



Section 2 – Applicable Legislation

THE MANAGEMENT OF HEALTH AND SAFETY AT WORK REGULATIONS 1999⁶

11) These Regulations apply to all workplaces and place a number of duties on employers.

These include:

- a) assessing health and safety risks (taking particular account of risks to young employees under the age of 18);
- b) deciding what measures need to be taken and making arrangements to implement them;
- c) appointing somebody competent to help comply with legal obligations this could be an employee or someone from another organisation;
- d) providing health and safety information for employees and other workers, such as contractors, who may work on the site, for example to carry out maintenance;
- e) providing health and safety training for employees;
- f) having arrangements to deal with serious and imminent danger; and
- g) co-operating in health and safety matters with other employers who may share the premises.

THE REPORTING OF INJURIES, DISEASES AND DANGEROUS OCCURRENCES REGULATIONS 1995 (RIDDOR)⁷

12) RIDDOR requires the reporting of the following kinds of work-related accidents, diseases and dangerous occurrences:

- a) An employee or self-employed person working on your premises suffers a major injury or is killed, or a member of the public is seriously injured or killed.
- b) An employee or self-employed person working on your site suffers an injury, which results in them being away from work or unable to do their normal work for more than three days.
- c) Certain dangerous occurrences must also be reported to the enforcing authority, the most relevant to a petrol filling station would be the sudden, uncontrolled release of more than 500 litres of petrol.
- d) Uncontrolled release or escape of petrol from a road tanker (quantity not specified).

Fire or explosion, which results in the stoppage or suspension of normal work activities for more than 24 hours.

⁶ The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE Books: ISBN 0 7176 2203 7.

Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books

⁷ RIDDOR Explained HSE 31(rev1) HSE Books: ISBN 0 7176 2441 2

Note: Where the incident involves petrol, notification must also be made to the Petroleum Licensing Authority.

- e) Full details of what types of accident must be reported and how you should do it is detailed in HSE's free publication 'RIDDOR Explained HSE 31'⁷.

THE ELECTRICITY AT WORK REGULATIONS 1989

- 13) These place duties on employers and employees in respect of the operation, use and maintenance of electrical equipment. They also require electrical equipment, which is exposed to any flammable or explosive substance, including flammable liquids or vapour such as petrol, to be constructed or protected so as to prevent danger. The Regulations prohibit electrical work from being carried out other than by competent persons. HSE's Memorandum of guidance on the Electricity at Work Regulations 1989 gives guidance on the practical application of the Regulations.

THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2007 (CDM)

- 14) These Regulations update the earlier CDM Regulations 1994 and replace the Construction (Health, Safety and Welfare) Regulations 1996. The Regulations aim to ensure that the risks to workers and others who may be affected by construction work are minimised by requiring that health, safety and welfare is taken into account and managed through all stages of a construction project. They place legal duties on virtually everyone involved in construction work and define a number of key dutyholders with specific responsibilities. These dutyholders include clients, designers and contractors and for large notifiable projects, involving more than 30 days or 500 person-days of construction work, the client has to appoint the specific roles of principal contractor and CDM coordinator. For all construction work the Regulations detail the general management duties that apply to the project and specify the requirements for a range of individual activities or issues. These include site access, security, stability of structures, demolition, excavations, vehicle movements, prevention of fire, fire-fighting, emergency procedures, lighting and weather protection. Additional requirements and duties apply to notifiable projects. Practical advice and guidance on the provisions of these Regulations is contained in an Approved Code of Practice⁹. Further advice on identifying hazards and controlling risks during construction activities and how to work safely at heights is contained in the HSE guidance document HSG150

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⁷ RIDDOR Explained HSE 31(rev1) HSE Books: ISBN 0 7176 2441 2.

⁹ Managing health & safety in construction. The Construction (Design & Management) Regulations 2007. Approved Code of Practice L 144 HSE Books 2007 – ISBN 978-0-7176-6223-4

THE REGULATORY REFORM (FIRE SAFETY) ORDER 2005 (RRO)⁸ & THE FIRE (SCOTLAND) ACT 2005 (FSA)⁹

- 15) The RRO applies in England and Wales and equivalent duties are implemented in Scotland by the FSA. They cover general fire precautions and other fire safety duties that are needed to protect 'relevant persons' in case of fire in and around most types of 'premises'. The RRO require general fire precautions to be put in place 'where necessary' and to the extent that it is reasonable and practicable in the circumstances of the case.
- 16) The duty for complying with RRO rests with the 'responsible person'. In a workplace, this is the employer and any other person who may have control of any part of the premises, e.g. the occupier or owner. In all other premises the person or people in control of the premises will be responsible. If there is more than one responsible person in any type of premises (e.g. a multi-occupied complex), all must take all reasonable steps to co-operate and co-ordinate with each other.
- 17) If you are the responsible person you must carry out a fire risk assessment that must focus on the safety in case of fire of all 'relevant persons'. It should pay particular attention to those at special risk, such as disabled people, those who you know have special needs and young persons and must include consideration of any dangerous substance liable to be on the premises.
- 18) Your fire risk assessment will help you identify risks that can be removed or reduced and to decide the nature and extent of the general fire precautions you need to take.

The following is a list of some other fire safety duties you will need to comply with: -

- a) You must appoint one or more competent persons, depending on the size and use of your premises, to carry out any of the preventive and protective measures required by RRO (you can nominate yourself for this purpose). A competent person is someone with enough training and experience or knowledge and other qualities to be able to implement these measures properly.
- b) You must provide your employees with clear and relevant information on the risks to them identified by the fire risk assessment, about the measures you have taken to prevent fires, and how these measures will protect them if a fire breaks out.
- c) You must consult your employees (or their elected representatives) about nominating people to carry out particular roles in connection with fire safety and about proposals for improving the fire precautions.

⁸ See Reference Document No (46) Regulatory Reform (Fire Safety) Order 2005, SI 2005/1541. The Stationery Office, 2005.

ISBN 0 11 072945 5.

⁹ See Reference Document (47) Fire (Scotland) Act 2005

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- d) You must, before you employ a child (under 16), provide a parent with clear and relevant information on the risks to that child identified by the risk assessment, the measures you have put in place to prevent/protect them from fire and inform any other responsible person of any risks to that child arising from their undertaking.
- e) You must, before you employ a young person, carry out a risk assessment which takes certain matters into account regarding their inexperience and immaturity, layout of the premises, exposure to chemical agents, use of work equipment, risks from process activities, the extent of safety training.
- f) You must inform non-employees, such as temporary or contract workers, of the relevant risks to them, and provide them with information about who are the nominated competent persons, and about the fire safety procedures for the premises. You must co-operate and co-ordinate with other responsible persons who also have premises in the building, inform them of any significant risks you find and how you will seek to reduce/control those risks that might affect the safety of their employees.
- g) You must provide the employer of any person from an outside organisation who is working in your premises (e.g. an agency providing temporary staff) with clear and relevant information on the risks to those employees and the preventive and protective measures taken. You must also provide those employees with appropriate instructions and relevant information about the risks to them.
- h) If you are not the employer but have any control of premises which contain more than one workplace, you are also responsible for ensuring that the requirements of RRO are complied with in those parts over which you have control.
- i) You must consider the presence of any dangerous substances and the risk this presents to relevant persons from fire.
- j) You must establish a suitable means of contacting the emergency services and provide them with any relevant information about dangerous substances.
- k) You must provide appropriate information, instruction and training to your employees, during their normal working hours, about the fire precautions in your workplace, when they start working for you, and from time to time throughout the period they work for you.
- l) You must ensure that the premises and any equipment provided in connection with fire-fighting, fire detection and warning, or emergency routes and exits are covered by a suitable system of maintenance and are maintained by a competent person in an efficient state, in efficient working order and in good repair.
- m) Your employees must co-operate with you to ensure the workplace is safe from fire and its effects, and must not do anything that will place themselves or other people at risk.

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The above examples outline some of the main requirements of RRO. There is a suite of industry related guides, published by the Department for Communities & Local Government, which provide more detailed information on how you might meet these requirements. The guides can be downloaded from the DCLG website: <http://www.firesafetyguides.communities.gov.uk/>

The enforcing authority for the RRO and FSA at industrial, retail and commercial premises (including petrol filling stations) is the local fire & rescue authority.

The Water Resources Act 1991

- 19) Under the provisions of this environmental protection legislation, it is an offence to cause or permit any poisonous, noxious or polluting substances to enter any 'controlled waters'. The Environment Agency has produced two sets of notes, under the heading of Pollution Prevention Guidelines, these are intended to assist site operators in minimising the risks of pollution occurring.

Note: This Act is not applicable to Scotland.

- 20) PPG7 Construction and Operation of Fuelling Stations and PPG27 Installation, Decommissioning of Underground Storage Tanks. These documents can be viewed or downloaded from the Environment Agency's website: <http://www.environment-agency.gov.uk/>

Groundwater Regulations 1998

- 21) These regulations aim to protect groundwater from pollution by a range of substances including petrol and diesel. Pollution of groundwater is an offence under the Water Resources Act, (see 19) above.
- 22) The Department for Environment, Food & Rural Affairs (DEFRA) have produced statutory guidance on the storage of hydrocarbons 'Groundwater Protection Code: Petrol stations and other fuel dispensing facilities involving underground storage tanks.'
<http://www.defra.gov.uk/environment/water/ground/petrol/>
- 23) Environment Agency staff can visit operators and help them with pollution prevention advice. The Agency can be contacted on 08708 506506.
- 24) More advice on groundwater protection is available in the Environment Agency's "Policy and Practice for the Protection of Groundwater".

Water Framework Directive

- 25) The directive takes a holistic approach to management and protection of the water environment. It will progressively change the way water including groundwater is protected from hazardous substances such as petrol and diesel. More information is available at:
<http://www.environment-agency.gov.uk/business/444217/444663/517208/>

Section 2- Applicable Legislation



3 INSPECTORS AND THE LAW

WHO ENFORCES THE PETROL SAFETY LEGISLATION AT PETROL FILLING STATIONS?

- 1) The local Petroleum Licensing Authority (PLA) appoints Petroleum Inspectors to enforce the Petroleum (Consolidation) Act 1928m and the Dangerous Substances & Explosive Atmospheres Regulations 2002¹ at premises falling within the definition of a 'petrol filling station'. In general, PLAs are the Fire & Rescue Authorities in the metropolitan areas of England, County Councils or Unitary Authorities elsewhere in England and Wales and the Councils, Islands & Isles Councils in Scotland.

Note: All other health and safety legislation, e.g. the Health & Safety at Work etc Act 1974, the Management of Health and Safety at Work Regulations 1999 and the Electricity at Work Regulations 1989, are enforced by the district council Environmental Health Officer and in some cases Inspectors from the Health & Safety Executive.

WHAT WILL PETROLEUM INSPECTORS DO?

- 2) Their responsibility is to ensure that you are doing what the law requires. They will check to see how you manage fire and explosion risks. They will provide advice, may require improvements to be made, and will enforce the law when needed. They will also investigate incidents and complaints in connection with the petrol installation.
- 3) For new petrol stations or material changes to existing ones, Petroleum Inspectors will decide whether the petroleum licensing authority should grant a petroleum licence, and discuss any further action you may need to take to ensure safety. Petroleum Inspectors will also liaise with the local Planning Department.
- 4) Once a petrol station is operational (i.e. storing and dispensing petrol), inspectors may visit unannounced. You are entitled to see their identification before letting them look around. Remember they are also there to give help and advice. You may want to talk to an inspector before carrying out any planned changes to your site.
- 5) If inspectors find problems, they will deal with you in a reasonable and fair way. Inspectors will explain to you or your representative anything you need to do to address the problems.

WHAT POWERS DO INSPECTORS HAVE?

- 6) Inspectors have extensive powers, which include the right to enter your premises, talk to employees and safety representatives and take photographs and samples. If they consider there is a problem at a petrol station, they can:

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Section 3 - Inspectors and the Law

- a) Give advice or guidance on how to address the problem, this will always be confirmed by the Inspector in writing;
 - b) Issue a notice, which requires improvements to be made where the law has been breached;
 - c) Issue a prohibition notice which stops a process or the use of dangerous equipment where a risk of serious personal injury exists; or
 - d) Recommend to the petroleum licensing authority that an application to renew the petroleum licence is refused.
- 7) Before an inspector issues an improvement or prohibition notice, he/she will explain and discuss the item(s) of non-compliance with yourself or your representative. If you receive an improvement or prohibition notice you have the right to appeal to an industrial tribunal.
- 8) Inspectors can prosecute a business or, under certain circumstances, an individual for breaking health and safety law, but they will take your attitude, management and safety record into account before taking such action.

WHAT RIGHTS DO I HAVE?

- 9) If your application for the grant or renewal of a petroleum licence is refused or if you are aggrieved at any condition attached to your petroleum licence, you can appeal to the Secretary of State at the Department of Work & Pensions at: - Health and Safety Sponsorship Division, 2nd Floor The Adelphi, 1-11 John Adams Street, London, WC2N 6HT.
- 10) If an inspector tells you to do something, he/she will always confirm in writing what needs to be done and give a time period for the work to be completed.
- 11) When an inspector issues an improvement notice or a prohibition notice, you will be told in writing about your right of appeal to an industrial tribunal and be given an appeal form. You will also be given a leaflet explaining:
- a) how to appeal;
 - b) where and within what time period an appeal may be brought;
 - c) that an appeal may be brought on any grounds; and
 - d) that any action required by an improvement notice is suspended while the appeal is pending.
- 12) If you are not satisfied with the way you have been treated, you can take the matter up with the inspector's manager, whose name should be on all letters from the Authority. As with any health and safety inspector, all complaints about Petroleum Inspectors will be investigated and the outcome of the investigation made known to you.
- 13) Further details can be found in the Health and Safety Commission's free publication: 'What to Expect When a Health and Safety Inspector Calls'¹¹

¹¹ What to expect when a health and safety inspector calls. (MISC 033) HSE Books: free leaflet.

4 TRAINING

WHO IS RESPONSIBLE FOR TRAINING?

- 1) If you are an employer, the Management of Health and Safety at Work Regulations 1999⁵ and the Dangerous Substances & Explosive Atmospheres Regulations 2002¹ say that you must provide training when employees are recruited, repeat it periodically, and provide further training when changes occur.
- 2) Employees must use all work items provided by their employer in a safe way and in accordance with the training and instructions they receive.
- 3) The leaflets produced by the HSE, 'Five steps to information, instruction and training'¹² and 'A guide to information, instruction and training'¹³ set out what the law requires in practice and give advice on how to comply.

WHY IS TRAINING IMPORTANT?

- 4) Training is vital in helping to prevent incidents and minimising the consequences if they do happen. Never presume that employees know and understand what to do; positive instruction and training are needed.
- 5) Employees need to know exactly what their duties are in both normal and emergency situations. They need to learn how to identify potentially dangerous situations and know what to do to prevent incidents developing.

DO ALL EMPLOYEES NEED THE SAME TRAINING?

- 6) No. Employees need the right amount of training to enable them to perform their work safely. Take account of their capabilities, their existing level of training and experience, and provide additional training where it is needed. Involve and consult your employees and a safety representative if there is one. They will know about hazards and risks occurring in everyday situations. Cater also for unusual occurrences, such as a vehicle breakdown on the forecourt, which causes an obstruction.
- 7) Think about when you should provide training and what it should cover. You must provide training when:
 - a) you recruit a new employee, previous experience or formal qualifications do not mean that new employees do not need any training;
 - b) you introduce new ways of working, new equipment or new technology;

⁵ The Management of Health and Safety at Work Regulations 1999 Approved Code of Practice and Guidance (L21) HSE Books: ISBN 0 7176 24889.

¹ The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd. Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE Books: ISBN 0 7176 2203 7.

Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books.

¹² Five steps to information, instruction and training (IND (G) 213) HSE Books: free leaflet.

¹³ A guide to information, instruction and training (IND (G) 235) HSE Books: free leaflet

- c) an employee moves to a new job or takes on different responsibilities; and
- d) performance is unsatisfactory and refresher training is needed.

- 8) Decide what the training should cover. Table 7 in Appendix 2 gives examples of the type of training that may be needed. Use your risk assessment to help identify what is appropriate for each person because employees with particular responsibilities will need specific training.
- 9) For example, the training of two forecourt controllers prevented serious injury to a customer when the dispenser hose suddenly burst and drenched her in petrol. The controllers immediately operated the emergency 'petrol pump switch' to stop the flow of petrol from the burst hose, closed the site and then provided the customer with a change of clothing (disposable cover-all suit) and changing/washing facilities.
- 10) People responsible for receiving petrol deliveries need to know how to prepare for a delivery and what to do during and after offloading. Employees who manage or check wetstock should be trained in the proper procedures and what to do if there are any unexplained losses. Staff at retail petrol stations need to know how to isolate the flow of petrol in the event of an emergency. Give special attention to employees who cover or deputise for others and ensure they receive sufficient training to carry out different or additional duties.

HOW SHOULD I CARRY OUT THE TRAINING?

- 11) Health and safety training must take place during working hours. You should not expect or ask people to use their own time.

However you are free to decide how it should be carried out.

- 12) Ensure that all information, instruction and training is understood by those who receive it. You will have to decide whether you are competent to give the training or whether you need help. This could be from one of your own staff who has the necessary experience, or someone from an outside organisation, for example, a training or industry organisation. Whoever you chose to carry out the training, remember you are responsible for ensuring your employees receive appropriate training related to their duties and the risks at the petrol station.
- 13) Carry out refresher training or practice exercises periodically. This is particularly important where skills are not regularly used, such as emergency procedures.

Section 4 – Training



WHAT TRAINING RECORDS SHOULD I KEEP?

- 14) It is good practice to ask for feedback from staff on the training they have received and to keep a record of the training, qualifications and any results or assessments from supervisory staff.
- 15) This will help you to decide what duties you can expect each of your employees to perform safely and what additional training they may need. The quality of training and the associated records are useful in assessing the competence of your supervisory staff.

Section 4 – Training

5 HAZARDS FROM PETROL

TYPICAL PROPERTIES

- 1) Petrol is a mixture of many organic substances and presents fire, explosion, health and environmental hazards. Its precise physical properties can vary depending on source, product specification and additives.

FIRE AND EXPLOSION HAZARDS

- 2) Petrol is a volatile liquid, which gives off flammable vapour at very low temperature, down to about minus 40°C. This vapour, when mixed with air in certain proportions, forms a highly flammable atmosphere, which can burn or explode if ignited. A mixture containing about 1%-8% of petrol vapour in air is flammable.
- 3) 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, drains, pits or other depressions. Accumulations of vapour in enclosed spaces or other poorly ventilated areas can persist for a long time, even where there is no longer any visible sign of the liquid itself.
- 4) Flammable vapours will be released when petrol is handled, or transferred between storage tanks and containers [without the provision of vapour emission control equipment], and whenever petrol is spilt or exposed to the air. A flammable atmosphere may exist above the liquid in tanks containing petrol and in those where petrol has been removed. A flammable atmosphere may also occur near clothing or other absorbent materials or substances, which have been contaminated with petrol.
- 5) Petrol floats on water and, if it is spilt or leaks 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 petrol was actually released.

HEALTH HAZARDS

- 6) Excessive exposure to petrol vapour can be harmful. Swallowing petrol, or getting it on skin, may pose other health hazards. Exposure should be minimised and this should be taken account of when petrol stations are designed as well as during normal operations. The health risks from petrol should be considered under the Control of Substances Hazardous to Health Regulations 2002⁴³.

Section 5 - Hazards from Petrol

⁴³ The Control of Substances Hazardous to Health Regulations 2002 SI 2002/2677 The Stationery Office 2002 ISBN 0 11 042919 2

ENVIRONMENTAL CONCERNS

- 7) Petrol is poisonous to many living things.
- 8) Environmental protection requirements, such as those covering drinking water contamination, are increasingly influencing equipment standards, petrol station design and operation. The risk your site presents to the environment should also be assessed; you should contact the Environment Agency for advice. It makes sense to think about safety and environmental risks at the same time.
- 9) Safety measures to prevent leaks and spills of petrol will also reduce contamination of the air, land and waterways. Where different standards apply for safety and environmental matters, you will need to apply the higher standard. Take care, however, that environmental protection measures do not compromise safety and vice-versa.
- 10) Advice on how to protect groundwater when storing hydrocarbons (petrol and diesel) in underground tanks can be found in the Department for Environment, Food & Rural Affairs publication 'Groundwater Protect Code: Petrol stations & other fuel dispensing facilities involving underground storage tanks' ¹⁴

Section 5 - Hazards from Petrol

¹⁴ Groundwater Protection Code: Petrol stations & other fuel dispensing facilities involving underground storage tanks (available from the DEFRA website www.defra.gov.uk and the Scottish Executive website www.scotland.gov.uk).

6 MANAGING THE RISK

WHAT IS RISK?

- 1) The words 'risk' and 'hazard' are given a precise meaning in law and in this guidance.
- 2) It is impossible to explain what the term 'risk' means without first understanding what a 'hazard' is. A 'hazard' is anything that can cause harm. Risk is the likelihood, great or small, that a person or persons may be harmed by the hazard. Activities involving petrol are potentially hazardous because the vapours given off by the substance are highly flammable and, therefore, easily ignited. In the case of petrol filling stations, the risks arising from petrol and who may be harmed are linked to the activity that is being carried on at the time.
- 3) The main factors to control are the presence or leaks of petrol and its vapour, and ignition sources. The control of ignition sources can be more difficult, and the potential for an incident greater, at petrol stations which the public use, or where there are other activities on the site. The level of risk can be affected by factors such as:
 - a) The frequency and method of delivery of petrol to the site;
 - b) The capacity and method of storage;
 - c) The number of vehicles passing through the site and dispensing operations taking place;
 - d) The number of employees and members of the public regularly on or around the site;
 - e) The age and type of the equipment and whether the site is operated on an attendant, attendant self service or unattended self service basis;
 - f) The siting of the petrol equipment (dispensers, fill points, tanks, pipework etc) in relation to other activities and fixtures on the site such as a car wash, shop, fast food restaurant, vehicle repair garage or radio-frequency (r.f.) transmitting equipment/mast;
 - g) The location of petrol equipment with respect to off-site features, such as proximity to other occupied buildings, underground tunnels, public thoroughfares, basements;
 - h) The layout of the site in relation to the manoeuvring of vehicles and the supervision of dispensers;
 - i) Site-specific factors such as ground conditions and watercourses; and
 - j) Vandalism.
- 4) These factors are considered in the key elements of the activities in Section 8 of this guidance.

Section 6 - Managing The Risk

WHAT IS RISK ASSESSMENT?

- 5) For the purposes of this document, risk assessment means a careful examination of how petrol could cause a fire and explosion. It enables you to decide whether you have already enough precautions in place (control measures) to ensure people's safety or whether you need to do more. You do not have to remove the risk, in fact it is not possible to have 'zero' risk, but you must make sure it is as low as is reasonably practicable.

DO I HAVE TO CARRY OUT A RISK ASSESSMENT?

- 6) Under DSEAR, employers (including self-employed) must assess the risks from activities involving a dangerous substance (petrol) to employees and anyone else, such as members of the public. The significant findings of the assessment must be recorded if 5 or more persons are employed. Apart from contributing to the overall safety of the petrol station, this makes good sense and business. DSEAR also requires risk assessments to be reviewed as circumstances change.

Note: You should not overlook your legal obligations to also carry out other risk assessment as required by the Management of Health and Safety at Work Regulations 1999 the Regulatory Reform (Fire Safety) Order 2005 and in Scotland the Fire (Scotland) Act 2005.

DO ALL PETROL STATIONS HAVE TO TAKE THE SAME SAFETY PRECAUTIONS?

- 7) No. The chance of an incident and its consequences vary between sites. Similarly, the action needed to prevent incidents will vary. Fire and explosion risks at petrol stations can be managed by:
- a) **engineering controls/physical safeguards** (also known as hardware), such as the installation of an overfill prevention device;
 - b) **management controls**, which minimise risk by using systems of work - for example at a site where a tanker has to manoeuvre on site, a system of supervision will reduce the risk of collision and possible spill; or
 - c) commonly, **a combination of both engineering and management controls**.
- 8) Reduction of risk by engineering controls or physical safeguards is a particularly effective way of ensuring people's safety because these measures are always present and less likely to go wrong. However the time, trouble, financial cost and physical difficulty of installing engineering controls may mean that it is only reasonably practicable to introduce them when a new site is being built or an existing site is being materially changed.

- 9) Bear in mind that future technological change may result in cheaper engineering controls. Such controls, although previously not reasonably practicable on financial grounds, may then become an option at your existing site.

NEW SITES

- 10) The employer's obligations under DSEAR (Regulation 6(8) (Schedule 1 (1))) include ensuring that the workplace is designed, constructed and maintained so as to reduce risk.
- 11) When a site is being designed and constructed, it should be possible to build-in engineering controls so that less reliance is placed on management controls and systems of work. For example, installing double skin tanks with interstitial leak monitoring, and locating the fill points so that a delivery tanker will be able to enter the site, unload, and leave without having to reverse.

EXISTING SITES

- 12) If you have assessed the risks and decided that your current controls adequately ensure people's safety, then you might not need to introduce any further measures. However, if you conclude that current controls are inadequate, you must introduce further measures. If the risk is low, the overall costs of introducing engineering controls might be grossly disproportionate, and effective management controls might be enough. However, if the risk is high, you may need to consider engineering controls, regardless of the overall cost. Remember that your ability to pay for additional measures is not a deciding factor as to whether they should be introduced.
- 13) For example, if a tanker has to reverse or manoeuvre onto or within a site to correctly position itself at the fill points, one or more measures may be necessary to reduce the risk of collision, which could lead to a spill of petrol. You would need to look at the relative costs and the degree of control each option provides. The options could include:
- a) relocating the fill points or obstructions and obstacles (engineering control);
 - b) creating new entry points to the site to provide better access (engineering control);
 - c) closing the site whilst the tanker is on the site (management control – system of work);
 - d) arranging for deliveries to be made during quiet periods when fewer people are on or around the site (management control); or
 - e) arranging for a competent member of staff to help the driver manoeuvre the tanker safely (management control - system of work).

Section 6 – Managing the Risk

HOW DO I CARRY OUT A RISK ASSESSMENT?

14) Identifying hazards is an essential first step. This book helps you to identify the most significant hazards and gives you guidance on how to deal with them. It does not set out specific or prescriptive ways of achieving safety but suggests a general approach, which can be followed at any petrol station.

15) The leaflets produced by the HSE, 'Managing Health and Safety: Five Steps to Success'¹⁵ and '5 steps to risk assessment'¹⁶ give further practical guidance. Based on these, the following five steps provide a systematic approach to identifying hazards and managing risks at petrol stations:

STEP 1 - IDENTIFY - take a fresh look at your site and identify where fire and explosion hazards may exist.

STEP 2 - CONSIDER - think about what could go wrong and who could be affected.

STEP 3 - EVALUATE - look at your findings and decide if the precautions you have already taken are enough to prevent anything going wrong or to reduce the consequences if something does happen, or if you need to do more.

STEP 4 - RECORD - make a note of your findings.

STEP 5 - REVIEW - consider when you will next need to review the assessment.

STEP 1 – Look for the areas where a fire or explosion hazard may occur.

16) To identify hazards you need to know about your site, how it operates, its surroundings, and the age, make and type of equipment installed. Employees or safety representatives may be able to help fill in any gaps in your knowledge. The site plan, used when applying for a licence, may also prove useful when carrying out the risk assessment. Looking for areas where petrol vapour may accumulate is a way of determining where vapours may occur and is a legal requirement. The guidance in the following sections of this document will help you to assess the risks associated with key activities and gives examples of how to deal with them.

STEP 2 - Think about what could go wrong and who might be harmed.

17) For each activity, decide whether and how petrol could escape. Think about how much could spill or leak, what route it might take and where it would collect. Look for possible sources of ignition. Take account of human error and the fact that people do not always follow instructions or behave in a responsible way. For example, customers may park badly and obstruct

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¹⁵ Managing Health and Safety: Five Steps to Success (INDG 275) HSE Books: free leaflet.

¹⁶ 5 steps to risk assessment (IND G 163) HSE Books: free leaflet.

delivery tankers or emergency escape routes. They may also attempt to fill unsuitable containers with petrol, or smoke when filling their cars. Consider all activities including cleaning, maintenance etc, and those, which only take place infrequently. Think about the greatest number of people who could be affected by a fire or explosion. Include those who:

- a) work at the petrol station;
- b) come to the site to buy petrol;
- c) visit the site for other reasons, such as contractors or customers using a forecourt shop or car wash;
- d) occupy adjacent property; and
- e) share and/or operate another business on your site.

18) In each case, think about what could happen or what could go wrong and include the most and least likely events to occur. Include the worst events that could happen and those where you may have no visible sign or warning. Make a written note of your findings and the measures you already have in place to deal with the hazard. This will help you later in the assessment.

STEP 3 – Evaluate your findings and decide whether further precautions are necessary.

19) Have you done all that the law requires to ensure people's safety? Look at the precautions you already have in place. Although the probability of a particular occurrence may be small, you will need to consider the consequences, if something does go wrong. If the risks are already low enough you should not have to introduce any further measures. But if you conclude that you should do more, you must explore other options for controlling or minimising the risk.

20) No two sites are the same, so it is not possible to provide a straightforward list of what you should do. Seek advice if necessary, and remember that you are responsible for seeing that the risk assessment is adequately done. Some changes, such as relocating vent pipes, may take time to achieve and require interim steps to be taken to minimise the risk.

21) When you have decided what to do and taken the appropriate action, you need to check that the measures work. How you do this will vary according to the nature of the changes you have made.

STEP 4 – Recording the findings.

22) You must keep a record of the significant findings of the risk assessment. The type of information recorded should include:

- a) the significant hazards, ie those which pose a serious risk to workers or the public whose safety might be affected if something goes wrong;
- b) the people who may be affected; and

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- c) existing control measures and the extent to which they control the risk – this need not replicate details more fully described in documents such as manufacturers' instructions, health and safety policy statement or procedures, company rules etc but you should refer to them if you intend to rely on them.

Note: Although it is only a requirement to record a risk assessment where five or more persons are employed and there are 'significant findings', it is recommended that a record of the date and result of the risk assessment is made irrespective of the number of persons employed. In this way evidence can be provided to a Petroleum Inspector that a risk assessment has been carried out. It will also serve as a recorded date on which to programme a periodic review of the assessment.

STEP 5 – Review your assessment.

- 23) Risk assessment is not a once and for all activity. You need to review your assessment if you suspect that it may no longer be valid or needs to be improved. Any change to the site or the operating procedures could affect the level of risk, so the effect should be assessed and understood. Although individual or small changes may not in themselves affect the assessment, a number of changes together may have a cumulative and significant effect. It is good management practice to plan to review risk assessments at regular intervals – the time between reviews will depend on the nature of the risks, the control measures put in place, and plans for future change

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7 GENERAL OPERATIONAL MANAGEMENT

7.1 PETROL LEAKS AND SPILLS

- 1) Leaks and spills can be caused in a variety of ways. These include failure of tanks or pipework, accidents during offloading, damage to or misuse of dispensers, and dispensing petrol into unsuitable containers. You need to take steps to prevent incidents like these and to identify the source of any or suspected leaks so that corrective action can be taken in good time. Evidence of leaks can come from, for example, monitoring of fuel stocks or excessive petrol odours at or near the petrol station.
- 2) Petrol is more likely to leak from tanks and pipework if equipment is poorly installed, inadequately maintained, or old. Where the integrity of the storage system cannot be ensured, for example by the provision of secondary containment, it can be augmented in a number of ways such as: wetstock measurement and reconciliation (manual or automatic) or by fitting a leak detection system. Additionally, periodic testing for the presence of water in underground tanks may indicate (through water ingress) a failure in the tank shell, gaskets sealing the tank lid or pipework connections. The method(s) you use will depend on the level of risk at the petrol station. Further information can be found in the Blue Guide² and LAC 65/34 'Leak Detection in Tanks and Pipework'¹⁷.
- 3) Spillages should be cleared up quickly. You can deal with small leaks and spills by applying dry sand or other absorbent materials. Remember that materials used in this way will be contaminated with petrol so make sure they are disposed of safely, if necessary by a hazardous waste disposal specialist. If you intend to store contaminated material prior to disposal, use a safe place like a closed bin or other container, which has been suitably labelled. Treat any other materials contaminated with petrol, such as clothing, rags or soil, in a similar way.
- 4) Accidents involving employees and customers becoming splashed with petrol are foreseeable events. Incidents where employees are splashed with petrol during road tanker deliveries and customers being sprayed with petrol when dispenser hose couplings suddenly fail can and do occur. The provision of disposable coverall suits and a changing room with washing facilities is a control measure that can be taken to reduce both the health and safety risks arising from wearing clothing that is contaminated with petrol.
- 5) Further guidance on dealing with spillages when petrol is being unloaded and dispensed is given in Sections 8.2 (paragraph 39) and 8.5 (paragraphs 20 and 21).

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X.

¹⁷ LAC 65/34 'Leak Detection in Tanks and Pipework' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).

7.2 CONTROL OF IGNITION SOURCES

HAZARDOUS AREA CLASSIFICATION

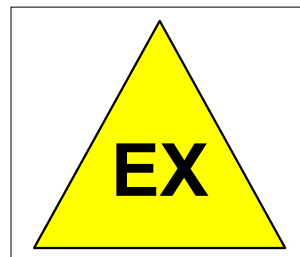
- 1) Three ingredients are needed for a fire: a fuel (in this case petrol); oxygen; and a source of ignition. If you control or eliminate any or all of these factors, fire can be prevented. To run a site safely you should know where flammable or explosive concentrations of petrol vapour might occur and keep sources of ignition out of these areas.

SPECIFIC REQUIREMENTS OF DSEAR (REGULATION 7)

- 2) DSEAR imposes a requirement to classify areas where explosive atmospheres may occur into zones based on their likelihood and persistence. Areas classified into zones must be protected from sources of ignition by selecting equipment and protective systems meeting the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (EPS)¹⁸.

Note: Equipment in use before July 2003 can continue to be used indefinitely provided the risk assessment shows it is safe to do so.

- 3) Where necessary, areas classified into zones should be marked with a specified "EX" sign at all entry points. This sign should not be confused with the Ex sign in a hexagon which is marked on equipment built to the requirements of EPS¹⁸. See paragraph 14.



- 4) Where employees work in zoned areas, they should be provided with appropriate work clothing that does not create a risk of an electrostatic discharge igniting the explosive atmosphere. In order to comply with this statutory duty, the work (on the forecourt) that staff are employed to undertake in the course of the day-to-day operation of the site or in accordance with the site's emergency procedure will have to be evaluated. For instance, if the site receives "driver assisted deliveries" and the member of staff assisting the tanker driver is expected to dip the tanks, remove covers to access chambers or remove/replace fill pipe caps, then (like the tanker driver) they should be provided with anti-static footwear. Anti-static weatherproof or outer clothing will not normally be necessary for work activities carried out by forecourt staff provided they do not remove such (ordinary) clothing in any high risk areas.

¹⁸ The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 ISBN 0 11 053999 0. The Stationery Office Ltd.

VERIFICATION

- 5) Regulation 7.4 of DSEAR requires that before a petrol station is used for the first time, the employer shall ensure that a competent person verifies its overall explosion safety.
- 6) What parts of the site require verification? Parts of the site that need to be considered during verification are those parts of the site where explosive atmospheres may occur and which have been designated as hazardous areas. It will also be necessary to take into account any equipment or facilities that may give rise to hazardous areas or are needed to limit the extent of any hazardous areas.
- 7) When should verification be carried out? The main requirement is to carry out verification procedures before a site is put into use, ie during commissioning, but as there is an on-going requirement to review the facilities it will also be necessary to verify that any significant changes on the site or any new equipment will not give rise to an unacceptable explosion risk. A like-for-like replacement or repair, however, should not require further verification.
- 8) What is the purpose of verification? Verification is an assessment of the measures that are needed to ensure that the fire and explosion risks will be properly controlled. It will include consideration of the measures to:
 - a) prevent explosive atmospheres forming;
 - b) control the fire and explosion risks from explosive atmospheres.
 - c) mitigate the effects of a fire or explosion.
- 9) What does verification include? Verification includes an assessment of the design of the petrol station to prevent fire or explosions and checks and tests to show that the completed facility is in accordance with the design standards and specifications. Checks will include:
 - a) inspection of records to show that the storage tanks and all associated product and vapour pipework are leak tight.
 - b) ensuring that a hazardous area classification drawing has been prepared and a visual inspection that equipment is of the correct type and category for the zone where it has been installed. See *Note* below.
 - c) confirmation that the equipment in the hazardous areas has been installed correctly and has been tested.
 - d) all warning and information notices are in place.
 - e) all electrical and other ducts from hazardous areas are properly sealed.
 - f) vapour emission control systems have been tested for integrity and operate correctly.
 - g) gauging and leak detection/leak monitoring systems operate correctly.

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- h) drainage systems, including oil separators, are complete and tested.
- i) all emergency equipment installed and in working order.
- j) Some parts of the verification checks can be carried out at an early stage, for example during the design, but other parts can only be carried out during commissioning or even after the first petrol delivery.

10) Who is competent to carry out the verification? The site operator has the duty to ensure that a competent person carries out the verification. The site operator may be the competent person but he may need to enlist the help of others such as the site designer, the installer of the equipment, test companies or an independent person or organisation. The person or persons involved must have practical and theoretical knowledge of the fire and explosion hazards arising at petrol filling stations, which may have been obtained, from experience and/or professional training.

ELECTRICAL EQUIPMENT IN HAZARDOUS ZONES

11) BS EN 60079-10: 2003 'Electrical apparatus for explosive gas atmospheres'¹⁹ sets out the concept of hazardous area classification and zoning for the purpose of selecting appropriately protected electrical equipment. You should also exclude other ignition sources from hazardous areas. BS EN 60079-10¹⁹ defines the following hazard zones:

Zone 0	in which an explosive air-gas mixture is continuously present, or present for long periods.
Zone 1	in which an explosive air-gas mixture is likely to occur in normal operation; and
Zone 2	in which an explosive air-gas mixture is not likely to occur in normal operation and, if it occurs, it will exist only for a short time
Areas outside these zones are defined as non-hazardous.	

12) Examples of typical sizes and locations of hazardous areas at petrol stations are given in figures 1 - 9 of Appendix 4. The guidance in the appendix, together with information obtained from equipment suppliers, will help you to determine the hazardous areas on your petrol station.

¹⁹ BSEN 60079-10-1996 Electrical apparatus for explosive gas atmospheres. Part 10: Classification of Hazardous Areas.

Note: The parameters of the hazardous areas detailed in Appendix 4 are taken from a generic hazardous area classification that has been long established feature in the design of petrol filling stations²⁰. However, these distances do not take into consideration site-specific characteristics such as the lie of the forecourt, potentially wetted areas, the effects on air/vapour dispersal by buildings, walls, trees/hedges etc and weather conditions.

- 13) Where possible, electrical equipment should be excluded from hazardous areas. Where this is not possible, for example electrical components in petrol dispensers, they must be constructed or protected so as to prevent danger arising from exposure to petrol vapour. Dispenser components like the pump and junction boxes will be marked with the sign (shown right)



- 14) Other ignition sources, which may be introduced into hazardous areas by customers, employees or contractors, should also be controlled or, preferably, excluded, these include:

- a) people smoking/using smoking materials such as lighters;
- b) tools or equipment which may cause sparks if rubbed or knocked against metal, concrete or brick;
- c) vehicle engines still running while petrol is being dispensed; equipment transmitting radio- frequencies (r.f.) (such as radios fitted to the emergency services vehicles);
- d) fixed electrical equipment (such as car vacuum cleaners)
- e) portable electrical equipment (such as mobile phones and power drills); hot surfaces (such as turbo-chargers and catalytic converters fitted to vehicle engines);
- f) naked flames;
- g) static electricity; and
- h) thermite reaction (friction sparks from aluminium/rusty steel impact).

ON-SITE STORAGE AND SALE OF OTHER FLAMMABLE SUBSTANCES

- 15) Most petrol stations sell commodities other than petrol. If your shop sells flammable liquids such as cigarette lighter fuel, barbecue lighter fuel, anti-freeze or other similar goods, be aware of the safety precautions to follow. These may be found on the packaging or labelling of the products. Any goods on display on the forecourt should be stored safely and should not cause an obstruction to traffic or emergency escape routes.

²⁰ Model code of safe practice in the petroleum industry Part 15: Area classification code for installations handling flammable fluids (3rd edition 2005) ISBN 978 85293 418 0 (available from the Institute of Petroleum).

16) If you sell other fuels such as diesel, paraffin, liquid petroleum gas or compressed natural gas, look at the way these fuels are delivered, stored and dispensed. As far as possible make sure they do not present a fire or explosion risk to your petrol facilities. Similarly, your petrol facilities should not present a risk to these other fuels. Guidance on the storage of flammable liquids can be found in HSG 51 'The Storage of Flammable Liquids in Containers'²¹. The LP Gas Association has produced a series of codes of practice covering all aspects of the bulk storage of LPG including motor vehicle refuelling at petrol filling stations.

17) In addition, the Approved Code of Practice 'Storage of Dangerous Substances'⁴¹ gives practical advice on the requirements of Regulations 5 and 6 of DSEAR to assess the risks from, and the control and mitigation measures for places where dangerous substances are stored. It includes advice on the safe disposal of waste materials.

Note: Highly flammable substances such as cigarette lighter fuel and LPG in cylinders are 'dangerous substances' as defined by DSEAR and as such you have a duty to carry out a risk assessment (regardless of the quantity on the premises) so as to determine what, if any control measures are necessary; including consideration being given to hazardous area classification. At retail filling stations, the environmental health officer from the local council enforces DSEAR in respect of these substances.

OTHER ON-SITE ACTIVITIES

18) When looking for potential sources of ignition remember other on-site activities such as shops, workshops, fast-food restaurants and car washes. Even if these facilities are not in a hazard zone, people may need to cross such a zone to get to and from them, possibly bringing ignition sources into the area. Good site design can help to eliminate this. Where changes to a site are planned, they may represent a material change to the 'approved arrangements' requiring the written approval of the Petroleum Licensing Authority.

²¹ The Storage of Flammable Liquids in Containers (HSG51) HSE Books: ISBN 0 7176 1471 9.

⁴¹ Approved Code of Practice and Guidance 'Storage of Dangerous Substances (L135)', HSE Books: ISBN 0 7176 2200 2.

7.3 OPERATING AND EMERGENCY PROCEDURE

OPERATING PROCEDURES

WHY HAVE OPERATING PROCEDURES?

- 1) People are an essential part of the operating life of a petrol filling station, so good systems of work and procedures are important ways of preventing incidents and minimising the consequences of any that happen.
- 2) Make sure that procedures are easily understood and that everyone working on the site knows about and uses them. Regularly check to see that procedures are being followed and that they work. Revise them if circumstances change.

WHAT ACTIVITIES SHOULD BE COVERED?

- 3) Your risk assessment will help you to identify where operating procedures are necessary. These may include:
 - a) offloading petrol (before, during and after the offloading process);
 - b) wetstock reconciliation, including loss investigation and reporting;
 - c) dispensing activities;
 - d) cleaning up petrol spills;
 - e) general site maintenance and housekeeping;
 - f) dealing with contractors;
 - g) dealing with customers; and
 - h) maintenance of site records.

EMERGENCY PROCEDURES

- 4) You must have procedures for emergency situations and train any employees who will need to take action in an emergency. They must be in no doubt about their responsibilities. Emergency or shutdown procedures, like any other kinds of operating instructions, should be reviewed regularly and updated to reflect any changes. You will need to ensure that your emergency procedures work when called upon. As well as testing and maintaining equipment, make sure people know and understand the procedures; practice helps to do this. If the response to an incident involves the use of equipment, such as a fire extinguisher, employees expected to use it must be properly trained.
- 5) In the event of a serious petrol spillage the following are obvious precautionary steps to take:

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- a) switch off the electricity supply to forecourt equipment (note that the public address system and, at night, the canopy lights may need to be kept operational);
 - b) raise the alarm and ensure all customers and non-essential employees leave the site;
 - c) contact the fire brigade (by telephoning 999) to report the spillage. Depending on the circumstances you may also need to contact other emergency services, such as the police. If the situation is potentially highly dangerous offsite, you should also alert the police;
 - d) check for sources of ignition;
 - e) do not allow any vehicles parked near the spillage to be started;
 - f) prevent anyone from driving onto the site;
 - g) take all practical steps to prevent fuel flowing off the forecourt into buildings, public drains, sewers or other water courses and try to direct the spillage into the forecourt interceptor system, for example by using temporary bunding and absorbent materials;
 - h) place all fire extinguishers in a readily available position upwind of the incident area; and
 - i) alert occupiers of properties on the boundary of the site.
- 6) In the event of a dispenser or other electrical apparatus being damaged, for example by being hit by a vehicle, switch off the electrical supply to the equipment and take the relevant steps from the above list. It should be remembered that the safety features built into modern petrol pumps and dispensers (fed from submersible or remote pumps) should prevent any significant releases of petrol if the pump/dispenser is damaged or knocked-over by a vehicle.
- 7) Once an incident is under control, you will need to determine the cleaning-up procedures necessary to ensure the safety of employees and the public on and off the site. Remember that where petrol has entered a site interceptor, you will have to make arrangements to remove the petrol and charge the interceptor with fresh water.
- 8) You will also need to have emergency procedures in place to deal with: -
- a) any serious leakages that may occur in the storage tanks and/or pipework; and
 - b) vehicle, petrol and other fires.

Note: The PLA should always be notified of any emergency incidents that occur on the site.

RECORD KEEPING

- 9) Maintaining up-to-date written procedures is good management practice. It will also help employees to understand what is required of them and will be useful when staff need to be trained.
- 10) You may find it helpful to keep this type of information in a site register. This could also be used as a central point to keep other information, such as:
- a) details of the equipment on site (type, age, location);
 - b) the results of commissioning and installation work;
 - c) testing, maintenance and repair records;
 - d) petrol inventory/stock records (including ullage and delivery records);
 - e) training records;
 - f) company safety policies and practices;
 - g) the results of the risk assessment;
 - h) a schematic diagram of the storage tanks, pipework and pump layout; and
 - i) a schematic diagram of the surface water drainage system, including all gullies, and the position of the oil separator or any other spillage retention/treatment system; e.g. a constructed wetland; and
 - j) a diagram(s) of the hazardous zones.

Note: Wet stock monitoring/reconciliation can be a 'centralised function' carried out remotely at a company's head office or by a specialist contractor. Where this is the case, records will be made quickly available to Petroleum Inspectors by fax or e-mail should this be necessary.

7.4 MAINTENANCE

WHAT SHOULD I DO?

- 1) DSEAR (Regulation 6(8) Schedule 1) requires that equipment related to the offloading, storage and dispensing of petrol is maintained in efficient working order and in good repair. The person responsible for this is the owner of the equipment or, where the equipment is leased or hired to another, that other person.
- 2) A maintenance programme should be in place to ensure the integrity of the plant and equipment on site. This should include: tanks; pipework; vapour emission control equipment; manhole chambers; dispensers; interceptors; cable ducts and drains; gauges and other product monitoring equipment; electrical equipment (see below); and emergency equipment.
- 3) Maintenance includes examination, servicing, cleaning, repair, or testing. The periods between these activities will depend on several things like the recommendations of manufacturers, suppliers or installers, conditions at the site, and the advice of the person who last carried out an examination. Accepted industry practice and the results of your risk assessment should also be taken into account. Only contractors that are competent to do what is necessary should carry out maintenance work at the site. Further information on maintenance is given in the Blue Guide². In addition, the Approved Code of Practice 'Safe Maintenance, Repair and Cleaning Procedures'²² gives practical advice on identifying hazards and implementing appropriate control measures and systems of work during maintenance and other similar non-routine activities. It includes advice on hot work and on permit-to-work systems for those activities identified as high risk.

ELECTRICAL EQUIPMENT

- 4) The Electricity at Work Regulations 1989⁸ require that electrical equipment must be maintained in a safe condition, so far as is reasonably practicable. This means that inspection and testing of electrical equipment should be carried out, with particular attention to equipment and wiring installed in hazardous areas. Electrical work should be carried out by someone competent to work on electrical equipment in hazardous areas and who is aware of the required standards for such equipment.
- 5) The electrical contractor will need to switch off supply to part of the site to carry out testing, maintenance or repair work. You may therefore need to agree times when the site or part of it may be closed to allow the work to proceed safely.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

²² Approved Code of Practice and Guidance 'Safe Maintenance, Repair and Cleaning Procedures (L137)'. HSE Books. (ISBN 0 7176 2202 9)

⁸ Memorandum of guidance on the Electricity at Work Regulations 1989 (HSR 25) 2nd edition. HSE Books: ISBN 9780717662289.

VISUAL EXAMINATIONS

- 6) Periodic visual examinations of your site, for example to check access chambers, fill points and dispensers, can help ensure that it is in a satisfactory operating condition.
- 7) Certain equipment that is more vulnerable to abrasive, impact or malicious damage needs to be inspected on a more frequent basis. For example, dispenser hoses can suddenly fail due to:
 - a) the gradual weakening of the section of the hose where it chafes against the ground;
 - b) impact damage if the hose is crushed against the pump island by the wheel of a vehicle: or
 - c) malicious damage by vandals. This type of damage is more likely to occur when the site is closed.
- 8) A daily inspection of the hoses should reduce the risk of spillages resulting from bursts or cuts etc.
- 9) A suggested visual inspection programme is given in Appendix 3.

MAINTENANCE RECORDS

- 10) Written records of maintenance history, faults detected and repairs or modifications carried out at your site will help you monitor your maintenance programme effectively, and also provide good evidence that you have a programme in place.

7.5 WORKING WITH CONTRACTORS

CONTRACTORS

- 1) A contractor is anyone you employ to do work for you who is not a member of your own staff. At petrol stations, contractors are routinely engaged to carry out construction work, maintenance, modification or installation of equipment.

WHAT THE LAW SAYS

- 2) The Health and Safety at Work etc Act 1974⁴ requires that you and your contractor do not endanger yourselves, employees or anyone else such as the public, as a result of your work. These duties cannot be delegated by contract. However, a contract can play a useful role in defining the rights and responsibilities of each party.
- 3) The Management of Health and Safety at Work Regulations 1999⁵ also require you to assess the risks, which might affect people, including contractors and the public, and provide them with appropriate information and instruction about risks to their health and safety from your operation.
- 4) The Construction (Design and Management) Regulations 2007 (CDM)⁹ may also apply where contractors are carrying out construction work to your site.
- 5) DSEAR (Regulation 11) applies where two or more employers share the same workplace (i.e. the site operator and a maintenance contractor at a petrol filling station) and makes the site operator responsible for co-ordinating the implementation of all the safety measures required by DSEAR.

SELECTING A CONTRACTOR

- 6) Your approach is crucial when influencing how much attention is given to safety by contractors.
- 7) Contractors invited to submit tenders should be made aware of the standards of health and safety you expect of them. The Institute of Petroleum's 'Code of Safe Practice for Retailers Managing Contractors - Working on Petrol Filling Stations'²³ is intended to assist site operators in managing contractors so that works are carried out in a safe and legal manner so as to prevent incidents and accidents of any kind during the work activities. This Code compliments the Institute of Petroleum's 'Code of Safe Practice for Contractors Working on Service Stations'²⁴, which gives guidance and examples of safe working practices.

⁴ The Health & Safety at Work etc Act 1974 Chapter 37: The Stationery Office Ltd: ISBN 0 10 543774 3

⁵ The Management of Health and Safety at Work Regulations 1999 Approved Code of Practice and Guidance (L21) HSE Books: ISBN 0 7176 24889.

⁹ Managing health and safety in construction. The Construction (Design and Management) Regulations 2007. Approved Code of Practice L144 HSE Books 2007 ISBN 978-0-7176-6223-4

²³ Code of Safe Practice for Retailers Managing Contractors Working on Petrol Filling Stations ISBN 0 85293 240 5 (available from the Energy Institute).

²⁴ Code of Safe Practice for Contractors Working on Petrol Filling Stations ISBN 0 85293 194 8 (available from the Energy Institute).

7.6 PLANNING THE WORK

Before any contractors start work you will need to satisfy yourself that they are capable of undertaking the work and can carry it out in a safe manner. Speak to them before work begins and make sure they are aware of the rules and requirements at your site. Depending on the work to be carried out a contractor may need to know about:

- a) the hazardous nature of petrol, the need to control ignition sources, and the location of hazardous areas;
 - b) your own operating procedures, so they can comply with them as necessary;
 - c) the location of underground tanks and pipework;
 - d) any other work that may be taking place whilst they are on site;
 - e) the location of underground services, ie conduits for electrical supplies to dispensers and car washes etc and the site's main electrical supply cable, gas and water supplies; and
 - f) items, equipment or information necessary for health and safety.
- 8) You and your contractor should be clear about:
- a) how your operations will affect each other's work.
 - b) who is responsible for managing the work on site and controlling sub-contractors;
- and
- timing and segregation of work to ensure that the activities of one person do not create risks for another.
- 9) In some circumstances it may be necessary to stop a particular activity, such as petrol offloading or dispensing in the area where contractors are working. This might also be necessary where the layout of your petrol station means that contractors working adjacent to the site could present a risk. Finalise arrangements with the contractors when they arrive on site. Make sure that there is no doubt about how health and safety will be managed during their work.
- 10) Failure to take account of a contractor's work can have serious consequences. For example, at one site in Leeds, contractors were carrying out alterations to offloading pipework. A road tanker delivered 5,000 litres of petrol into the off-set fill pipe of a tank on the site. The contractors had disconnected this pipe and hundreds of litres of petrol escaped into the ground before the competent person and the driver realised the mistake. As a result the public were put at high risk and the environment was affected, resulting in adverse publicity and a high-cost clean-up operation. This incident could have been avoided by preparing a work plan describing the procedure for deliveries to be carried out safely or, alternatively, postponing deliveries until the alterations were complete.

SAFETY METHOD STATEMENTS

- 11) One way of ensuring safe working at petrol stations during construction or maintenance is to use a detailed Safety Method Statement (SMS) for each particular task. This should identify the problems and solutions concerning the tasks. It is a useful tool for ensuring that work is carried out safely. An SMS can range from a simple statement to a detailed technical document depending on the scale of the task(s) involved. The purpose of the SMS is to identify the hazards associated with each task and specify the necessary precautions to control them.
- 12) Responsibility for drawing up the SMS lies with the contractor, who should, if necessary, act in conjunction with you regarding site details, specific precautions or specialist information. The SMS should clearly show that all of the hazards have been identified and will be correctly dealt with.

PERMIT-TO-WORK SYSTEMS

- 13) Some maintenance or repair work will be high risk because it has the potential to cause a serious accident, such as the removal of a storage tank lid. These tasks need to be carefully controlled and planned. A permit-to-work system is a structured way to make sure these activities are done safely.
- 14) A permit-to-work is a formal written means of making sure that potentially dangerous tasks are approached and carried out using only the correct safety procedures. It is not merely permission to carry out work, but can also help to ensure that these activities are done safely. It should cover all foreseeable events.
- 15) You and your contractor can get further information on permit to work systems in the following Health and Safety Executive's publications:
 - a) 'Permits-to-work in the chemical industry'²⁵ a free leaflet;
 - b) 'Guidance on permit-to-work systems in the petroleum industry'²⁶ and;
 - c) Approved Code of Practice and Guidance on 'Safe Maintenance, Repair and Cleaning Procedures'²²

²⁵ Chemical manufacturing Permit-to-work systems IND G 98 HSE Books: free leaflet.

²⁶ Oil Industry Advisory Committee: Guidance on permit-to-work systems in the petroleum industry HSE Books: ISBN 0 7176 1281 3.

²² Approved Code of Practice and Guidance 'Safe Maintenance, Repair and Cleaning Procedures (L137)'. HSE Books. (ISBN 0 7176 2202 9)

8 KEY ACTIVITIES

The following sub-sections of this guidance document identify six key activities that take place at petrol stations. These are:

1. Commissioning;
2. Unloading and venting;
3. Storage;
4. Pipework;
5. Dispensing;
6. Decommissioning.

For each activity, practical advice is given to help you comply with the law. For unloading and venting, storage, pipework and dispensing a simple guide is provided to help you to identify the risks and, where necessary, introduce appropriate control(s).

Section 8 - Key Activities

8.1 COMMISSIONING

INTRODUCTION

- 1) Commissioning is the process of bringing plant and equipment into use.
- 2) This sub-section contains guidance to help you ensure that:
 - a) new sites;
 - b) those which are subject to a material change; and
 - c) any new equipment installed or refurbished;
 are safe to use. It also includes guidance on physical checks of the site to ensure that emergency equipment and information notices are adequate and effective. You will also need to consider what operational, management and emergency procedures are necessary and make arrangements for initial staff training.
- 3) Technical information on how to commission the site and its equipment, and the selection and use of various testing methods are given in the Blue Guide².

COMMISSIONING HARDWARE

- 4) For new petrol stations, testing and checking of equipment may have been carried out before you take over the site. People competent to do the job should carry out this work. Satisfy yourself that these tests and checks have been completed satisfactorily. If new hardware is being installed at your existing petrol station, ask for evidence that the necessary tests and checks have been properly carried out before bringing the equipment into use.
- 5) Some procedures, such as initial testing of electrical circuits, are carried out more effectively before petrol is delivered and introduced into the system. Others, such as checking the operation of a dispenser, cannot be tested until petrol has been introduced into the system.

VAPOUR RECOVERY (STAGE 1B AND STAGE 2 SYSTEMS)

- 6) Systems for vapour recovery during the delivery and dispensing of petrol should be tested in accordance with the manufacturer's instructions before petrol is introduced into the system and for a stage 1b system, during the first delivery to confirm its integrity.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X.

STORAGE TANKS

- 7) The integrity of each tank or compartment, its internal fittings (eg drop pipe and overfill prevention device etc) including the manhole and any connections to it should be determined, where possible, before petrol is offloaded. This can include checking that monitoring systems are operating and testing tanks without monitoring systems. The tank manufacturer should provide a certificate of examination and testing carried out before the tank left the factory.

Note: The leak testing of the drop tube and associated fittings may need to be carried out after petrol has been introduced into the tanks.

PIPEWORK

- 8) New pipework and joints should be tested before petrol is offloaded. Obtain information about the type of tests that have been carried out and the results. Where double-skin pipework has been installed, check that tests on the monitoring system have been carried out according to the manufacturer's instructions. The contractors installing the pipework should provide you with a certificate detailing the test method used and the result. All the pipework, including the ventilation/vapour recovery system, that forms an integral part of the petrol installation should be leak tested and certified in the commissioning procedure.

Note; there are some (final) joints in pipework that can only tested after petrol has been delivered into the storage tanks. These joints should be 'wet tested' by the contractor when the pipework is primed with petrol.

DISPENSERS AND RELATED EQUIPMENT

- 9) All dispensing equipment, including pumps, valves, hoses and nozzles should be checked for leaks and correct operation after installation.

ELECTRICAL INSTALLATION

- 10) Any new, extended or modified installation should have valid certificate of electrical inspection and testing.

VERIFICATION

- 11) See paragraphs 5- 12 of Section 7.2 CONTROL OF IGNITION SOURCES on Page 26.

OTHER COMMISSIONING PROCEDURES

Before petrol is delivered to the site it will be necessary to check that:

- a) safety signs or notices are in place;
- b) all means of escape are clear of obstructions;
- c) emergency equipment has been installed and is in working order;

- d) any combustible material is removed;
- e) fill points, tanks and pipework (where visible), and dispensing equipment have been clearly marked;
- f) where drainage systems have been installed, they are connected, leak tested and free from the debris and the interceptor has been charged with its water seal; and
- g) cable ducting has been properly sealed to prevent petrol/vapours migrating into buildings and non-hazardous areas.

RECEIVING THE FIRST DELIVERY OF PETROL

- 12) In order for a manifolded vapour recovery system to operate correctly and safely, there has to be a liquid (petrol) seal between the bottom of the drop tube and the ullage space of all the (manifolded) tanks. Clearly this situation is not possible with a new installation or where tanks have been temporarily decommissioned for maintenance purposes etc. It is, therefore, important that the first delivery of product is carried out with great care so as to avoid the release of large volumes of vapour through the fill pipe openings of the tanks. A safe method of introducing petrol into the tanks is to (individually) unload a quantity of 1000 litres of petrol into one tank at a time until all the tanks are charged with sufficient petrol to provide a liquid seal at the drop tube. The vapour recovery hose must, of course, be connected at this initial commissioning stage of the delivery and the fill pipes caps of the tanks not being filled must be in the closed position. After this stage of the commissioning procedure has been completed, the remainder of the product on the tanker can then be unloaded in the normal manner.

RECORD KEEPING

- 13) It is an essential practice to maintain records of the result of initial tests and commissioning procedures for future reference. These records should be kept in a site register, together with other relevant documents, for the petrol installation. By comparing these with future test results or other information for example, from maintenance work, you will be able to identify any changes in the performance of the equipment, which may indicate a potential risk to safety. A Petroleum Inspector may ask to examine the site register for details of the work that has been carried out.
- 14) Table 1 lists the documents that the architect, or the principal contractor⁹ (overseeing the development) should provide you with, when all the work is completed. For partial redevelopment work (e.g. re-pumping), the individual contractors carrying out various elements of the works should provide you with the documents.

⁹Managing health and safety in construction. The Construction (Design and Management) Regulations 2007.
Approved Code of Practice L144 HSE Books 2007 ISBN 978-0-7176-6223-4

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Table 1 Commissioning – Certificates/Records

Equipment/Installation	Certificates/Records	Provided by
The whole site	<ul style="list-style-type: none"> • 'As built' plans/drawings detailing the whole development • Drawings identifying hazardous areas and types of zones. 	Architect
Petrol installation	<ul style="list-style-type: none"> • Diagrams of the layout of tanks, pipework and dispensers. This may include a schematic diagram for on-site display as general information to staff, contractors and the emergency services 	Architect or pipework installer
Petrol tanks	<ul style="list-style-type: none"> • Details of construction of tank and method of installation • Certificate for testing of tank and/or leak monitoring system 	Architect Principal Contractor ¹⁰
Pipework (including vapour recovery systems)	<ul style="list-style-type: none"> • Details of construction of pipework and method of installation • Certificate for testing of pipework and/or leak detection system 	Architect Pipework installer
Leak detection system	<ul style="list-style-type: none"> • Details of class of system installed • Commissioning certificate 	Leak detection installer
Surface water drainage system	<ul style="list-style-type: none"> • Diagram of the layout of the drainage system. This may include a schematic diagram for on-site display as general information to staff, contractors and the emergency services • Certificate for testing of the drain pipes 	Architect Principal Contractor
Electrical installation	<ul style="list-style-type: none"> • Pre-commissioning test record • Inventory check list • Initial assessment • Inspection & test report • Certificate of test & inspection 	Electrical contractor

¹⁰ Managing health and safety in construction. The Construction (Design and Management) Regulations 2007. Approved Code of Practice L144 HSE Books 2007 ISBN 978-0-7176-6223-4

8.2 UNLOADING AND VENTING

INTRODUCTION

- 1) The bulk unloading of petrol is inherently hazardous. Petrol may escape from the tanker, for example if it collides with another vehicle, or because of a leak during unloading. The volume of petrol that could be spilt is potentially very large, with a consequent serious threat to the safety of people on and near the site. The guidance in this section will help you ensure that petrol is unloaded safely.
- 2) The engineering and management controls at your site will determine the method of unloading you are able to use and the precautions you and the tanker driver need to take to ensure people's safety. Make sure you are familiar with the requirements of the Approved Code of Practice 'Unloading Petrol From Road Tankers' (L133)²⁸ and that your operating procedures reflect what is necessary to ensure people's safety.

Note: Different equipment and procedures will be required for unassisted deliveries.

- 3) The risks can be reduced if a dedicated tanker unloading stand is provided or if petrol is delivered at quiet times when fewer people are on or around the site. This is not always possible and your operational procedures will need to ensure that petrol can be delivered safely, whenever it is done. In some cases, this may require closing part of, or the whole all of the site if this is the only way to control the risks sufficiently.
- 4) You should establish procedures for the unloading of petrol; ensure that everyone involved is familiar with them and that they are followed. Failure to do so can have serious consequences. In one incident, a filling station had to be evacuated after petrol overflowed into a fill point access chamber during the course of a delivery. The outflow of petrol from a storage tank fill pipe that had not had its cap replaced went unnoticed at the time the delivery was taking place. It was only later in the same evening when the shop started smelling of petrol that the Fire Brigade discovered that the spillage had occurred. An investigation by Petroleum Inspectors found that both the competent person taking the delivery and the tanker driver were at fault. The fault on the part of the competent person was not replacing the fill pipe cap after petrol had been received into the tank, whilst the driver was at fault for failing to connect-up the vapour recovery hose after re-positioning the tanker. The site was closed for 48 hours whilst the clean-up work was carried out resulting in a significant loss of trade for the operator.

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²⁸ Approved Code of Practice and Guidance 'Unloading Petrol From Road Tankers (L133)'. HSE Books. ISBN 0 7176 2197 9

TANKER ACCESS

- 5) It is important that the driver can manoeuvre a tanker onto and around the site as easily as possible. The likelihood of an incident increases if the driver has to make difficult manoeuvres, or drive close to obstacles or other vehicles.
- 6) Try to provide and maintain a clear, unobstructed entry and exit route at all times. If this is not possible, ensure that the route is clear when a tanker enters or leaves the site. On some sites this may involve cordoning off the route or closing down some or all dispensers or other equipment, such as a car wash.
- 7) In the event of a fire a tanker needs to be able to leave the site quickly and safely. This is achieved most easily if it can drive off the site in a forward direction. Where it is not possible to drive onto and off the site without reversing, you should arrange for the tanker to reverse into position to access the fill points and then drive away in a forward direction if this is possible. If this cannot be achieved, it is important to have good arrangements in place to ensure that the tanker can manoeuvre safely. These could include positioning mirrors to aid visibility, or clearly marking the route to be taken by the tanker, other vehicles and pedestrians. Where necessary, provide supervision or assistance for the driver using pre-arranged signals, and make sure that who ever you select is competent to carry out this role.

TANKER STANDING AREAS

- 8) The Blue Guide² gives guidance on good locations for tanker standing areas in relation to other equipment and activities on and off the site. Wherever it is located, the standing area should be maintained in a good condition.
- 9) If the area is not well located you may need additional control measures to ensure that petrol can be unloaded safely. These could include hardware changes, where reasonably practicable, such as the construction of a firewall to act as physical barrier between the unloading area and adjacent buildings or public areas. Alternatively you may look to introduce management procedures. For example, if a tanker cannot be accommodated wholly on the site during unloading, you may need to provide some form of cordon between the tanker and off-site traffic to avoid a collision. Warning notices can be used to good effect to advise members of the public and others that unloading is taking place and of any precautions they may need to take.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X.

DRIVER/OPERATOR TRAINING

- 10) The competence of the tanker driver will also determine how safely a vehicle moves around the site. Drivers and their employers must ensure that tanker operations are carried out safely. But you should always satisfy yourself that whoever drives the tanker onto your site can do so competently and safely. Ask to see the driver's training certificate provided in compliance with the Carriage of Dangerous Goods by Road (Driver Training) Regulations 1996. If you have any doubts, ask your petrol supplier to provide you with evidence of driver competence.

LIGHTING

- 11) Routes to and from the tanker standing area, and the area itself, must be adequately and safely lit to enable people engaged in the unloading operation to carry out their tasks properly and safely. Drivers need a clear view of their way onto and around the site and the fill points. Illumination of the road tanker's valves and the site's control panel (if there is one) at the fill point may also be necessary. Lighting must be maintained to ensure that it is kept in working order.

Note: For sites that receive 'driver unassisted deliveries' when the filling station is closed, the road tanker's headlights can be considered as adequate illumination for vehicular ingress/egress.

FILL POINTS

- 12) The Blue Guide² contains guidance on standards for the location of fill points for storage tanks. The exclusion of potential ignition sources from the hazard zone is easier if fill points are at least 4 metres from site boundaries, as this is generally the extent of the hazard area associated with them. At existing sites this may not be the case but moving the fill points will not normally be a reasonably practicable option. In these circumstances your operating procedures should ensure that unloading is not carried out while there are potential sources of ignition in the hazardous area.

- 13) Vapours can accumulate near the fill point during unloading. The chance of an incident increases if ignition sources are not controlled, putting members of the public or employees near the area at risk. You can mitigate the consequences of vapour emission, spills or leaks by:

- a) controlling ignition sources in and around the unloading area;
- b) excluding non-essential people from the unloading area, this should be done whenever unloading is taking place, regardless of the location of the fill point; separating people from the unloading area by a safe distance or by erecting a fire wall;

Note: A fire wall is an option where a safety distance cannot be achieved.

- c) providing adequate spillage control i.e. drainage and interceptor;
- d) ensuring warning and information notices are in place and legible;

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- e) providing properly maintained fire extinguishers; and
- f) providing an adequate supply of dry sand or other absorbent material.

- 14) If a fill point is inside a building or a partially enclosed area, you will need to decide whether you can move it to a safer location outdoors. If this is neither possible nor reasonably practicable, you will need to explore alternative measures in addition to those listed above, such as improving ventilation to disperse vapours from any leak, or removing or isolating sources of ignition such as electrical equipment and fittings which are not suitable for use in hazard zones.
- 15) Special controls and procedures may be needed if the fill point is in or near a building or public thoroughfare. It may be necessary to restrict deliveries to when the building is unoccupied or at quiet times. Warning signs or arrangements for someone to monitor the area for ignition sources during unloading may be needed.
- 16) All fill point connections, including those for vapour balancing, should be designed and installed for easy use. Some may need protection against impact and vandalism. They must be well maintained and the unique identification markings must be kept clear and legible.

VENT PIPES

- 17) The primary function of vent pipes is to allow the tanks to breathe by providing an inlet for air to enter the tanks when petrol is being dispensed and to enable petrol vapour displaced from storage tanks during unloading to be either returned to the road tanker or dispersed into the atmosphere. They should be positioned to minimise the build up of vapour around the pipes and be remote from sources of ignition. For example, the location should take account of nearby buildings and their effect on airflow, and areas where vapour could accumulate.
- 18) The Blue Guide² gives guidance on the height and location of vent pipes and vapour control systems. Advice is also available from the Environment Agency.
- 19) Vent pipes, which are above ground should be included in the site's inspection and maintenance programme and examined for corrosion or damage, particularly at or around ground level, and for stability.
- 20) A flame arrestor should be fitted to the outlet of vent pipes and vapour return connections for a Stage 1b vapour recovery system so that, if vented vapours are ignited, the arrestor will prevent the fire spreading from the atmosphere to the inside of the tank. Flame arresters should be included in the site's maintenance programme to ensure that they continue to be effective. Pressure/vacuum valves fitted to the outlets of vent pipes at sites provided

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

with vapour recovery systems have in-built flame arrestors. The Health & Safety Executive' publication 'Flame arresters: Preventing the spread of fires and explosions in equipment that contains flammable gases and vapours'²⁹ gives further details.

VAPOUR EMISSION CONTROLS (VAPOUR RECOVERY)

21) Since the introduction of stage 1b vapour recovery onto UK filling stations there have been a number of incidents, during and after road tanker deliveries, where:

- a) Large quantities of petrol have flowed out from the fill pipes of storage tanks;
- b) Fill pipes have become pressurised resulting in vapour and/or petrol being released to atmosphere when the cap is removed. Such situations are potentially dangerous, as the person removing the cap is at risk of being engulfed in vapour or wetted with petrol. In addition there is the risk of serious physical injury being sustained where quick-release caps are in use, as these devices can be displaced with considerable force when released.

22) There have also been other operational problems attributed to vapour recovery systems; namely:

- a) Pressures inside the storage tanks have affected simple contents measuring systems (dipsticks and hydrostatic gauges) leading to inaccurate wet stock control;
- b) Excessive backpressures or vapour locks have caused deliveries to slow down or even stop.

23) If a vapour recovery system is properly designed, installed and maintained it should not adversely affect the safety/efficiency of the unloading process and instances of over-pressurisation, vapour lock or vapour release should not occur. It is, therefore, important that an effective maintenance regime is place and adhered to. Staff training also has an important role to play in the safety/efficiency aspects of the vapour recovery system as they can recognise and report any problems that would indicate a fault on the system. For instance, reporting unusually slow deliveries and instances of vapour locks, pressurisation and vapour release through the pressure/vacuum valve.

24) At sites where a Stage 2 vapour recovery system returns the vapours displaced during the dispensing operation to one of the storage tanks, problems have arisen from the pressure build-up in the tank which has been the cause of petrol vapour spluttering from the vent pipe, rattling p/v valve and petrol vapours escaping from tank lid fittings. The cause of this problem has been attributed to a combination of natural vapour pressure, the volume of vapour returned being slightly in excess of that removed and the temperature of the returned vapour and air being significantly lower than the

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²⁹ Flame arresters: Preventing the spread of fires and explosions in equipment that contains flammable gases and vapours (HSG158) HSE Books: ISBN 0 7176 1191 4

temperature in the storage tank. As the temperature in a storage tank remains at a fairly constant 12°C, this problem is particularly acute in the winter months when the temperature of the displaced vapour can be at or around 0°C. The result of cold vapour and air entering a tank with an ullage space at a significantly higher temperature is the expansion of the vapour and air causing an increase in pressure.

- 25) A solution to this problem, which is now acceptable to DEFRA, is the fitting of an orifice plate at the outlet of the vent pipe. The orifice plate (a disc with a central 10mm hole) will allow air into the tank when petrol is being dispensed and will release any excess pressure as it slowly rises; thereby maintaining the tank at atmospheric pressure. Where an orifice plate is fitted, it should be supplemented with a pressure release valve to facilitate emergency venting should there be blockage or serious restriction to the vapour flow during a Stage 1b delivery.

Note: Under the terms of Regulations made under the Environmental Protection Act 1990, road tanker unloading at petrol filling stations becomes a prescribed process which must be registered with, and authorised by the local district council in England and Wales. In Scotland, it is the Scottish Environment Protection Agency.³⁰

- 26) There will be occasions at operating sites where one or more tanks are low in product or even empty of product. In the latter case typical examples will be where a tank has been cleaned or where there is to be a grade change. For the purposes of this guidance, the term 'low in product' refers to a condition where all the product has been drawn-off by the dispensing pump but a liquid seal remains at the drop tube.
- 27) In order to reduce the risk of petrol or vapours being released from the fill pipe of the tank with a low product level or an empty tank, it is important to ensure that this is the first to receive product when the next delivery takes place.
- 28) If, for operational reasons, it is necessary for any tank to remain empty of product on a short term basis, it should be isolated from the manifolded vapour recovery system if the other tanks on site are to continue receiving deliveries.
- 29) If for any reason a situation arises where all the tanks on site are low in product or empty, the procedure detailed in paragraph 12 of Section 8.1 should be followed when a road tanker delivery takes place.

OVERFILL PREVENTION

- 30) As well as marking fill point connections, further controls are needed to prevent tanks or compartments being overfilled. These include marking

³⁰ Environmental Protection Act 1990 Part 1 Secretary of State's Guidance PGI/14(06) Unloading of Petrol into Storage at Petrol Stations:
<http://www.defra.gov.uk/environment/ppc/localauth/pubs/guidance/notes/pgnotes/pdf/pg1-14.pdf>

measuring devices, dip sticks and gauges with the same unique identifier as the tank they serve.

- 31) Many tanks have overfill prevention devices which automatically stop the flow of petrol when a predetermined level is reached. Where these devices are installed, they must be maintained in a safe working condition. They should be set so that, when triggered, any petrol remaining in delivery hoses can safely drain into the storage tank. Storage tanks can also be fitted with high-level alarms to warn when petrol has reached certain levels.
- 32) Alarms and overfill prevention devices are meant to be used as a backup to accurate stock control to ensure that tanks receive the correct amount of petrol. You need to be able to accurately determine the ullage in your tanks and only order the quantity of petrol the tanks can accept.

SPLIT DELIVERIES

- 33) The risk of an overfill situation occurring is increased when the contents of the compartment on the road tanker exceed the ullage space of the storage tank to be filled. Unloading a road tanker in this event is referred to as a 'split delivery'. Split deliveries should, therefore, be avoided whenever possible. It is, however, not always possible to avoid split deliveries at some small and ruraly located sites. Where it is necessary to unload the road tanker by splitting a compartment between two storage tanks, procedures must be in place to reduce the risks of overfills occurring. The Institute of Petroleum guidance 'Unloading Procedure for Split Compartment Deliveries'³¹ details the procedures to be followed.

STATIC ELECTRICITY

- 34) Conditions that cause static electricity to be generated are present on petrol filling stations from:
 - a) the road tanker, which can become electrically 'charged' during the journey to the filling station;
 - b) the flow of petrol through the delivery hose to the storage tanks; and
 - c) personnel involved in the delivery process becoming charged with static electricity.
- 35) The inadvertent ignition of flammable vapours by a spark from a static discharge can be avoided by ensuring that:
 - a) the forecourt surface on and around the road tanker stand does not have a high electrical resistance and allows the static charge to go to earth via the road tanker's tyres or the footwear of personnel. High resistance surfaces such as asphalt and certain impervious sealants should be avoided.

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³¹ Offloading Procedures for Split Compartment Deliveries of Petrol between Service Station Tanks ISBN 0 85293 353 3 (available from the Institute of Petroleum).

- b) the storage tanks and delivery pipework are adequately earthed. This is particularly important at sites provided with non-metallic off-set fill pipework.
- c) The driver and the person assisting with the delivery are provided with anti-static footwear.
- d) More detailed information is available in the Energy Institute publication 'Guidelines for the Control of Hazards Arising from Static Electricity'³²

THERMITE REACTION

- 36) The widespread use of aluminium couplings on road tanker delivery and vapour recovery hoses together with the prevalence of fittings/equipment made from steel in the immediate fill point area of a filling station, access chamber covers and frames etc, creates the conditions for an incendive spark to be generated if a coupling makes a sharp impact with rusty steel.
- 37) In order to reduce the likelihood of a coupling being dropped or coming in contact with rusty steel, the following precautions need to be taken:
- a) Safety platforms, made from non-ferrous materials, should be fitted in direct fill chambers where the chambers are deep.
 - b) A capture device should be fitted to attach the fill pipe cap to the fill pipe.
 - c) Any steel drainage channels in close proximity to where the delivery/vapour recovery hoses are handled should be replaced with non-metallic gratings when any redevelopment works take place.
 - d) Any fixed steel items, e.g. above ground fill pipe protection posts, should be treated so as to prevent/remove rust.
- 38) LAC No.65/39b 'Petrol Filling Stations - Road Tanker Deliveries - Ignition of Vapour by Thermite Reaction'³³ provides further information.

DEALING WITH SPILLAGE

- 39) The number of road tanker compartments unloaded simultaneously into tanks should not be more than:
- a) the number that can be safely managed at any one time; or
 - b) the maximum number allowable to achieve correct vapour balancing.
- 40) Even if you have taken reasonable steps to prevent an incident, a spillage can still occur, for example, if a delivery hose connection catastrophically

³² Guidelines for the Control of Hazards Arising from Static Electricity (second edition) ISBN 0 85293 353 8 (available from the Energy Institute).

³³ LAC 65/39b 'Petrol Filling Stations - Road Tanker Deliveries - Ignition of Petrol Vapour by Thermite Reaction' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).

fails. You must have procedures to follow and equipment available if something goes wrong. The procedures should be in writing and available at all times to staff on site, including the delivery driver.

- 41) Tanker standing areas should have design features to deal with spillages, such as diversionary kerbs, slope to a safe area, drainage grids/channels and interceptor or constructed wetland systems. Where such features are provided it is important that they have the capacity to collect/retain a sudden release of up to 3000 litres of petrol or diesel. It is also important that they are properly maintained; for example, make sure drainage channels are regularly cleared of debris like leaves or mud.
- 42) If you do not have permanent physical features of this type you may have to rely on temporary equipment, such as moveable bunds, supported by operational procedures and management controls. You must always provide suitable absorbent material for mopping up small spills during unloading.

ASSESSING THE RISKS

- 43) For each stage of the unloading process, identify what could lead to a spillage and where possible sources of ignition could occur. Think about the ways to prevent each event, and minimise the consequences if they occur. Decide whether the precautions you have in place are enough, seek advice if necessary from the road tanker company or the local Petroleum Inspector, and write down the outcome.
- 44) Table 2 shows one way to complete this process. The control measures column gives some examples of the precautions that could be taken there may well be alternatives. Also, some measures are most appropriate to new sites and those being refurbished than older, existing sites, where the cost of installing them could be disproportionate to the risk. Remember that you must provide sufficient control measures to keep the risk as low as is reasonably practicable.

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Table 2 Controlling the Risks from Unloading and Venting

Activity	Risk	Control Measure
Tanker access	Collision whilst moving on site or during unloading	<ul style="list-style-type: none"> Provide and maintain a dedicated clear route. Where possible, arrange that the tanker can be driven off the site in a forward direction. Locate tanker-standing area away from other traffic. Cordon off the tanker standing area. Where necessary, provide supervision or assistance to the driver whilst the tanker is manoeuvring. Provide the delivery firm with advance information on site layout and systems, etc. Ensure adequate lighting when necessary. Take deliveries when the site is closed or at quiet periods e.g. at night.
Unloading process	Leak from connection or rupture of hose	<ul style="list-style-type: none"> Ensure staff are trained and the driver follows the correct procedures. Have emergency procedures in place.
	Overfilling storage tank or compartment	<ul style="list-style-type: none"> Make sure fill points are clearly marked, suitable and maintained. Follow laid down procedure for checking tank ullage. Ensure syphon pipes are closed down during the delivery. Provide and maintain an overfill prevention device. Make sure that any dispensers close to the unloading area are switched off during deliveries. Ensure site operative is trained and tanker driver follows the correct procedures. Make provision for containing and controlling any spillage e.g. sloping ground, drains/interceptors. Make provision for retaining spillages that occur in the tank fill point chamber (brick built chambers can be unreliable in retaining spillages). Draw up emergency procedures and ensure staff are trained in how to deal with a fire, a spillage and an over-fill situation.
Venting & Vapour Emission Controls	Accumulation of vapour	<ul style="list-style-type: none"> Consider location of vent pipes if changes to the layout of the site are made. Check height of pipes and extend if necessary. Repair or replace corroded or damaged pipes.
	Over pressurisation of the tanks	<ul style="list-style-type: none"> Train staff in the operating principles of the vapour recovery system so that they can recognise and report problems that would indicate a fault in the system; e.g. 'vapour lock', slow deliveries, pressure in the fill pipe(s), or vapour release from the p/v valve.
	Ignition of vapour	<ul style="list-style-type: none"> Fit and maintain flame arresters.
Static electricity	Ignition of vapour	<ul style="list-style-type: none"> Make sure that the resistance of the road tanker standing area surface does not have a resistance exceeding $10^8 \Omega$.

Table 2 Controlling the Risks from Unloading and Venting

Activity	Risk	Control Measure
		<ul style="list-style-type: none"> • Make sure that the storage tanks and associated pipework are properly earthed and bonded to the delivery pipework. • Where the vapour recovery hose is kept at the site, ensure that it checked by a competent person for electrical continuity. • Provide employees with anti-static footwear (for driver assisted deliveries).
Thermite reaction	Ignition of vapour	<ul style="list-style-type: none"> • Make sure that non-ferrous safety platforms are fitted in deep fill point access chambers. • Make sure that fill pipe caps are fitted with captive devices. • Make sure that any fixed steel items in close proximity to the fill points are treated to prevent corrosion; e.g. drainage channels.
General		<ul style="list-style-type: none"> • Control ignition sources in hazardous areas. • Provide suitable fire extinguishers and keep them ready for use. • Draw up emergency procedures and train staff.

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8.3 STORAGE

INTRODUCTION

- 1) Site operators are responsible under the Dangerous Substances & Explosive Atmospheres Regulations 2002 for ensuring that petrol is stored safely. A range of control measures, from the initial suitability and integrity of storage tanks, to ongoing management and maintenance, can all help to ensure that the risk of a leak of petrol, and therefore the safety of people on and around the site, is as low as possible.

SELECTION OF TANKS

- 2) Where new tanks are being installed, your risk assessment should identify the level of control required for your site and hence the type and standard of tank that is appropriate. Some sites require higher standards than others because of the risks from a leak. For example, a high standard of containment might be needed for a tank at a new or re-developed site in a residential or urban area where the filling station is surrounded by domestic and commercial properties, or where there are nearby cellars or basements into which petrol could leak. You should also take account of environmental requirements and may need to consult the Environment Agency before deciding what type of tank to install.
- 3) The Blue Guide² gives guidance on design, construction and installation standards for above and below ground petrol storage tanks. You should always take steps to ensure that a suitable type of tank is selected and installed.

UNDERGROUND TANKS

- 4) Underground tanks should be selected, sited and installed so that the risk of leakage is reduced to the lowest level that is reasonably practicable.
- 5) Tanks should be suitable for the prevailing ground conditions and suitably protected from corrosion and premature degradation by chemical attack.

ABOVE GROUND TANKS

- 6) The immediate risk of fire and explosion from a leak from an above ground tank is greater than from an underground tank. Where tanks are installed, or are planned to be installed, above ground, an assessment should be carried out to determine the risks from the unloading process, a leak of petrol from the tank, a fire or explosion, site traffic arrangements which could lead to a vehicle colliding with the tank, other types of impact, and vandalism.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

MARKING OF TANKS/COMPARTMENTS

- 7) Tanks and fill points, which are connected, must be uniquely marked. Markings on tanks/compartments and associated equipment, including dipsticks and contents gauges, should be clear and legible at all times to help avoid confusion or errors. Incorrect marking could result in petrol being transferred into a tank that has insufficient ullage or contamination of product leading to expensive and hazardous procedures to remove the contaminated product from the tank.

DETECTING LEAKS

- 8) Leaks from underground tanks cannot usually be observed directly and are, therefore, more difficult to detect than leaks from tanks installed above ground. At one petrol station in an urban area, 50 year old tanks were found to have leaked petrol into the basement of nearby flats. Fortunately, the petrol was discovered before the vapour had built up to a dangerous level. Sources of ignition were removed and the flats evacuated. An evaluation of the risks of the tanks leaking should have been made which, together with a suitable inventory or leak detection system, could have found the leak before it became a risk to the public.
- 9) The results of a risk assessment will enable you to decide the level of control needed to identify and deal with petrol leaks. A number of leak prevention and leak detection methods exist. To be effective, the method you select needs to either prevent a release of petrol or provide early warning of a leak to enable remedial actions to be taken quickly so that people are not put at risk. You will also have to consider risks to the environment from a petrol leak and may need to consult the Environment Agency. If your site is located in an area where a leak of petrol would be a serious risk to public safety or a serious contamination risk to groundwater, you will need to install leak prevention controls instead of leak detection as the latter will only give warning after petrol has escaped from the containment system.

CONTINUOUS INVENTORY MONITORING

- 10) Whilst it is good business to control wetstock, continuous (daily) inventory monitoring is also the most basic and simple form of leak detection. Consistent and accurate monitoring of the amount of petrol unloaded, stored and dispensed can allow leaks from tanks and pipework systems to be identified. Manual inventory checking is usually only suitable as the sole method of leak detection at sites, which have a low throughput of petrol where information about gains and losses is likely to be more reliable.
- 11) The simplest way to manually carry out inventory checking is to use dipsticks. Automatic stock reconciliation systems can provide an instant display of any discrepancy and might be a more reliable control method at sites having more than a very low throughput. Whatever method is selected, the record should show all gains and losses for each tank or compartment and connected pipeline system. This will allow you to detect unusual trends of stock variation, which could indicate a leak.

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12) The effectiveness of inventory monitoring as a method for detecting leaks depends on a number of factors:

- a) the reliability of the measurement ie the accuracy of the contents gauge or dip;
- b) accurate recording of sales and deliveries; and
- c) a competent assessment of trends indicated by the results.

13) Competent assessment means comparing results over a period of time, taking into account the possible effects of significant temperature variations on volumetric measurement, the loss of petrol through vapour release, for example during tank or compartment filling, and examining the results of checks for the presence of water. Assessments should be carried out by someone who is competent to analyse the figures and produce results and trends (this could be the site operator or someone contracted to assess the information or the use of specialist computer software). Small daily discrepancies, which, over a period tend to vary around a norm, are likely to arise from factors other than leakage. Significant leaks are soon apparent; it should be possible to identify smaller leaks from trends established over a period of days rather than months.

STATISTICAL INVENTORY RECONCILIATION (SIR)

14) SIR systems establish acceptable stock reconciliation profiles by statistical analysis of the daily losses and gains for each tank. As well as considering daily stock variances, SIR systems also consider the cumulative variances as a percentage of the cumulative sales in order to identify trends and anomalies. They can be operated by independent third parties or by in house personnel

15) Appendix 1 details a recognised methodology for carrying out statistical inventory reconciliation.

CHECKS FOR WATER

16) If a tank fails, variations in the water table may mean that petrol could escape or, conversely, that water could enter the tank. Where practical, inventory checking should be supported by periodic checks for water in each tank or compartment, which might be affecting inventory results. Water can be detected with water detecting paste on the dipstick. Automatic water detection is included in some tank gauge systems. A certain amount of water will be present in the bottom of a storage tank due to condensation. However, the amount should be negligible and any increase in water levels would indicate that the tank has developed a leak.

LEAK DETECTION SYSTEMS

- 17) Proprietary leak detection systems constantly monitor for petrol in locations that would indicate a leak from the tank. Such systems remove the need for inventory checking as the primary means of detecting leaks.
- 18) Leak detection systems are appropriate at sites with a larger throughput of petrol where frequent changes in the volume of petrol stored make inventory checking more difficult and less reliable, thus presenting a greater risk to the safety of people on or around the site if a leak is undetected.
- 19) Leak detection systems work in different ways and have different levels of sophistication. The Blue Guide² gives guidance in selecting an appropriate class of detection system.

TANK TESTING

- 20) When a leak is suspected, for whatever reason, it should be thoroughly investigated. This may involve taking a tank out of service and inspecting it or carrying out a precision tank test. A variety of testing methods exist; volumetric, vacuum and low pressure.

The investigation should take into consideration reasons other than leaks, which may cause wet stock discrepancies **before** tank testing is carried out. A recommended investigation sequence is:

- Check the reconciliation figures to ensure the arithmetic is correct and that all deliveries and other stock movements have been accounted for;
- Check the wet stock control procedures are carried out correctly and whether forecourt staff require additional training;
- Check for any obvious leaks from pipe joints in manhole chambers, electrical ducts, drainage systems and around the dispenser base;
- Check for any increases in petrol smells. Take into account any reports or complaints from neighbours;
- Have the dispensers checked for accuracy;
- Check the tank contents measuring system. Check the dip stick for damage or the gauging system for correct operation. Check whether tank gauges need to be recalibrated or serviced;
- Check the tanks for water ingress;
- Have the pipework tested for leak; and
- Consider fraudulent activities or short deliveries

- 21) Testing may also be appropriate when someone takes over the operation of an existing site. You may also want to consider periodic testing where there are nearby structures, such as underground railways or basements, in which people could be at risk in the event of a leak.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

22) The most appropriate test method will depend on the type of installation at your site. Before selecting a particular test find out whether:

- a) the test has third party accreditation, if so for what fill levels, tank sizes and ullage volumes;
- b) the test takes account of the water table;
- c) the ullage space is tested;
- d) there are any safety features; and
- e) the operators have been properly trained.

23) Tank tests should be supported by documented procedures and you should ensure that the test is carried out by people who are competent in the operation of the particular test used. Depending on ground water levels it is possible for tests to give false assurances, i.e. a tank may leak but pass the test. You may want to seek advice on testing from a Petroleum Inspector.

Note: It should, however, be borne in mind that periodic leak testing is not an alternative to having a recognised and appropriate method of leak detection in operation.

24) LAC No.65/34 'Leak Detection in Tanks and Pipework'¹⁷ provides further information on this subject.

MAINTENANCE, REPAIRS AND MODIFICATIONS

25) Tanks and their associated equipment, including leak detection and overfill prevention systems, fill pipes including the drop tube, access chambers and their covers, are key areas where maintenance is vital. This will help to ensure the effectiveness of the tanks and safety and emergency devices.

NOTE: LAC No: 65/55 'Safety Implications of Leaking Drop Tubes & Vapour Retention Devices'⁴² provides more detailed information on the problems associated with leaking drop tubes.

26) Work on petrol tanks is inherently dangerous and precautions should take account of the flammable contents, particularly when the tank or compartment is nominally empty. Maintenance, modifications and repairs should be carried out only by people who are competent to carry out this type of work.

27) Repairs involving hot work should not be considered on underground tanks. Explosion hazards exist from petrol that has leaked out of a tank and which returns either as liquid or vapour while hot work is in progress.

¹⁷ LAC 65/34 'Leak Detection in Tanks and Pipework' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).

⁴² LAC 65/55 'Petrol Filling Stations – Safety Implications of Leaking Drop Tubes & Vapour Retention Devices' (available from HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).

- 28) Tank repair companies should provide well-documented procedures covering safety, the standard to which the work is to be completed, and the means of monitoring that this is done. All tanks should be leak tested following repairs and before being brought back into use.

CLEANING OF TANKS

- 29) Cleaning may be needed from time to time, for example to prepare a tank for re-lining, or to remove build up of solid and liquid residues. This should only be carried out by competent persons under controlled conditions using a planned system, such as a permit-to-work. The HSE guidance note CS15 'Cleaning and Gas Freeing of Tanks Containing Flammable Residues'³⁴ provides further information. You will need to consider precautions such as clearing the surrounding area of ignition sources and isolating all pipe connections, including off set fill points. It may be necessary to close the site during the cleansing operation. The Approved Codes of Practice 'Safe Work in Confined Spaces' and 'Safe Maintenance, Repair and Cleaning'³⁵ provide more detailed guidance.

ASSESSING THE RISKS

- 30) Firstly, consider the age and design of the storage tanks and then look at the leak detection methods you currently use. You will need to decide whether these precautions are enough to detect leaks, or if you need to do more.
- 31) Table 3 shows one way you could go through this process. The control measures column gives some example precautions that could be taken; there may well be alternatives. Some measures are most appropriate to new sites or those being refurbished. For older sites the cost could be disproportionate to the risk. Remember that you must provide sufficient control measures to keep the risk to people's safety as low as is reasonably practicable.

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³⁴ Cleaning and gas freeing of tanks containing flammable residues (CS15) HSE Books: ISBN 0 7176 1365 8.

³⁵ Approved Code of Practice, Regulations and Guidance: Safe Work in Confined Spaces, Confined Regulations 1997. (L101) HSE Books: ISBN 0 7176 1405 0.

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Table 3 Controlling the Risks from Storage

Activity	Risk	Control Measure
Petrol stored in underground tank.	Leak through tank wall.	<ul style="list-style-type: none"> • Install a continuous inventory checking system. • Install a suitable leak prevention or leak detection system and regularly maintain it. • Install a tank liner. • Install cathodic protection • Install a monitoring/retrieval well. • Remove the dipstick from the (internal) fill pipe of tanks with off-set fill arrangements. • Instruct staff not to drop the dipstick in the fill pipe after removing to measure contents.
Petrol stored in above ground tank.	Leak through tank wall.	<ul style="list-style-type: none"> • Provide spill containment. • Install a monitoring or leak detection system. • Carry out regular visual inspections of the tank and its fittings for signs of corrosion or damage. • Regularly check for signs of leaks such as staining on outer surfaces or contaminated soil. • Apply a suitable surface coating.
	Impact damage, such as collision or vandalism.	<ul style="list-style-type: none"> • Locate or re-locate tank away from normal site traffic route. • Provide road marking or other signs to direct traffic. • Provide physical protection such as bollards or fencing.
	Fire involving tanks and fire from an external source.	<ul style="list-style-type: none"> • Protect tank with an insulating material. • Provide additional fire protection measures such as automatic fire detection equipment or suppression systems. • Ensure that there is adequate separation between (unprotected) tanks and other features that pose a threat from fire or could be threatened by a fire involving the tank.
Repair to tank.	Ignition of vapour due to repair work.	<ul style="list-style-type: none"> • Use competent contractors. • Agree safety method statement or permit-to-work system. • Cordon off and control ignition sources in area around tank as agreed with contractor.
	Leak due to faulty repair.	<ul style="list-style-type: none"> • Ensure repairs are carried out by competent staff according to written procedures. • Draw up standards for repair work. • Carry out a test tank before bringing equipment back into use.

8.4 PIPEWORK

INTRODUCTION

- 1) Pipework includes:
 - a) direct and off-set fill pipes between the unloading point and the storage tank;
 - b) pipes to transfer fuel from the tank to the pump or dispenser by means of suction or pressure;
 - c) siphon pipes linking storage tanks;
 - d) vapour recovery system and ventilation (vent) pipes; and
 - e) fittings and valves associated with pipework.
- 2) Pipework needs maintaining to ensure its integrity, that it is safe to use, and is in a good state of repair. Leaks from pressurised systems have the potential to be particularly severe because of the way petrol can be forced out of the pipe under pressure. The Blue Guide² gives technical guidance on the selection, construction, installation and testing of all pipework.

UNDERGROUND PIPEWORK

- 3) Pipework, with the exception of part of the filling and vent systems, is generally installed underground. This gives greater flexibility over forecourt design and removes the need to protect the pipework from fire or impact damage.
- 4) However, underground pipework is the source of the majority of petrol leaks in petrol installations. Ground conditions and differential movement between the pipework and the tank, can cause corrosive and mechanical damage that result in leaks. Some leaks can find migration paths, which allow the petrol or vapours to escape from the site and affect neighbouring properties (especially those with basements) and other below ground features like tunnels and drains/sewers.
- 5) The possibility of off site migration increases the possibility of an undetected build-up of petrol, and more importantly its vapour, with the potential for significant risks to people's safety.
- 6) The surface of the ground above pipework should be adequately reinforced to protect it from the weight of traffic. Where possible, pipework should not be located under buildings or other obstructions, which could hinder or prevent access for repairs or modifications.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

- 7) The Institute of Petroleum's 'Performance specification for underground pipework at petrol filling stations'³⁶ gives guidance on the specification of underground pipework.

ABOVE GROUND PIPEWORK

- 8) Pipework installed above ground needs to be firmly supported and adequately protected against fire and corrosion, and from impact where it is adjacent to traffic areas. Above ground pipework should be constructed of materials resistant to light degradation.

TYPES OF PIPEWORK

- 9) Pipework must be compatible with petrol or petrol vapour, have sufficient structural integrity to withstand operating conditions and be suitable for prevailing environmental conditions. It is commonly made of steel, glass reinforced plastic or other non-metallic material (e.g. polyethylene).

SELECTION OF PIPEWORK

- 10) When pipework is installed at a new site or during changes to an existing one, select whichever type will best suit the circumstances of the site and therefore effectively keep the risks to people's safety as low as reasonably practicable. If you operate an existing site, find out what type of pipework has been installed and how old it is so that you can take account of it in your risk assessment. Use the results of the assessment to check whether you need to take any further precautions. Where safety and environmental factors require different standards, the higher standard will generally be needed.

MARKING OF PIPEWORK

- 11) All pipework, valves and fittings should be clearly and permanently marked to make identification easy and to reduce the risk of error or confusion, which might create a risk. For example, direct or off set fill pipes and valves should indicate to which tank or compartment they are connected and working capacity of the tank or compartment. You may also want to show the type and grade of fuel. The Institute of Petroleum's 'Code of practice for a product identification system for petroleum products'³⁷ and the Blue Guide² give further advice on the marking of pipework.

LEAK DETECTION

- 12) All sites should have some method for detecting leaks from pipework. The methods are similar to those for detecting leaks from storage tanks.

³⁶ Performance specification for underground pipe work systems at petrol filling stations (TP46) (second edition) ISBN 0 85293 323 1 (available from the Institute of Petroleum).

³⁷ Code of practice for a product identification system for petroleum products (TP52) (fourth edition) ISBN 0 85293 307 X (available from the Institute of Petroleum).

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

Guidelines on classes of leak detection for all types of pipework are described in the Blue Guide².

CONTINUOUS INVENTORY MONITORING

- 13) The previous section, 8.3, under the sub heading Continuous Inventory Monitoring, explains when inventory monitoring may be an appropriate method of leak detection. Discrepancies, which cannot be accounted for elsewhere, may indicate a leak from pipework. However, it is unlikely that simple dipstick methods would detect leaks from pipes unless there was major damage to the pipework.

Monitoring and leak detection systems

- 14) The previous section, 8.3, under Monitoring and Leak Detection Systems explains the types of leak detection and leak alarm systems, which are available for storage tanks and the criteria, which should be applied in selecting and using one. The same principles apply to pipework. Use the results of the risk assessment to ensure that your system protects people's safety, so far as is reasonably practicable.
- 15) Some systems are suitable only for double skin pipework, such as those, which constantly monitor the vacuum or pressure of the interstice or secondary containment area. Others, including those, which detect petrol or vapour in the surrounding soil or water, or changes in the conditions of a pressurised line, are suitable for double or single skin pipework. Seek advice from the manufacturer, a competent contractor or a Petroleum Inspector if necessary. Whichever system you select should be installed and used in accordance with the manufacturer's instructions and be adequately maintained.
- 16) Additional safety controls are necessary for pipework, which is part of a pressurised system. Pressurised pipework should have secondary containment and should be fitted with a continuous leak monitoring system, which will isolate the pump if a leak is detected. Additionally impact check valves positioned at the base of each dispenser will prevent the flow of petrol if the dispenser is struck or subject to intense heat. If it is not reasonably practicable to install this equipment, the system should be converted to suction operation.

PIPEWORK TESTING

- 17) Pipework testing has an important role to play in the operation of petrol filling stations and leak testing will be necessary when:
- a) prior to the commissioning of new or repaired pipework.
 - b) when developing an in-house reconciliation system in order to confirm the integrity of the petrol containment system.

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- c) prior to bringing back into use any sections of pipework that have been out of operation for more than 12 months.
- d) for the periodic testing pipework where there is no recognised or suitable leak detection systems available. For example, vapour pipework and where applicable off-set fill pipework.
- e) where a risk assessment identifies a specific need for periodic testing.

Note: It should, however, be borne in mind that periodic leak testing is not an alternative to having a recognised and appropriate method of leak detection in operation.

18) Where testing is necessary, appropriate test methods include:

- a) nitrogen gas pressure testing of non-pressure lines;
- b) hydrostatic pressure testing on suction lines;
- c) hydraulic pressure testing for pressure lines;
- d) vacuum testing;
- e) gas low pressure testing using a helium/nitrogen mix in association with a helium sensing device; and
- f) any other suitable pipework testing system with an acceptable performance capability.

19) Valves and other associated equipment should be tested in accordance with the manufacturer's instructions.

20) LAC No.65/34 'Leak Detection in Tanks and Pipework'¹⁷ provides further information on leak detection in tanks and pipework.

Maintenance, repairs and modifications

21) Maintenance, repairs and modifications work should be undertaken by people competent to carry out this type of work.

22) Pipework, including fittings, valves and any associated monitoring equipment, should be included in the site maintenance scheme. As most pipework is below ground there is little that can be visually inspected. However access chambers will allow the conditions of valves and joints to be checked for signs of corrosion, damage or leaks.

23) Any defective pipework should be taken out of use pending repair or replacement. Pipework to be extended or modified should be tested to ensure its integrity before any work is carried out. Similarly, it should be tested after work has been completed and before it is brought back into operation. The previous section (8.3) under 'maintenance, repairs and modifications' draws attention to the safety precautions, which need to be

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¹⁷ LAC 65/34 'Leak Detection in Tanks and Pipework' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).

taken when working on storage tanks the same measures apply to work on pipework.

- 24) Keep a record of any work carried out on pipework. Amend the site plan to reflect any extensions or modifications to the pipework system. This information will be useful when you carry out your risk assessment and will help you to decide when pipework, fittings and valves should next be examined or tested.

ASSESSING THE RISKS

- 25) Consider the age and design of your pipework. Then look at the leak detection methods you currently use. You will need to decide whether these precautions are enough to detect leaks or if you need to do more.

- 26) Table 4 shows one way you could go through this process. The control measures column gives some example precautions that could be taken there may well be alternatives. Also some measures are more appropriate to new sites or those being refurbished than older, existing sites, where the cost of them could be disproportionate to the risk. Remember that you must provide sufficient control measures to keep the risk to people's safety as low as is reasonably practicable.

Table 4 Controlling the Risks from Pipework

Activity	Risk	Control Measures
Petrol/vapour in pipework	Leak through pipe wall.	<ul style="list-style-type: none"> • Carry out a visual examination of accessible parts. • Carry out regular inventory checking. • Install a constant monitoring device. • Install a leak prevention system • Install a leak detection system. • Install a check valve under the dispenser (for suction systems). • Carry out periodic leak testing of any sections of pipework not covered by a leak prevention/detection system according to the age and type of pipework; e.g. vent pipes. • Regularly maintain and test monitoring/leak detection systems. • Use non-corrodible or double skin pipework.
	Leak from pipework fittings.	<ul style="list-style-type: none"> • Carry out a visual examination of accessible parts. • Maintain, and where necessary replace, fittings, valves, pumps, connectors and other equipment. • Keep, on site, an up to date schematic diagram of tank to pump pipework layout.

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8.5 DISPENSING¹¹

INTRODUCTION

Misuse or failure of equipment, damage to dispensers, hoses or nozzles, or attempting to fill unsuitable tanks or containers can result in petrol being spilt. The amount that could be spilt during dispensing is small compared to bulk unloading, but the number of dispensing operations is considerably higher. It is also likely that members of the public will be in the hazardous area. In order to comply with the requirements of DSEAR, site operators will need to ensure that petrol is dispensed safely.

METHODS OF OPERATION

- 1) The dispensing arrangements can operate in a variety of ways; from attended service, where site staff refuel customers' vehicles through to sites that are unmanned and where customers refuel their own vehicles without any on-site supervision or assistance from the site operator. Some filling stations now function on an alternating system where the site is operated as attended self-service at busy periods and unattended self-service at quiet periods (i.e. late evening and through the night).
- 2) The decision as to the mode of forecourt operation is one for the site operator to take on a commercial basis but after taking safety concerns into account. The safety considerations must be based on a site-specific risk assessment. Irrespective of the mode of operation, forecourt attendants should not be under the age of 16 years and no one under the age of 18 years should be left in sole charge of a filling station.

LOCATION OF DISPENSING AREA

- 3) A clear route for vehicles to and from dispensers can reduce the chance of a collision. If vehicles can refuel wholly on site there is less chance of them (or a person dispensing petrol) being hit by another vehicle. If this is not possible, operating procedures will need to be tailored to the circumstances and for example, only allow refuelling by attendants and providing warning signs to alert other road users.
- 4) The exclusion of potential ignition sources from around dispensers is easier if they are at least 4 metres from site boundaries, as this is generally the extent of the hazardous area surrounding dispensers. Where this is not the case, and moving your dispensers is not a reasonably practicable option, your operating procedures should ensure that dispensing is not carried out while there are potential sources of ignition in the hazardous area.
- 5) Dispensing should be carried out away from potential sources of ignition and in the open air so that vapours can disperse easily and quickly. Dispensing equipment including the nozzle and hose should be protected from potential impact with vehicles, for example by mounting dispensers on a plinth which is

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¹¹ See Reference Document (44) LAC 65/59 'Petrol Filling Stations – Dispensing Control Measures' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector)

designed in the shape of a dog bone or is sufficiently wide and high to prevent collisions, or by using fixed barriers.

TYPES OF DISPENSERS

- 6) All dispensers have certain safety features to prevent releases of petrol. Modern dispensers are designed and certified to a higher standard than older ones with features such as cut-off or limiting devices and breakaway couplings. Information on the selection of dispensers and recommended standards can be found in the Blue Guide².

MOBILE TELEPHONES

- 7) Generally mobile telephones are not designed and certified for use in explosive atmospheres. Their use can also create a serious distraction for people carrying out dispensing activities. Radio transmissions from individual mobile telephones are generally too low to induce dangerous electric currents in nearby equipment and the risk of incendive sparking from the battery is low, however, they should not be used in the hazardous areas that exist when actually dispensing petrol. Neither should they be used in the hazardous areas around the fill and vent pipes during petrol deliveries.
- 8) Rather than applying a total prohibition on the use of mobile telephones on petrol forecourts which has resulted in some anomalies and frequent abuse to staff, the following controls are recommended:
 - a) Mobile telephones should not be used by customers or forecourt staff whilst actually dispensing petrol into fuel tanks or containers;
 - b) During petrol deliveries mobile telephones should not be used on those parts of the site that have been designated as hazardous areas by the site operator or the driver;
 - c) Mobile telephones should not be used during other petrol handling operations or during the maintenance of petrol equipment unless a specific assessment shows the risks are negligible;
 - d) There is no need to restrict the use of mobile telephones, with respect to the safe keeping of petrol, at other times or in other areas of the forecourt. This includes in the shop, in motor vehicles parked on the forecourt or in other non-hazardous areas.

Note: Site operators may, however, wish to use their discretion and put a total ban on the use of mobile telephones on the forecourt if that provides a more manageable arrangement.

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- 9) The use of radio equipment fitted on emergency vehicles and citizen band (CB) radios may create an ignition risk. These types of transmitting equipment do have a power out-put sufficient to induce dangerous electrical currents in nearby fixtures and they should not be allowed to be used at the dispensing points or in the vicinity of the road tanker when unloading. It should be noted that the radio equipment mounted on most emergency vehicles is under automatic interrogation from the base station. This means that radio messages are being received and transmitted without anyone speaking into a hand set.

Note: The Home Office has issued Police Forces and Fire & Rescue Services with separate advice on the use of radios transmitting equipment in the vicinity of filling stations.

PORTABLE CREDIT/DEBIT CARD TERMINALS

- 11) The introduction of high security chip and PIN credit/debit cards together with the requirement to provide equivalent services for disabled drivers has created a need for portable credit/debit card terminals to be used at the disabled driver's vehicle after it has been filled with petrol.
- 12) Portable credit/debit card terminals are not certified for use in explosive atmospheres. They may be used, however, on the petrol forecourt by trained attendants provided suitable procedures are established and adopted that will prevent the terminals from being taken into the temporary hazardous areas that will arise during petrol dispensing. The procedure will include the attendant ensuring that there are no petrol spillages in the area and that petrol is not being dispensed from any nozzles within 1metre of where the terminal is to be used.

MANAGEMENT OF THE FORECOURT

- 13) Whether the site adopts pre or post authorisation of the dispensers the site operator will need to ensure that proper supervision of the forecourt is achieved particularly during busy times or when the site is taking delivery of petrol or other provisions. In carrying out his assessment of the ability of staff to supervise the dispensing operations he will need to consider:
 - a) Appropriate staffing levels;
 - b) Other duties expected of staff (i.e. re-stocking shelves, sales, petrol deliveries) during times the forecourt is open for business;
 - c) Management of forecourt staff
 - d) Training of forecourt staff (see sub section below).
- 14) Where the forecourt layout gives rise to poor visibility of dispensers, additional methods of work will need to be introduced for the forecourt staff. It may be necessary to delay authorisation (or to cancel the pre-authorisation) of a specific pump until a temporary obstruction to vision has moved away or instructions may be given over the public address system for the customer to

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move to an alternative pump. When portable containers to be filled are out of the attendant's line of vision it may also be necessary to use the public address system to ask the customer to show the container, prior to filling, so that it can be identified as being suitable.

TRAINING OF FORECOURT ATTENDANTS

- 15) It is a requirement of the Dangerous Substances and Explosive Atmospheres Regulations 2002 and the Management of Health and Safety Regulations 1999 to provide adequate training and relevant information for all employees involved in the storage and handling of any dangerous substances. It will, therefore, be necessary to identify the training and retraining needs of forecourt staff by an assessment of the risks relating to fire and explosion. Further general information can be found in an Approved Code of Practice (L21)⁵ to the Management Regulations.

Training in matters relating to the dispensing operation should include:

- a. Procedures for activating and controlling dispensers;
- b. Safe dispensing procedures;
- c. Use of customer information systems, e.g. public address systems;
- d. Safe filling of petrol containers;
Dealing with customers' enquiries on safety matters;
- e. Spillage control and emergency procedures during dispensing including the practical use of the types of fire extinguishers provided;
- f. Recognising the circumstances when it is not safe to authorise a dispenser and when pre-authorisation should be over-ridden; and
- g. Understanding customer behaviour and unacceptable customer practices.

- 16) It is the responsibility of site management to instruct forecourt attendants not to authorise (or to over-ride the pre-authorisation of) a pump when a situation of poor visibility arises.

SAFE DISPENSING OF PETROL

- 17) Particular attention needs to be paid to the following points to ensure that petrol is dispensed safely:
- a. petrol should only be dispensed into the fuel tank of a vehicle, motorbike or motorboat, a suitable container or demountable petrol tank;
 - b. no-one should smoke or use smoking materials in the hazardous area around the dispenser;

⁵ The Management of Health and Safety at Work Regulations 1999 Approved Code of Practice and Guidance (L21) HSE Books: ISBN 0 7176 24889.

- c. the engine of the vehicle to be filled should be switched off before dispensing begins. Dispensing equipment should be operated in accordance with the manufacturer's instructions (e.g. equipment designed to be operated by an attendant should only be operated by an attendant). Delivery hoses should not be kinked or stretched. After dispensing, nozzles should be firmly stowed in their housings to switch-off metering pumps and dispensers or, in the case of centralised pump systems, to isolated hoses from sources of pressure. If appropriate, hoses should be draped to avoid damage by moving vehicles;
- d. motor cyclists and their passengers should dismount from their machines;
- e. portable and CB radios, mobile telephones and other electrical equipment should not be used in hazardous areas;
- f. the dispensing area should be kept clear of obstructions to allow easy access and exit; and
- g. petrol should not be dispensed by persons under 16 years of age. This restriction should not preclude young persons (e.g. teenagers) from operating dispensers to refuel motor vehicles provided this activity is carried out under the supervision of an adult.

PORTABLE PETROL CONTAINERS

18) Petrol should be dispensed into appropriately marked or labelled portable containers suitable for keeping petrol. The definition of a suitable container⁴⁵ includes

- a metal container satisfying the constructional and labelling requirements of the Petroleum-Spirit (Motor Vehicles etc) Regulations 1929; or
- a plastic container satisfying the constructional and labelling requirements of the Petroleum-Spirit (Plastic Containers) Regulations 1982; or
- a demountable fuel tank of a motor boat or similar vessel; or
- a United Nations approved container for the carriage of petrol

Note: The 1929 and 1982 Regulations do not apply to work activities. This means that an employer's risk assessment, under the Dangerous Substances & Explosive Atmospheres Regulations 2002, may determine that containers of a type and capacity different to those mentioned above are suitable for the storage (and transport) of petrol in connection with a work process/activity.

Where portable containers are to be filled they should be removed from inside vehicles and be placed on the forecourt and filled with the nozzle-operating lever held open manually. Containers should be securely closed as soon as dispensing finishes. Pedestrian customers should be discouraged from bringing full containers into the shop when paying for petrol

Portable containers must be:

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- a. suitable for the purpose of storing petrol;
- b. suitably labelled to identify the highly flammable nature of the contents;
- c. constructed and maintained so that they are reasonably secure against breakage and leakage (of petrol and vapour); and
- d. fitted with a secure closure, i.e. a screw or clamp tight cap.

FILLING OF MORE THAN TWO PETROL CONTAINERS

15) In considering the numbers of suitable containers that can be filled at one time you need to take into account the risks to the person filling the container and also to other people who may be using or working on the forecourt at the time. You also have duty of care to your customers to enable them to comply with the legal requirements for any subsequent carriage or storage of the petrol.

16) A limit of two containers is generally accepted as providing a reasonable level of safety on the forecourt and also allows for compliance with the majority of storage conditions applicable to petrol supplied to the general public for their private/domestic use. This does not mean that greater numbers of containers cannot be legally filled but it will be for you to decide on the appropriate numbers based on a risk assessment and a review of your hazardous area classification; as is required of you by the Dangerous Substances & Explosive Atmospheres Regulations 2002 (DSEAR).

17) The assessment must take into account the forecourt layout, the filling procedures and how you can ensure compliance with the filling procedures. Where a customer is 'at work' he/she will have duties under DSEAR and the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004 to ensure that any dispensing and loading of the vehicle is carried out safely and that person will also have duties to ensure compliance with the subsequent transport and storage legislation.

18) The risks from vapour release, spills and accidental ignition increase with the number of containers being filled; as do the consequences of any ignition. Where for example >10 containers are to be filled at any one time, it is important that in addition to the normal dispensing control measures, the following controls are incorporated into a 'written' filling procedure: -

- electrostatic ignition risks must be effectively controlled by ensuring that all containers are placed on the ground when being filled and that the person or persons filling the containers are provided with anti-static footwear;

Note: Regulation 7.5 of DSEAR requires an employer 'to ensure that appropriate work clothing which does not give rise to electrostatic discharges is provided for use in places classified as hazardous'.

- the build-up of dangerous concentrations of vapours in vans or on high-sided vehicles must be avoided. Removing the containers from the vehicle prior to filling together with a procedure to ensure that container

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caps are only removed when the container is actually be filled should provide an effective measure to prevent vapour accumulation in/on the carrying vehicle. (Consideration should also be given by the customer to the method of securing the containers in place in/on the vehicle);

- all containers should have their caps securely replaced immediately after filling;
- after filling, containers should remain on the ground for a short period to allow for the safe dispersal of vapours from any wetting caused by petrol splashes or outflows;
- containers should be filled one at a time. The caps of the other containers, both empty and full, should remain securely closed. This control measure will prevent the escalation of a fire should an ignition occur; and
- the place used for the multiple filling of containers will need to be provided with some form of barrier to prevent members of the public entering the hazardous area when filling is in progress.

19) In order to implement effective control measures where the multiple filling of containers is to take place, you must enter into an agreement with the contractor or person requiring the petrol so as to ensure that the procedure is understood and followed by the person or persons filling the containers. This agreement should also include the number of persons required to safely fill the containers and a time of day when the containers are to be filled.

Note: Regulation 11 of DSEAR imposes a duty on the employer responsible for the workplace to co-ordinate with any other employer sharing the workplace the implementation of fire and explosion control measures.

Supply of Petrol to Children

19) Petrol or any other dangerous substance should not be sold to children under 16 years of age⁴⁵.

STATIC ELECTRICITY

20) Conditions that cause static electricity to be generated prior to, and during the dispensing operation are:

- a. the customer's motor vehicle can become electrically charged during the journey to the filling station;
- b. the customer becoming charged with static electricity whilst in the vehicle or on the forecourt;

⁴⁵ LAC 65/61 'Petroleum (Consolidation) Act 1928 (PCA) - Petrol Filling Stations – Model Conditions of Licence' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector)

c. when large portable containers (> 5 litres capacity) are filled with petrol.

21) The inadvertent ignition of flammable vapours by a spark from a static discharge can be avoided by ensuring that:

- a) the forecourt surface does not have a high electrical resistance, thereby not inhibiting earthing of the charge via the motor vehicle's tyres or the footwear of customers. High resistance surfaces such as asphalt and certain impervious sealants should be avoided; and
- b) portable containers are placed on the forecourt when being filled.

LIGHTING

22) Vehicle entry and exit routes and the area around the dispensing equipment need to be sufficiently lit to allow people to dispense petrol safely. This means not just providing adequate lighting but also maintaining it.

WHAT TO DO IF SOMETHING GOES WRONG

23) Whatever type of petrol station you operate, you need procedures to deal with emergencies and ensure that your employees are trained to deal with them.

An example procedure would be:

- a. stop fuelling operations and return nozzles to their housings;
- b. isolate the electrical supply from faulty equipment;
- c. clear up spills promptly;
- d. contact the emergency services where necessary; and
- e. do not resume dispensing until faults affecting safety have been corrected or other incidents properly dealt with.

Dealing with Spillages

24) Spillages of petrol when dispensing activities are taking place are foreseeable events and control measures and equipment should be in place to deal with such occurrences. Experience has shown that spillages can be put into the following three general categories in the order of frequency: -

- a. Blow-backs from the fuel tank or container when the liquid level is reaching full capacity. Due to the safety features designed into the dispenser nozzle, this type of spillage will normally only involve a small quantity of petrol; most of which will quickly evaporate on the forecourt surface;
- b. A leak from a defective fuel tank of the vehicle being refueled. This type of spillage can arise from the sudden and catastrophic failure of the fuel tank resulting in the full contents being discharged onto the forecourt.

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The quantity can be in the region of 50 litres if the failure occurs when the tank is full; and

- c. The failure of a hose coupling or a leak from a hose that has been cut or stabbed by vandals. This is, potentially, the most serious type of leak as it can result in the customer being splashed with petrol. In a worst-case scenario, there is the possibility of a customer being 'showered' with petrol if, for example, there is a coupling or hose failure on a 'high hose' dispenser.

The types of spillages described in paragraphs 'a' and 'b' can be easily dealt with by trained staff using the dry sand or other absorbent material, which should be available. The likelihood of a customer's clothing or skin being contaminated with petrol in the circumstances outlined in paragraph 'c' should not be discounted.

Staff should be trained in how to deal with such a situation and there should be facilities available for a customer to wash the affected parts of their body and remove contaminated clothing. Consideration should be given to keeping a supply of disposable cover-all suits for use by customers.

ATTENDANT OPERATED SITES (AS)

- 25) Whenever an attendant service filling station is open for business, a trained attendant should be available to operate the dispensing equipment. The attendant should not allow customers to operate the equipment with or without supervision.
- 26) Trigger latching mechanisms are acceptable on petrol pump nozzles operated by an attendant. However, site operators should be aware that latched nozzles have been implicated in a number of forecourt fires. Static charge is able to build up on users if they let go of the earthed nozzle during dispensing and this can subsequently cause an incendive discharge when they make contact with the nozzle again to complete the transaction. Where trigger-latching mechanisms are installed the site operator should ensure that attendants are provided with, and wear, appropriate anti-static footwear whilst carrying out dispensing operations.

ATTENDED SELF-SERVICE SITES (ASS)

- 27) At these sites control over the dispensing is exercised by one or more attendants located at a control point or points. The location and design of the control point should allow, as far as is reasonably practicable, the attendants a clear and unrestricted view of all the dispensers so that they can prevent unsafe practices and if necessary switch-off the dispenser, if for instance:
 - a. inappropriate containers are being filled with petrol, or containers are not placed on the forecourt when being filled with petrol (static discharge hazard);

- b. sources of ignition are present (i.e. smoking, vehicle engine still running, radio transmitting equipment operating);
- c. inappropriate use of the dispenser (i.e. devices being used to hold open the trigger mechanism on the nozzle, the hose being over-stretched/damaged due to the vehicle position; and
- d. children (under 16) operating the dispenser or attempting to obtain petrol.

Note: Latching mechanisms on nozzles should be removed or disarmed.

28) In practice the attendant will not always be able to observe all details of self-service operations even at well-designed sites. Observation of the nozzle actually being placed into the vehicle fuel tank or container will frequently be restricted because of the configurations of vehicles, dispensers and customers relative to the control point. The attendant often needs to make judgements of the customer's intentions based on what can be observed from the control point. What it is reasonable to observe from the control point will vary from site to site, from dispenser to dispenser, and from situation to situation and will not always include a complete view of various nozzle positions.

29) Knowledge that a customer is being observed directly from the control point is likely to ensure customer adherence to commonly accepted practices and instructions.

OTHER AIDS

30) Mirrors may provide some improvement in vision at specific dispensers. Generally, however, their use will be restricted because the small and distorted image will not provide sufficient detail if installed with a total viewing distance (i.e. from control point to dispenser via a mirror) greater than about 10 metres. The effectiveness of a mirror to improve supervision can only be determined by practical trials at specific locations.

31) Supervision of the dispensing operation is likely to be improved as a result of a direct attendant service or by the presence of staff on the forecourt.

USE OF CLOSED CIRCUIT TELEVISION EQUIPMENT (CCTV)

32) CCTV should not normally be required at sites that are designed in accordance with accepted good practice to maximise the visibility of the dispensers from the control points. Such designs will include locating the control point so that an attendant can see the forecourt and dispensers clearly when no vehicles are present and also arranging the dispensers so they are aligned with the attendant's line of vision rather than at right angles to it.

33) Additionally road tankers or other delivery vehicles properly parked for unloading should not obscure the view from the control point.

34) CCTV can be used as a supervisory aid at existing sites in order to overcome visibility problems at specific islands. For example CCTV may have applications in the following circumstances when alternative solutions have been explored and found not to be practicable:

- When the dispenser cannot be viewed directly from the control point. For example, a building, car wash or a large stanchion obstructs the view; or
- Large multi-hose dispensers are installed so that their long side is at right angles to the line of vision from the control point; or
- Following change of use from attendant to self-service operation where the dispensers are not easily seen from the control point; or
- For dispensers installed at the extremities of very large sites that cannot be easily seen because of their distance or angle of vision from the control point.

35) New or redeveloped sites that have been designed without adequate visibility of the dispensers will require CCTV as an aid to supervision. These sites include those where the control point is located at the rear of a convenience store and the presence of customers, goods on display or the distance of the attendant from the viewing panel restricts vision of the forecourt. The CCTV system will require high-resolution equipment providing sufficient definition so that the activities occurring at the dispensers can be clearly identified. In addition the monitors should be interlinked with the control panel so that each dispenser is automatically displayed on the screen before it can be authorised by the attendant. It is recommended that a touch-screen system be adopted so that the attendant has to look at the actual screen before authorising the pump.

PRE-AUTHORISATION OF DISPENSERS

36) In certain circumstances dispensers may be pre-authorised (i.e. removing the need for the attendant to authorise the dispensers for each transaction). The decision to operate the site with the dispensers pre-authorised, should only be taken after a risk assessment has been carried out and it can be demonstrated that the monitoring exercised by the forecourt staff will maintain the same level of vigilance as would be the case if the dispensers had to be authorised for each transaction. The attendants will still need to be vigilant to the customers' actions at the commencement of and during the dispensing activity. In order to restrict children from access to petrol and minimise misuse pre-authorised dispensers should only be activated by a credit/debit card payment facility.

37) Other additional control measures for pre-authorisation of dispensers include:

- Limiting devices on each pump set to prevent the continuous operation for more than 3 minutes and a continuous outflow of more than 75 litres;
- Readily accessible and conspicuous emergency pumps isolation switch. This may be of the 'push button' design or, if provided, interlocked with the door of an emergency cabinet. More detailed guidance on emergency isolation switches is given in clause 14.6.4 of the Blue Guide².

UNATTENDED SELF-SERVICE AND UNMANNED SITES (USS)

RISK ASSESSMENT

38) The decision to operate a site on an USS basis for the whole or part of the business hours must be preceded by a risk assessment. The risk assessment should be carried out on a site-specific basis and should be undertaken in two phases.

- 1) Phase 1 should be an assessment of the risks of damage to the dispensing and safety equipment and the intimidation of customers by the actions of vandals and other persons of an unruly nature. Sites where vandalism has occurred or is likely to occur (if it is open for business without any supervision) should only be considered suitable for USS where effective control measures can be employed to deter damage to equipment.
- 2) Phase 2 should comprise a more detailed assessment that covers the following points:
 - a) The site's location to determine if any incidents arising during dispensing can be contained within the curtilage of the site;
 - b) The number and the position of the dispensers. The number of dispensers should not normally exceed two allowing up to four vehicles to be refuelled simultaneously (but see item iii);
 - c) Identifying any additional measures to those listed in the following paragraphs of this sub-section for sites where more than two pumps are required or where the throughput of fuels is high during the period of time that the site is in USS operation. Such sites will need special consideration to ensure that the control measures are adequate and the larger numbers of customers that will visit the site do not compromise safety. This may necessitate a trained person being immediately available to deal with any incidents that may arise;

² APEA/IP Guidance document for the Design, Construction and Operation of Petrol Filling Stations. Portland Press: ISBN 0 85293 217 0.

- d) The range and location of equipment/facilities to deal with foreseeable emergency incidents.
- e) Proposed 'management' and 'engineered' control measures including those built into the installed equipment;
- f) Road tanker deliveries, but only in respect of deliveries that may take place when the site is in USS operation.

ENGINEERED CONTROL MEASURES

39) Typically engineered control measures for unattended sites include: -

- Limiting devices on each pump set to prevent the continuous operation for more than 3 minutes and a continuous outflow of more than 75 litres (or the equivalent monetary amount);
- Restricting the sale of petrol to credit/debit card transactions only in order to limit access to children and minimise misuse;
- Removal of any latching mechanisms fitted to nozzles;
- Adequate illumination of the dispensing area and the position(s) of the emergency equipment; and
- Displaying a notice detailing the restrictions on the types of containers that can be filled with petrol.

EMERGENCY EQUIPMENT

40) Emergency equipment for unattended self-service sites will include the following items: -

- Petrol pumps isolation switch. This may be of the 'push button' design or interlocked with the door of the emergency cabinet. More detailed guidance on emergency isolation switches is given in clause 14.6.4 of the Blue Guide². See note below;
- A means for communicating quickly and directly with site personnel and the emergency services. An adjacent notice should display the site's name and address and emergency telephone number;
- Notice displaying the actions to be taken in case of emergency;
- An appropriate number of dry powder fire extinguishers and a container of dry sand or other absorbent material to deal with small spillages. See note below.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

Notes:

At sites which alternate between ASS and USS, there should be no need to install an additional petrol pump isolation switch if the existing external isolation switch is conspicuously marked in accordance with clause 14.6.4 of the Blue Guide², is of the push button type and in a position that is clearly visible from the dispensing position(s) of the USS pumps

When a site is in AS or ASS operation there should always be staff available that are trained in the use of extinguishers, therefore, the number of extinguishers provided should be in accordance with clause 4.3 of the Blue Guide². The same will not apply when a site is in USS operation and the likelihood that at the time of fire there is a customer or passer-by being on hand who is trained in how to use an extinguisher is remote. For this reason, there should normally be no need to make available more than 2 x 4.5kg dry powder extinguishers when a site is in USS operation; the preference being given to dry powder extinguishers because of their effectiveness when used by untrained persons.

- 41) The location of the above equipment should be conspicuous so that it can be seen from the dispensing areas. It should also be at a safe distance from the potentially wetted areas should any spillages or leakages occur when the dispensers are in use.
- 42) If the equipment is located in a cabinet, the enclosure should be clearly marked to indicate the equipment it contains. Alternatively, the door could be fully glazed so that the customers can see the equipment. The method of securing the door to cabinet should not impede immediate access in the case of an emergency.
- 43) Consideration should be given to providing an additional telephone (to the one installed for emergency use) for customers to seek non-emergency advice or to notify the site operator of any instances of equipment not working properly etc.

MANAGEMENT CONTROL MEASURES

- 44) Management Control Measures for unattended self-service sites would, typically, include: -
 - The site operator or a trained member of staff being on-call whenever the site is open for USS operation;
 - An emergency procedure for responding to incidents and assisting customers (See paragraph 46 below);
 - A procedure for carrying out inspections whenever the site is open for USS operation. At sites alternating between ASS and USS operation, this procedure should be carried out at the changeover time;
 - Procedures for checking, testing and maintaining emergency equipment.

Section 8 - Key Activities



Section 8 - Key Activities

- 45) The extent of management controls will need careful consideration to ensure that any emergencies or incidents are effectively and quickly dealt with. When determining the level of management control measures to put in place, two important points must be borne in mind. The first is that any incident may involve a customer being in a state of distress and in need of personal assistance. The second point is that the emergency services, especially the fire and rescue service, should not be relied upon to deal with minor incidents; this is the responsibility of the site operator.
- 46) A procedure must be in place for a trained person to attend the site (within a realistic time period) to deal with any reported incidents. Consideration can be given to installing a remote CCTV monitoring system with direct two-way communication with the forecourt as this will provide an immediate response to advise a person in difficulties and an initial assessment of the severity of the incident can be made and relayed to the person available to attend the incident. However, remote supervision of the site should not in all instances be considered as a pre-requisite to USS operation as the primary control measure is the response to the site by a trained person.
- 47) Incidents of sudden coupling and hose failures are a foreseeable event that can result in the customer becoming splashed/sprayed with petrol. The consequences of such an incident occurring when a site is in USS operation has to be addressed in the risk assessment so that effective control measures, to mitigate against serious personal injury, can be put in place.
- 48) *Note: See paragraphs 20 and 21 under the sub-section 'What to do if something goes wrong' with respect to customers becoming splashed/sprayed with petrol.*

ASSESSING THE RISKS

- 49) When you assess the risks associated with dispensing operations you will need to take into account the way you operate your site. Consider how the equipment is operated and identify how spills could occur. Then consider the possible ways to prevent each event, and measures to mitigate if it does happen. You will need to decide whether the precautions you have in place are sufficient to control the risk.
- 50) Table 5 shows one way you could go through this process. The control measures column gives some examples of the precautions that could be taken; there may well be alternatives. Also, some measures are more appropriate to new sites or those being refurbished than older existing sites, where the cost of them could be disproportionate to the risk. Remember that you must provide sufficient control measures to keep the risk to people's safety as low as is reasonably practicable.

Section 8 - Key Activities

Table 5 Controlling the Risks from Dispensing

Activity	Risk	Control Measures
Vehicle access	Vehicle collision with petrol dispenser while manoeuvring on site	<ul style="list-style-type: none"> • Provide impact check valves at the base of the dispensers using pressure delivery. • Provide shear valves at the base of the pumps using suction delivery. • Protect dispensers by mounting on properly designed plinths and/or provide safety barriers. • Hoses should be draped to avoid damage by moving vehicles • Provide, maintain and mark clear routes to, from and around dispensers. • Ensure adequate lighting. • Train staff to take appropriate action if collision occurs. • Ensure that spills of petrol, diesels etc are cleared up promptly; the latter to reduce the risk of vehicles skidding.
	Vehicle collision where vehicles are refuelled on highway.	<ul style="list-style-type: none"> • Only use attendant operated procedures. • Train staff to take appropriate action if collision occurs. • Provide notices to alert pedestrians to refuelling activity and hazards.
Dispensers	Leak from damaged dispenser.	<ul style="list-style-type: none"> • Check that dispensers are undamaged, working and are properly maintained. • Do not allow damaged dispensers to be used/activated.
	Leak from damaged hose or nozzle.	<ul style="list-style-type: none"> • Use dispensers with volume or time limited cut-offs, or fit such devices to existing dispensers. • Ensure that dispenser nozzles and couplings etc are regularly inspected and properly maintained. • Do not allow dispensers with damaged hoses etc to be used. • De-activate hold-open devices on the nozzles of self service dispensers. • Draw up procedures for emergency shut down.
	Petrol spilled during dispensing.	<ul style="list-style-type: none"> • Draw up emergency procedures and train staff. • Provide and maintain emergency equipment. • Provide sand to absorb small spills. • Provide changing/washing facilities (including disposable coverall suits) for customers/employees who are splashed with petrol.

Table 5 Controlling the Risks from Dispensing

Activity	Risk	Control Measures
	Member of public drives away during refuelling.	<ul style="list-style-type: none"> • Install breakaway couplings. • Draw up procedures for emergency shut down.
Static Electricity	Ignition of vapours	<ul style="list-style-type: none"> • Make sure that the resistance of the forecourt surface does not have a resistance exceeding $10^8 \Omega$. • Train staff to ensure that portable containers >5 litres capacity are placed on the forecourt before the pump is commissioned. At unattended self-service sites, a notice to this effect should be displayed at the dispenser(s).
General		<ul style="list-style-type: none"> • Train staff to take appropriate action if a leak or spill occurs. • Control ignition sources in hazardous area. • Train staff not to activate dispensers when potential ignition sources are present. • Train staff to take appropriate action where there is a fault or malfunction with the Stage 2 vapour recovery system.

Section 8 - Key Activities

8.6 DECOMMISSIONING

INTRODUCTION

- 1) Where equipment used for storing or dispensing of petrol is taken out of use, the Dangerous Substances & Explosive Atmospheres Regulations 2002¹ require operators to ensure that the work is carried out safely and that the equipment is left in a safe state.
- 2) Taking equipment out of use is a specialist activity and, as a site operator or owner, you are unlikely to carry out the work yourself. Seek advice from a contractor, the enforcing authority or, if necessary, the site owner about:
 - a) whether you should take equipment out of use permanently or temporarily;
 - b) what methods will be necessary and appropriate for the circumstances of the site and the equipment, the results of a risk assessment will help to answer this; and
 - c) how the work should be carried out.

METHODS OF TAKING EQUIPMENT OUT OF USE

- 3) The following paragraphs describe what you need to consider when you intend to take equipment out of use. Guidance on technical aspects of the work, including the selection and use of particular methods, is given in: the Blue Guide², the Institute of Petroleum's 'Guidelines for uplift of product from retail filling stations and customers' tanks'³⁸. In addition, the 'Approved Code of Practice on Design of Plant, Equipment and Workplaces (L134)'²⁷ gives practical advice on assessing the risk from, and the design and use of, plant, equipment and workplaces which handle or process dangerous substances. The ACoP also includes measures for making redundant plant and equipment safe.
- 4) Your trade association may also be able to offer you some advice.

TAKING EQUIPMENT OUT OF USE PERMANENTLY

- 5) If there is no intention to use equipment in the future, either for economic reasons or because it is damaged and cannot be repaired, it should be taken out of use permanently.

¹ The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd. Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE Books: ISBN 0 7176 2203 7.

Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books.

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X

³⁸ Guidelines for uplift of product from retail filling stations and customer's tanks (TP30) ISBN 0 852923 146 8 (available from the Institute of Petroleum).

²⁷ Approved Code of Practice and Guidance 'Design of Plant, Equipment and Workplaces (L134)' HSE Books. ISBN 0 7176 2199 5

TAKING EQUIPMENT OUT OF USE TEMPORARILY

- 6) Equipment may be taken out of use temporarily for a variety of reasons. For example, a storage tank may be taken out of use for cleaning³⁴, modification or during reconstruction of a petrol station, but will remain in place for future storage of petrol or alternative substances such as diesel or heating fuels. Before expiry of a lease, a site may stop storing and dispensing petrol, but it may need to be returned to the owner with equipment in situ, functional and safe. In this case, suitable and appropriate measures will need to be taken to bring equipment safely back into use.

SAFE SYSTEMS OF WORK

- 7) A systematic examination of all the tasks associated with the decommissioning works should first be carried out for the purposes of identifying all the hazards associated with the decommissioning works. The system of work should be a formal process that defines safe methods of work so as to ensure that hazards are eliminated or that risks are minimised. The Approved Code of Practice and Guidance on 'Safe Maintenance, Repair and Cleaning Procedures'²² provides further information.

METHOD STATEMENT

- 8) A suitable method statement should be prepared by the person carrying out the work. The statement should be comprehensive for example, a method statement for taking a tank out of use should include information on how the supply lines, vent pipes and other related equipment will be made safe.
- 9) Where the proposed work is a high-risk activity, stricter controls will be required and the work should only be carried out against previously agreed safety procedures by implementing a permit-to-work system²⁵.

STORAGE TANKS AND PIPEWORK

- 10) Tanks (and individual compartments, where appropriate) and pipework taken out of use permanently may be removed from the site and disposed of safely, or made safe and left in place. If they are to remain in the ground, they should require no future maintenance.

³⁴ Cleaning and gas freeing of tanks containing flammable residues (CS15) HSE Books: ISBN 0 7176 1365 8.

²² Approved Code of Practice and Guidance 'Safe Maintenance, Repair and Cleaning Procedures (L137)'. HSE Books. (ISBN 0 7176 2202 9)

²⁵ Chemical manufacturing Permit-to-work systems IND G 98 HSE Books: free leaflet.

11) When taking tanks, compartments or pipework out of use temporarily, the method you select should take account of the condition of the equipment, the length of time it is likely to be out of use, and why. Depending on the method chosen, you will need to know what maintenance may be required in the interim. For example, when tanks or compartments are temporarily filled with water, the water level can drop to leave a flammable sludge or vapour. You will need to make frequent and regular checks to ensure that the water level is not falling, and, where necessary, arrange for petrol to be removed from the surface of the water.

12) Tanks, compartments and pipework that are taken out of use for a very short time but still contain petrol, such as during a temporary surplus of resources, should remain subject to the same operational procedures and maintenance regime as other similar equipment still in use on the site. Tanks taken out of active use temporarily but still holding a quantity of residual petrol will remain subject to the licensing regime.

13) Under the provisions of Section 73 of the Public Health Act 1961 (Section 94 of the Civic Government (Scotland) Act 1982 in Scotland)³⁹, site operators have a legal obligation to take all practical steps to prevent danger from the storage tank.

ELECTRICAL INSTALLATION

14) The supply to equipment taken out of use should be isolated by someone competent to carry out such work. If the site is being vacated, this should be the electricity supply company.

Other equipment

15) Work to take dispensers, the interceptor and drainage systems, and manhole chambers out of use should be carried out safely, and the equipment left in a safe condition. For example, after dispensers have been made safe, they can be removed from the site or left in place, provided they have sufficient protection from vandalism, such as by enclosure in a sturdy encasement.

Conversion to other products

16) Work carried out to convert petrol equipment to other products, such as diesel and heating fuels, should take account of the effects of cross-contamination of the new substance with petrol. Other precautions, such as re-labelling the fill points and posting warning notices, may also be necessary. The Institute of Petroleum's 'Code of practice for a product identification system for petroleum products'³⁷ give further advice on the marking of pipework.

³⁹ The Public Health Act 1961 (Section 73) ISBN 0 10 8502147 The Stationery Office Ltd

³⁷ Code of practice for a product identification system for petroleum products (TP52) (fourth edition) ISBN 0 85293 307 X (available from the Institute of Petroleum).



Record keeping

- 17) You should keep records to show how equipment has been taken out of use and made safe. Where appropriate, the equipment itself should be clearly marked to show that it is no longer in service. The location of abandoned underground tanks or pipework should be recorded and brought to the attention of anyone who subsequently becomes responsible for the site.

Section 8 - Key Activities

APPENDIX 1 – STATISTICAL INVENTORY RECONCILIATION

WETSTOCK CONTROL FOR PETROL FILLING STATIONS

- 1) Many petrol filling station operators rely on a manual petrol stock reconciliation system to detect leaks from the storage tanks and pipework. The basic idea is that by finding how much petrol has come out of a tank through the dispensers (by checking the totaliser readings, for example) and taking into account how much has been put into the tank, you can calculate how much should be left in the tank. If you then measure how much petrol actually is in the tank you know if there has been a loss or gain that could indicate a leak.
- 2) This method of leak detection relies on consistent measurements of the tank contents, the accuracy of the measurements, and knowledge of the pattern of apparent losses and gains for your site.
- 3) A lot of sites still use dipsticks or pump-up (hydrostatic) gauges to measure the contents of tanks. Pump-up gauges and dipsticks can only be read to a certain accuracy, not usually better than 50 to 100 litres either way. The readings are still useful because over a period of time they can be analysed and in some cases very small leaks can be detected by using special methods. Even without specialist analysis the readings can be sufficient to detect leaks before a lot of petrol has been lost.
- 4) Stock losses are to be expected due to evaporation, shrinkage and the displacement of vapour during the road tanker unloading process. Typically, an average stock loss of some 0.2% to 0.3% can be expected. However, at some sites average stock losses can be as high as 0.5% or 0.6%. Although most sites tend to experience stock losses, occasional stock gains can occur.

NOTES:

- a) *If a vapour recovery system has been fitted then dipsticks and pump up gauges can become unreliable (as they are affected by positive and negative pressures that can be present in the tank(s)) and it can be practically impossible to detect leaks. You should seek advice from your Petroleum Inspector regarding the fitting of a pressure relief device if you are experiencing problems with stock measurements.*
- b) *For the purposes of detecting a leak, it is essential that the quantities of petrol delivered, stored and dispensed are accurately monitored and recorded on a daily basis.*

Appendix 1 – Statistical Inventory Reconciliation

SAMPLE STOCK RECONCILIATION FORM

- 5) Stock reconciliation entails using very simple arithmetic, but recording the information in a clear and useful way can be difficult. There are some good commercial computer programmes to help you, but you really only need a calculator to do the calculations. The form attached allows you to record all the details of your reconciliation for a petrol tank. In some cases, where a tank feeds more than one pump, you will need to work out the sales from the tank by adding up the totals for all the dispensers fed by the tank.

USING THE FORM

Columns A and D

- 6) If your site is not open 24 hours a day then you should try to take your 'opening stock' measurement before the site opens (or after you close in the evening). This will go into *column A* of the form. Your closing (dipped) stock one-day should match your opening stock the next day. The closing (dipped) stock should go into *column E*. For 24-hour sites the same stock measurement should be used.
- 7) If you operate a 24-hour site, taking the readings at roughly the same time of day will make it easier to get into a routine so that you don't miss any readings, and may help eliminate some variations.

Column B

- 8) Record deliveries into the tank in this column.

Column C

- 9) The total sales from each tank will go into column C. You need to add together the sales for each pump fed by the tank.

Note: Petrol removed from the tank for reasons other than sales must be included in the daily reconciliation. For example, if 50 litres is drawn from a pump to check the accuracy of the meter, the quantity will be automatically recorded on the (pump) totaliser as a sale. This quantity (50 litres) must then be recorded in column B when the petrol is returned to the tank.

Column D

- 10) In this column enter the amount of (book stock) petrol that should be in the tank, calculated according to:
- a) Amount in at start of day + amount delivered – amount sold
- (This can be expressed as $D = A + B - C$ where a letter stands for the number written in that column.)

- 11) The closing (dipped) stock, in *column E*, is what is actually left in the tank when you measure the contents. If there is less than you expect (ie, less than the quantity you have written in *column D*) then there is an apparent loss. To find the loss or gain (referred to as the variance) calculate: dipped stock – book stock = variance. (This can be expressed as $E - D$ where a letter stands for the number written in that column) This figure goes into *column F*.

Remember that occasionally there may be a stock increase that will result in the dipped stock being a larger figure than the book stock. An example of adding an increase to a loss is given in paragraph 15.

Columns G, H and I (Cumulative Figures)

- 12) The daily loss can be useful to know but it does not show you the way stock variations change over time. A large loss one day can be followed by several days where smaller gains show up and even out the variations.
- 13) To get round this you can use the totals for each period, adding the figures day by day and using these to find the percentage variation. The figure of greatest interest is the cumulative loss as a percentage of sales, which gives an evened out picture of the normal losses and gains for a site.
- 14) The cumulative variance (G) is calculated by adding the *day's* variance (F) onto the previous *day's* cumulative variance (G). Care is needed during this step of the record keeping as you may be adding a day's gain to a cumulative loss. For example, +20 litres added to -250 litres is -230 litres.
- 15) The cumulative sales (H) are calculated by adding the *day's* sales onto the previous *day's* cumulative sales.
- 16) The percentage cumulative loss (or gain) is based on the cumulative sales (H) and is easily calculated by using the formula; $G \div H \times 100 = \%$
- 17) An example of the calculations over a five-day period is shown on the form below.

Conclusion

- 18) It is important to note that there are more sophisticated ways to examine the stock figures that have the advantage of detecting quite small leaks. The appropriate level of leak detection/prevention for your site should be determined by a risk assessment, which you are obliged to carry out as a duty under the Dangerous Substances & Explosive Atmospheres Regulations 2002¹. However if, as a minimum, you carry out your stock reconciliation using a system similar to the one described here you should be able to detect unusual losses and the figures you have collected will be there for more detailed analysis if required.

19) Section 11 of the 'Guidance for the Design, Construction, Modification & Maintenance of Petrol Filling Stations'² describes the various systems of leak detection available and a methodology to assess the most appropriate class of system for a particular site.

Table 6 - Example of Wet Stock Reconciliation

NAME OF SITE: High Street Filling Station, Anytown TANK NUMBER: 3 GRADE: ULG CAPACITY: 22,700 litres PUMP NUMBERS: 1 & 4										
Day	Date	Opening Stock	Delivery	Sales	Book Stock (A + B - C)	Closing (Dipped) Stock	DAILY Variance Loss/Gain (E - D)	CUMULATIVE Variance Loss/Gain	Sales	% G÷Hx100
		A	B	C	D	E	F	G	H	I
1	1-Jan-02	20,000	0	2,500	17,500	17,495	-5	-5	2,500	0.200
2	2-Jan-02	17,495	0	3,300	14,195	14,186	-9	-14	5,800	0.240
3	3-Jan-02	14,186	5,000	2,000	17,186	17,160	-26	-40	7,800	0.510
4	4-Jan-02	17,160	0	3,500	13,660	13,665	+5	-35	11,300	0.310
5	5-Jan-02	13,665	0	2,400	11,265	11,260	-5	-40	13,700	0.290
6	6-Jan-02	11,260								
7	7-Jan-02									

The figures in columns E, G, H & I are carried forward to the next weekly or monthly period.

Appendix 1 – Statistical Inventory Reconciliation

² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X



APPENDIX 2 - TRAINING

Table 7 gives examples of the training needs of people working at petrol stations. The list is not exhaustive and some elements may not always be appropriate. Similarly, additional or more specific training may be necessary to meet the needs of staff with key responsibilities and to deal with the circumstances at individual petrol stations.

Appendix 2 – Training

Appendix 2 – Training

Table 7 Examples of Training Needs

Activity/area	Training
Control of ignition sources	<ul style="list-style-type: none"> • The hazards and characteristics of petrol. • Hazardous zones. • Procedures to identify and report potential ignition sources and other fire and explosion hazards. • Instruction/information signs.
General forecourt safety	<ul style="list-style-type: none"> • Procedure for opening and closing the site. • Site security arrangements. • Special arrangements for other permanent or temporary activities or other people on site. • Procedures for managing contractors. • Reporting procedures for damage to the site or equipment. • Procedures for dealing with minor leaks and spills. • Procedures for dealing with customers splashed with petrol. • Maintenance and safe housekeeping procedures. • Company safety policy.
Emergency procedures	<ul style="list-style-type: none"> • Types of emergencies. • Isolation/shutdown procedures. • Individual responsibilities. • Arrangements for contacting the emergency services. • Evacuating the site. • Location and use of fire fighting equipment. • First aid. • Clean-up procedures.
Vapour recovery process	<ul style="list-style-type: none"> • Basic principles of vapour balancing related to the type of system installed. • Safety precautions to be followed before, during and after a delivery. • Restrictions on measuring the contents of tanks where dipsticks are used. • Restrictions for split compartment deliveries. • Reasons for and correct sequence for connecting/disconnecting the vapour recovery hose. • Signs and symptoms of vapour leaks. • Reporting/recording procedures for instances of vapour lock, vapour leak, equipment failure or slow deliveries. • Precautions to be taken should the system become over-pressurised.
Unloading procedures	<ul style="list-style-type: none"> • Site procedures in preparation for and during unloading. • Arrangements for tanker access and parking. • Identification of fill points, tanks and vent pipes. • Dipping/ullage checks. • Gauge/monitor readings. • Documentation procedures. • Arrangements for driver unassisted and driver

Table 7 Examples of Training Needs

Activity/area	Training
	<ul style="list-style-type: none"> assisted deliveries. Overfill prevention devices and alarm systems. The vapour recovery system.
Petrol storage	<ul style="list-style-type: none"> Methods of wetstock reconciliation. Operation of monitoring equipment. Operation of leak detection equipment. Loss reporting. Maintenance procedures.
Operation of dispensing equipment (attendant operated)	<ul style="list-style-type: none"> Fuel grades and types. Safe dispensing procedures. Correct use of dispensing equipment. Safe use of petrol containers. Recognising and reporting equipment faults. Emergency procedures during dispensing. Injury/incident reporting procedures for employees.
Operation of dispensing equipment (attended self-service)	<ul style="list-style-type: none"> Procedures for activating and controlling dispensers. Fuel grades and types. Safe dispensing procedures. Use of public information/communication system. Safe use of petrol containers. Dealing with customers' enquiries on safety matters. Emergency procedures during dispensing. Injury/incident reporting procedures for members of the public.

Appendix 2 – Training

APPENDIX 3 – SUGGESTED VISUAL INSPECTION PROGRAMME

Table 8 Visual inspection programme		
Item	Scope	Actions
Observation well	Inspect for presence of petrol or vapours.	Investigate the possibility of a leaking tank or pipework or spillage during offloading. Inform Petroleum Inspector if necessary. Make arrangements for removal of petrol.
Underground storage tank access chambers (including those without fill points)	Inspect for presence of petrol.	Investigate source of petrol. Check for leaking pipework or spillages. Make arrangements for removal of petrol.
	Inspect for presence of excessive quantity of water.	Remove water. If necessary, carry out remedial work to prevent further water ingress.
	Inspect for accumulation of debris/rubbish.	Remove and take necessary action to prevent reoccurrence.
	Inspect condition of fill point labels and warning notices.	Replace missing, damaged or illegible labels/notices.
	Inspect general construction of chamber, cover, frame, safety platform and liner where applicable.	Make arrangements for repair/replacement as appropriate.
	Inspect dipstick for damage or serious deformation.	Repair, replace or recalibrate as appropriate.
	Inspect the condition of exposed pipework for leaking joints, signs of corrosion or damage.	Make arrangements with a competent person for repairs as appropriate.
	Inspect the effectiveness of fill point security including off-set fill 'T' piece access plug where appropriate.	Secure fill point. Lubricate and/or replace defective padlocks. Make arrangements for a competent person to replace or tighten the 'T' piece plug.
Above ground storage tanks	Inspect the bunding system for the presence of surface water.	Open stock valve or siphon/pump out as appropriate.
	Inspect the bund for accumulations of debris/rubbish.	Remove and take necessary action to prevent reoccurrence.
	Inspect the tank for signs of damage, corrosion etc	Treat any areas of incipient corrosion and re-apply protective coating. In case of severe corrosion or evidence of damage, make arrangements for a competent person to carry out a thorough examination and repairs as necessary.

Appendix 3 – Suggested Visual Inspection Programme For Petrol Stations

Appendix 3 – Suggested Visual Inspection Programme For Petrol Stations

Table 8 Visual inspection programme		
Item	Scope	Actions
	Inspect the condition of surface mounted pipework, joints and fittings for corrosion or damage.	Treat any areas of incipient corrosion and re-apply protective coating. In case of severe corrosion or evidence of damage, make arrangements for a competent person to carry out a thorough examination and repairs as necessary.
	Inspect the condition of fill point labels and warning notices.	Replace missing, damaged or illegible labels/notices.
	Inspect the general construction of the bund walls	Make arrangements for repairs as necessary.
Pipework access chambers	Inspect the condition of the valves/joints for signs of leaks, corrosion or damage.	Make arrangements with a competent person for repairs as appropriate.
	Inspect the condition of instruction/warning labels.	Replace missing, damaged or illegible labels.
	Inspect for accumulation of debris/rubbish.	Remove and take necessary action to prevent re-occurrence.
Vapour recovery system	Inspect the condition of: the p/v valve (or orifice plate and pressure valve); the self sealing poppet valve; warning notices.	Make arrangements with a competent person for repairs/ replacement as necessary.
	If there is a vapour recovery hose kept on site check: the condition of the spigot for evidence of damage or deformation; the general condition of the hose; electrical continuity.	Make arrangements with a competent person for repairs/replacement as necessary and periodic electrical continuity testing.
Vent pipe (above ground level)	Check pipe for stability/ corrosion/damage (pay special attention to signs of corrosion at ground level).	Make arrangements with a competent person for repairs/ replacement as necessary.
	Inspect the condition of the of flame trap outlet.	Make arrangements with a competent person for repairs/ replacement as necessary.

Appendix 3 – Suggested Visual Inspection Programme For Petrol Stations

Table 8 Visual inspection programme

Item	Scope	Actions
Pumps/dispensers	Remove pump panel(s) and check for signs of leaks, general condition of electrics (signs of overheating, etc) and the integrity of the cavity infill/seal.	Make arrangements with a competent person for a thorough inspection, repair or replacement.
Dispenser Hoses	Check condition of dispensing hose and nozzle for: Cracks in the hose cover such that the reinforcement is clearly visible. Leakage from the hose assembly. Abrasion of cover revealing the reinforcement. Movement of the hose from the end fitting. (A Colour change near fitting may be an indicator. Swelling or blistering of the cover.	Make arrangements with a competent person for a thorough inspection, repair or replacement.
Hazardous areas	Check the hazardous areas associated with the underground storage tank fill point, vent pipe, vapour balance pipe and dispenser for sources of ignition and fire hazards.	Remove/isolate as appropriate.
Cable ducts	Inspect access chambers and the entry point in the building to ensure that the seals have not been damaged or removed.	Make arrangements with a competent person for the seals to be replaced.
Drainage gullies and forecourt surface	Check for blocked drains (this may need to be more frequent in the Autumn when leaves fall from trees) and signs of deterioration to the forecourt surface.	Clean out drains and make arrangements for repairs as necessary.

Appendix 3 – Suggested Visual Inspection Programme For Petrol Stations

Table 8 Visual inspection programme

Item	Scope	Actions
Interceptor	Inspect all chambers for the presence of petrol/oil and build-up of grit and debris.	Make arrangements with specialist contractor for cleaning.
Artificial illumination	Check all forecourt and tanker standing hazardous area lighting systems.	Replace defective bulbs/ tubes and repair as necessary. Note: repairs to light fittings within or above hazardous areas may only be carried out by a competent electrical contractor as defined by Regulation 16 of the Electricity at Work Regulations 1989. 8
Fire fighting equipment	Check that none of the extinguishers are missing, all are fully charged and there are no signs of damage. Check the sand bucket(s) is full of dry sand with the applicator intact.	Make arrangements for recharging/replacement as appropriate.
Housekeeping	Check for accumulations of combustible refuse and general tidiness of site.	Remove refuse to a safe place. Empty forecourt bins used by the public.
Emergency equipment	Check that all emergency switches and the loudspeaker system and telephone (where applicable) are functioning correctly.	Make arrangements with a competent person to repair as appropriate.
Warning/advice notices	Check that none are missing, damaged or illegible.	Replace and clean as necessary.

⁸ Memorandum of guidance on the Electricity at Work Regulations 1989 (HSR 25) HSE Books: ISBN 0 7176 1602 9.

APPENDIX 4 – EXAMPLES OF TYPICAL HAZARDOUS AREAS

Tables 9-16 take account of the typical operational arrangements, which exist at petrol stations. However, local conditions at your petrol station may mean that the extent of the hazardous areas may vary in individual cases. In particular the horizontal distances quoted for Zone 2 areas depend on the likely wetted area resulting from a petrol spillage, and this will vary with paving and drainage conditions and with the degree of containment from walls and other obstructions. Also, if a location falls within two zones you should regard it as being in the one with the higher risk.

More detailed information on hazardous area classification at petrol filling stations can be found in Section 3 of the Blue Guide². Section 3 of the Blue Guide also covers hazardous area classification for above ground tanks and spillages which are not dealt with in this publication.

Table 9 Hazardous area classification for underground tanks

Facility	Area classification	Location of hazardous area
Underground storage tanks Fig 1 (a), (b) and (c)	Zone 0	Within any tank and within any access chamber in which there are either direct or off-set fill connection points or vapour connection points.
	Zone 1	A nominal 1m radius from the tank fill point. When the fill point is located in a below ground chamber, the radius is extended from the edge (lip) of the chamber as shown in Figures 1a and 1b.
	Zone 2	A horizontal radius of 4m with a height of 1m from any above ground off-set fill point. A nominal 1m radius from the vapour connection point

Table 10 Hazardous area classification for vent pipes

Facility	Area classification	Location of hazardous area
Vent pipes for underground storage tanks without vapour recovery. Fig 2(b)	Zone 1	Within a radius of 2m in all directions of the open end of any vent pipe.
	Zone 2	The area below the Zone 1 area of the vent pipe, for a radius of 2m around the discharge point and down to ground level.
Vent pipes for underground storage tanks with vapour emission control. Fig 2(a)	Zone 2	Within a radius of 2m in all directions of the open end of any vent pipe and extending vertically down to ground level.

¹² APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd edition). Portland Press: ISBN 0 85293 419 X.

Appendix 4 – Examples Of Typical Hazardous Zones At Petrol Stations

Table 11 Hazardous area classification for oil/water separators

Facility Figure 3(a)	Area classification	Location of hazardous area
Access chamber (a)	Zone 1	Where fitted with a 'gas tight' cover.
Access chamber (b)	Zones 1 & 2	Where not fitted with a 'gas tight' cover, an additional Zone 2 area (above the chamber) extending in a 2m (1m high) radius is created.
Separator chamber (a)	Zone 0	Ullage space when a spillage has occurred.
Separator chamber(b)	Zone 1	Ullage space when the separator has been cleaned
Vent pipe (a)	Zone 1	A 1m radius around the outlet when a spillage has occurred.
Vent pipe (b)	Zone 2	A 1m radius around the outlet when the separator has been cleaned

Table 12 Hazardous area classification for constructed wetlands

Facility Figure 3(b)	Area classification	Location of hazardous area
Valve chamber (a)	Zone 1	Where fitted with a 'gas tight' cover.
Valve chamber (b)	Zones 1 & 2	Where not fitted with a 'gas tight' cover, an additional Zone 2 area (above the chamber) extending in a 2m (1m high) radius is created.
Wetland area (a)	Zone 1	Where the wetland is below ground level or is surrounded by an enclosure restricting the dispersal of vapours.
Wetland area (b)	Zone 2	Where the surface level is at or about the surrounding ground level.
Surrounding area	Zone 2	A nominal 4m extending from the edge(s) to a height of 1m.

Note: The descriptors in this Table and the diagram in Figure 3(b) relate to a rectangular shaped wetland. At some sites, the wetland may form part of an undulated landscaped area which does not conform to a rectangular pattern; in which case consideration will have to be given low levels where vapours may accumulate or migrate from and high banks which will restrict the spread of vapour.

Appendix 4 – Examples Of Typical Hazardous Zones At Petrol Stations

Table 13 Hazardous area classification for petrol dispensers and vehicle refuelling

Facility Figures 4 and 5	Area classification	Location of hazardous area
Dispenser housing (a)	Zone 2	Without an (internal) vapour barrier, 200mm surrounding the housing and extending 50mm above the housing.
Dispenser housing (b)	Zone 2	With an (internal) vapour barrier, 200mm surrounding the housing not extending above the level of the vapour barrier
Air separator vent (with or without Stage 2 vapour recovery.	Zone 1	From the vent outlet, 250mm horizontally down to ground level and 100mm vertically above the vent outlet.
Nozzle housing (a)	Zone 0	Within the housing.
Nozzle housing (b)	Zone 1	Within a 100mm (external) radius of the nozzle housing.
Vehicle refuelling without Stage 2 vapour recovery.	Zone 1	Extends from the nozzle housing to 0.5m beyond the vehicle fill-point to a height of 1.2m
Vehicle refuelling with Stage 2 vapour recovery.	Zone 2	Extends from the nozzle housing to 0.5m beyond the vehicle fill-point to a height of 1.2m

Table 14 Hazardous area classification for road tanker deliveries

Facility Figure 6	Area Classification	Location of hazardous area
Road tanker unloading with Stage 1b vapour recovery.	Zone 1	A nominal 1m radius around the road tankers delivery valves (faucets) which extends to ground level.
	Zone 1	A nominal 1m height above ground level and a 1m radius either side of the 'hose corridor' running from the road tanker to the storage tank.
	Zone 2	A 4m radius from the road tanker's faucets to a height of 1m
	Zone 2	A 1m sphere of the road tanker's p/v valve
Road tanker unloading without Stage 1b vapour recovery. When manual dipping of a compartment is taking place	Zone 1	A 1m radius in all directions from the centre of the dipping point or compartment opening to a height of 2m above the coaming.

Appendix 4 – Examples Of Typical Hazardous Zones At Petrol Stations

Table 15 Hazardous area classification for 'Autogas' delivery, storage and dispensing

Facility	Area Classification	Location of hazardous area
Road tanker unloading Figure 7	Zone 2	A 4m radius in all directions from the 'on-board' pump
	Zone 2	For 'soft-seated' relief valves, a radius of 0.5m in all directions from the valve. For other types of relief valve, the radius is increased to 2.5m.
	Zone 1	A radius of 1.5m, in all directions from the valve.
Storage vessel (buried) Figure 8(a) and 8(b)	Zone 1	Below ground fill point and ullage indicator chambers.
	Zone 2	A 1.5m radius in all directions from the edge (lip) of the chamber when a delivery is in progress.
	Zone 1	For above ground off-set fill and ullage level indicator points, a 1.5m radius in all directions from the points when a delivery is in progress.
Storage vessel (above ground) Figure 8(c)	Zone 1	A radius of 1.5m in all directions of the fill point and ullage level indicator
		A 0.5m radius in all directions of the pressure relief valve
Dispensers Figure 9	Zone 2	For the length of the dispensing hose, between the dispenser and the vehicle fill point to a height and radius of 1.2m.
		A nominal 150mm around the whole of the dispenser housing.
		A 1m radius in all directions from vent apertures in the dispenser casing.

Appendix 4 – Examples Of Typical Hazardous Zones At Petrol Stations

Table 16 Miscellaneous hazardous area classifications

Facility	Area classification	Location of hazardous area
Remote pumps	Zone 1	Within any enclosure around the pump.
	Zone	Within 3m horizontally coning downwards to 4m at forecourt level of the centre line of the remote pump housing and vertically to the top of the hydraulic housing with a minimum height of 1.25m.
Screwed or flanged joints in above ground pipework	Zone 2	A cylinder 1m in diameter centred on the joint extending from 1m above the joint to ground level, unless the pipe is in an enclosed or essentially enclosed space in which case it is the entire space.
Buildings	The appropriate Zone at the same height throughout the building	Kiosks and other small buildings with openings in a hazard zone.
Pits, trenches, etc	Zone 1	Any pit, trench or depression below ground wholly or partly in a Zone 1 or Zone 2 area

Appendix 4 – Examples Of Typical Hazardous Zones At Petrol Stations

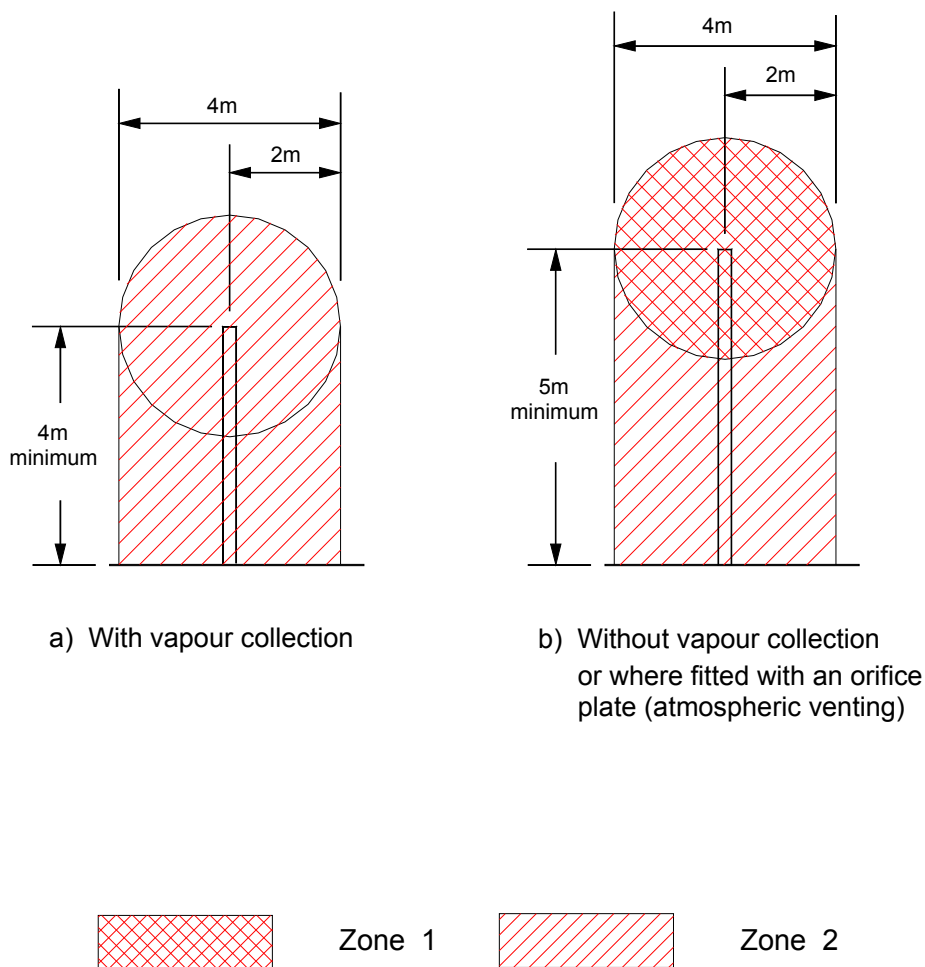


Figure 2 - Typical hazardous area around a storage tank vent pipe

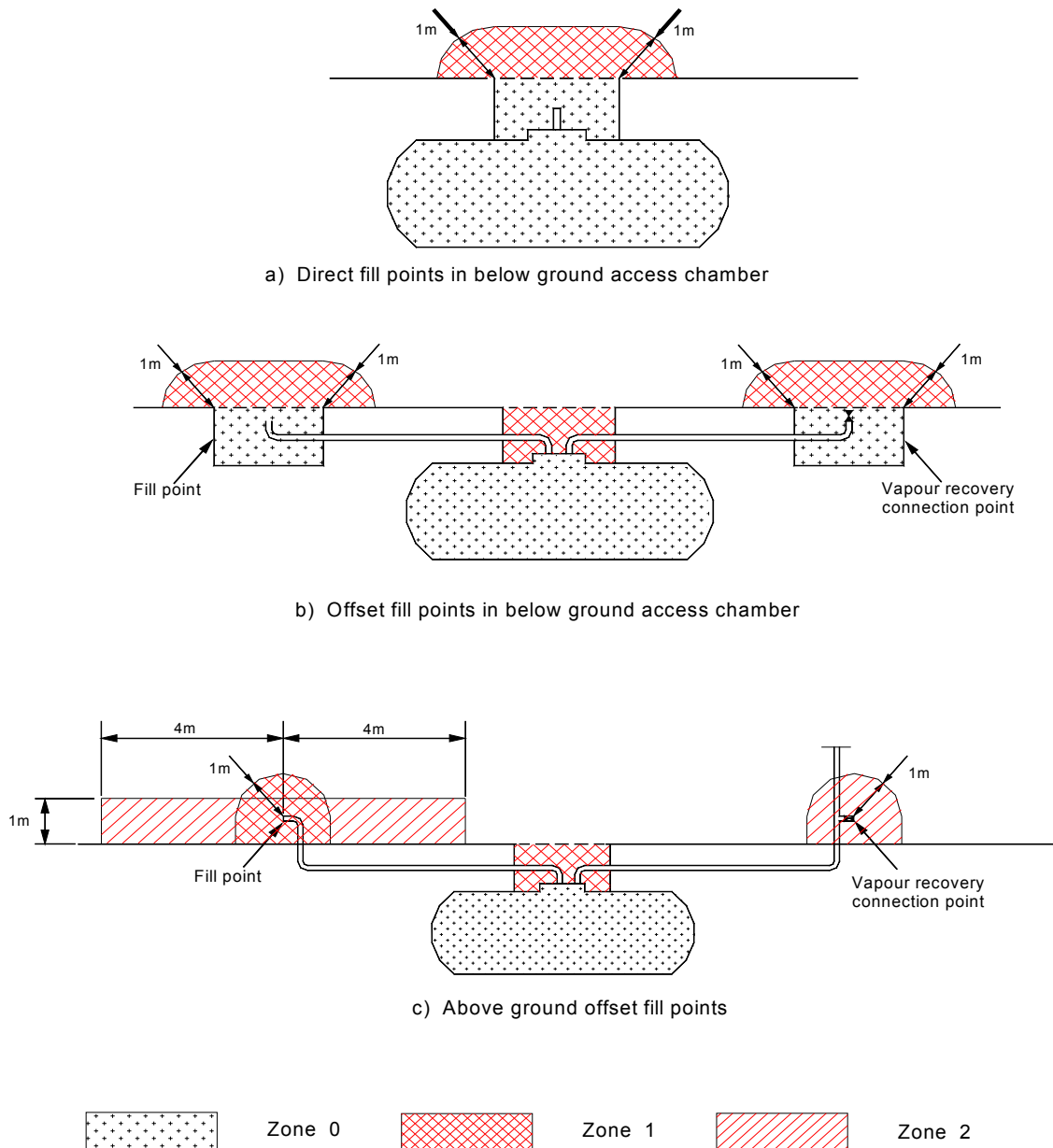
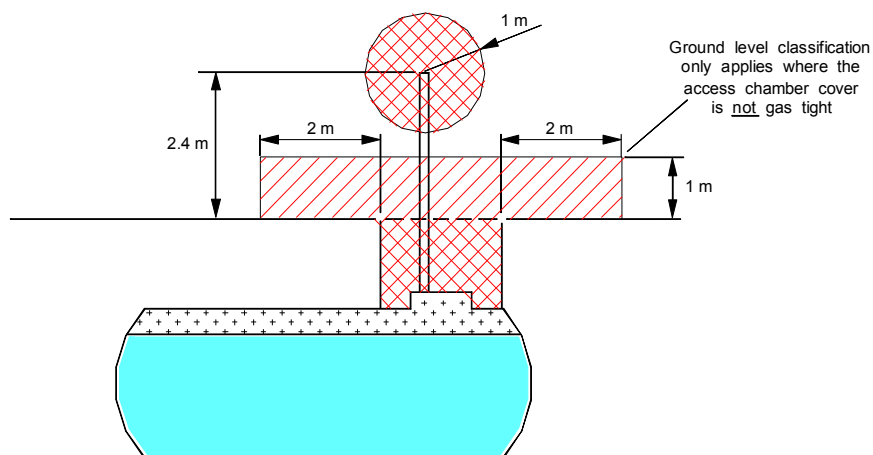
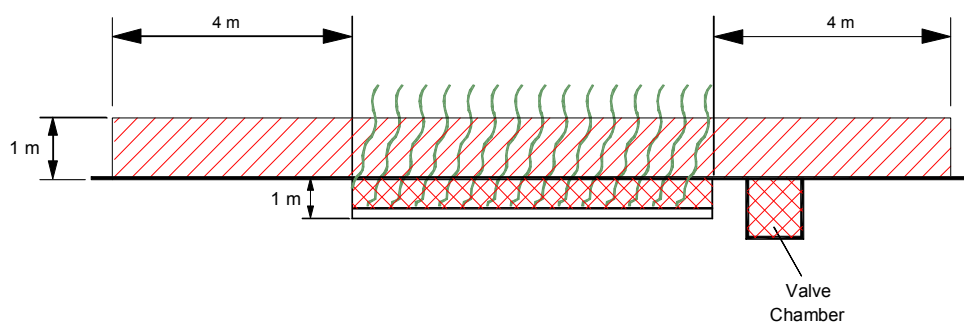


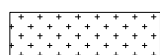
Figure 1 - Typical hazardous areas for underground access chambers and fill points



a) Oil Separator



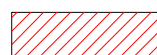
b) Constructed wetland (reed bed)
(see Note in table 12)



Zone 0

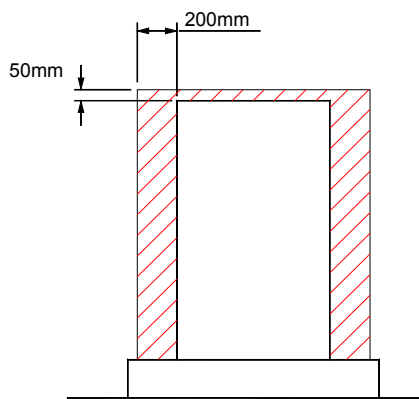


Zone 1

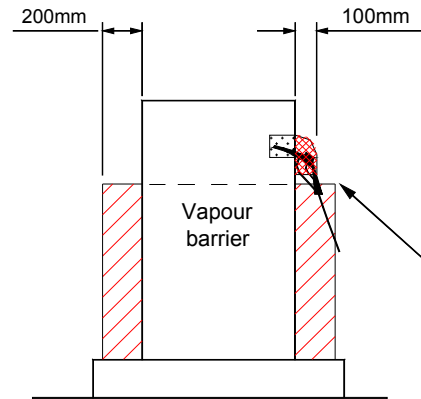


Zone 2

Figure 3 - Typical hazardous areas for drainage systems

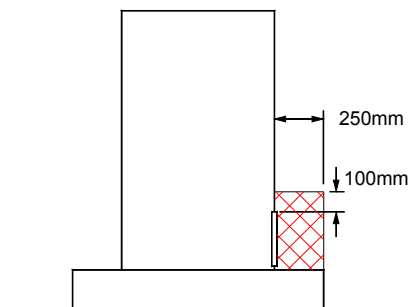


a) Without a vapour barrier



b) With a vapour barrier showing nozzle spout housing

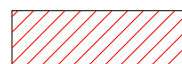
If a vapour barrier is fitted inside the dispenser housing the Zone 2 area extends upwards to the vapour barrier



c) With an external air separator vent

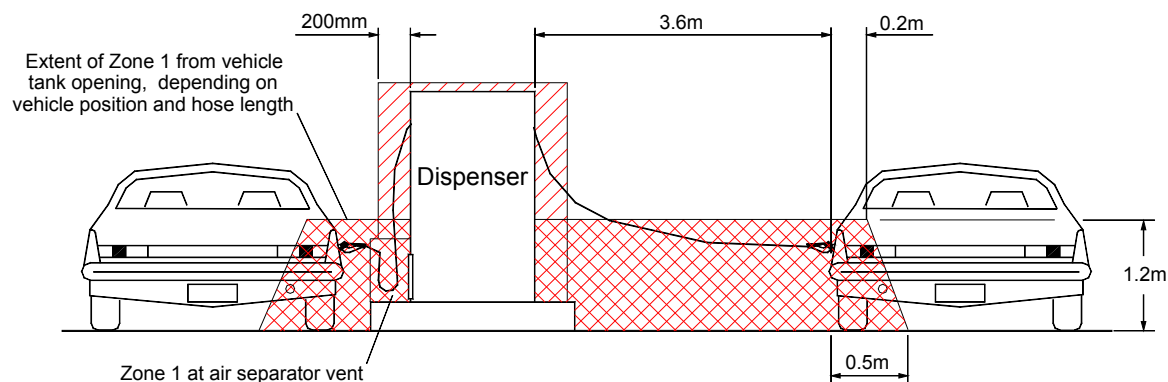


Zone 1

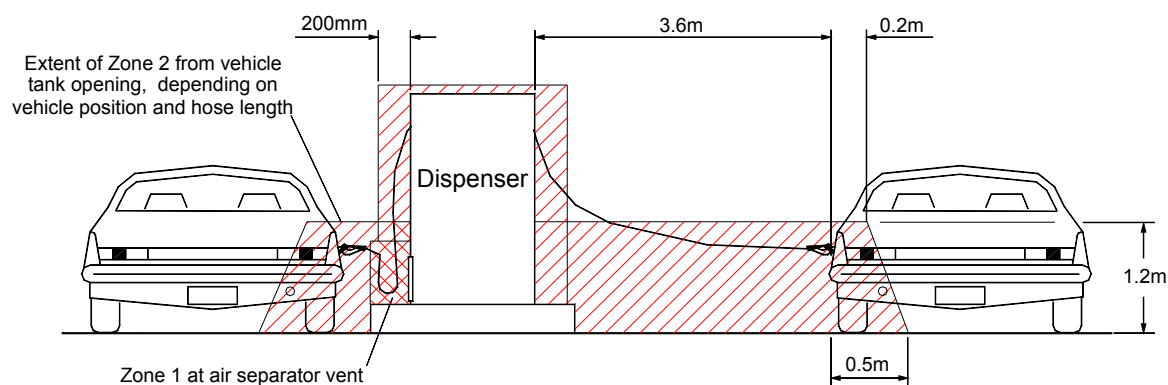


Zone 2

Figure 4 - Typical hazardous areas around a petrol dispenser housing and nozzle spout housing



WITHOUT Stage 2 vapour collection installed



WITH Stage 2 vapour collection installed

Figure 5 - Typical hazardous areas around a petrol dispenser during refuelling

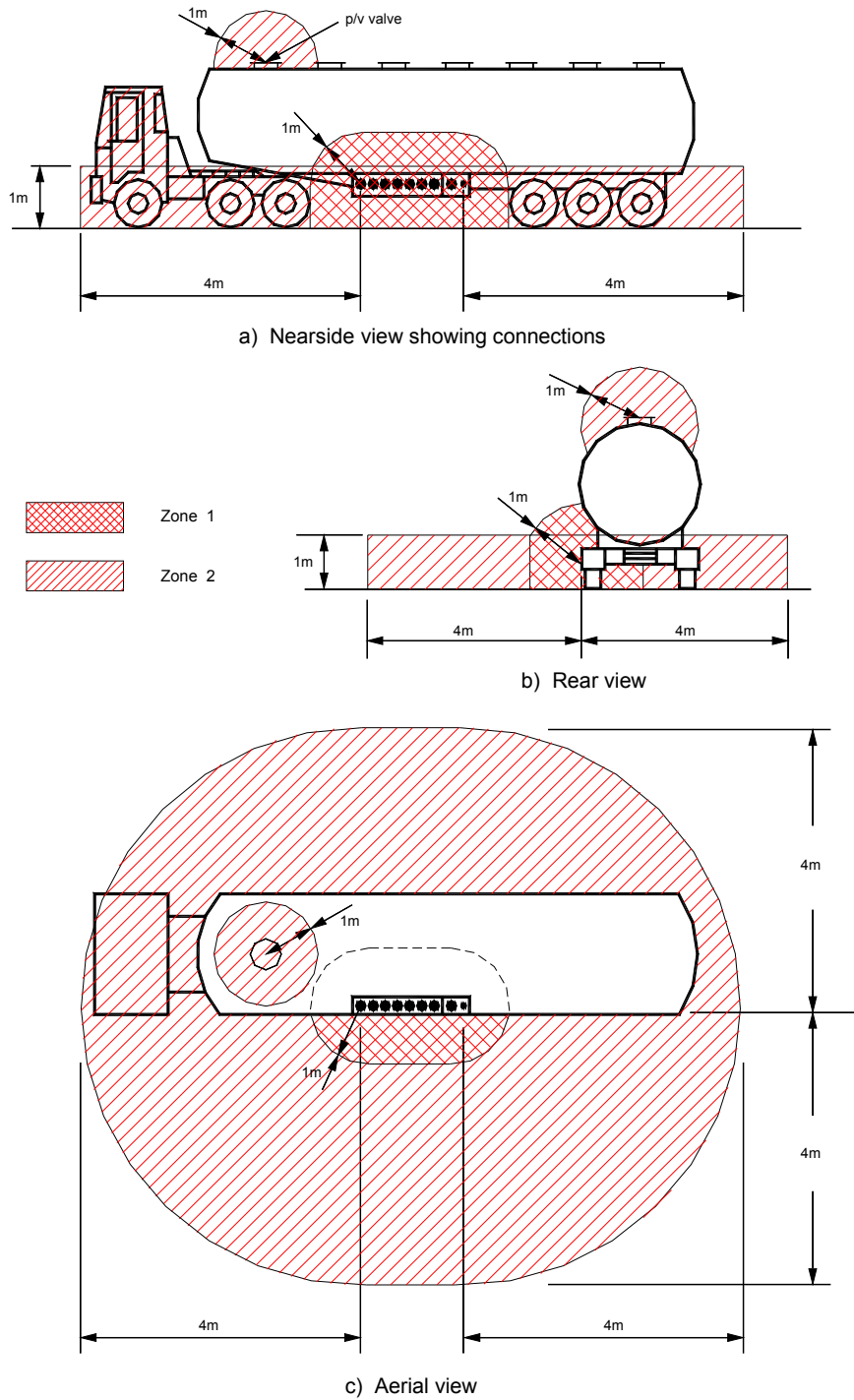
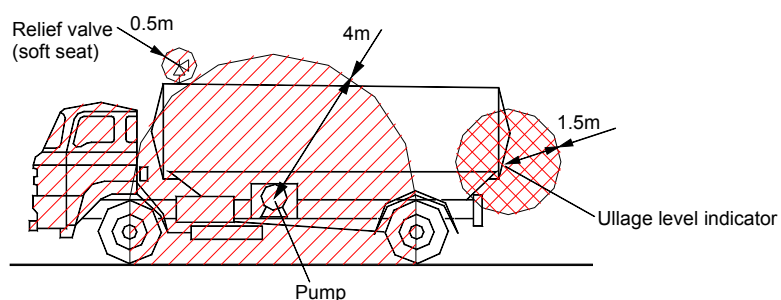
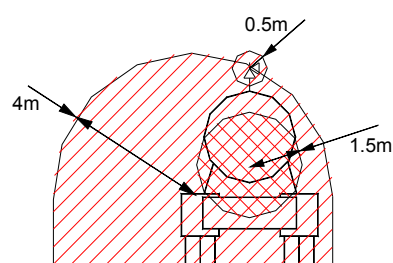


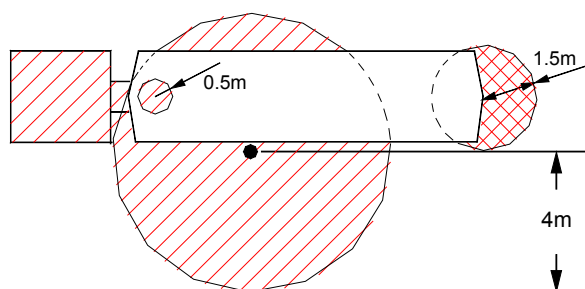
Figure 6 - Typical hazardous areas for a road tanker parked for unloading with vapour recovery facilities



a) Nearside view



b) Rear view



c) Aerial view

Figure 7 - Typical hazardous areas for an autogas road tanker parked for unloading

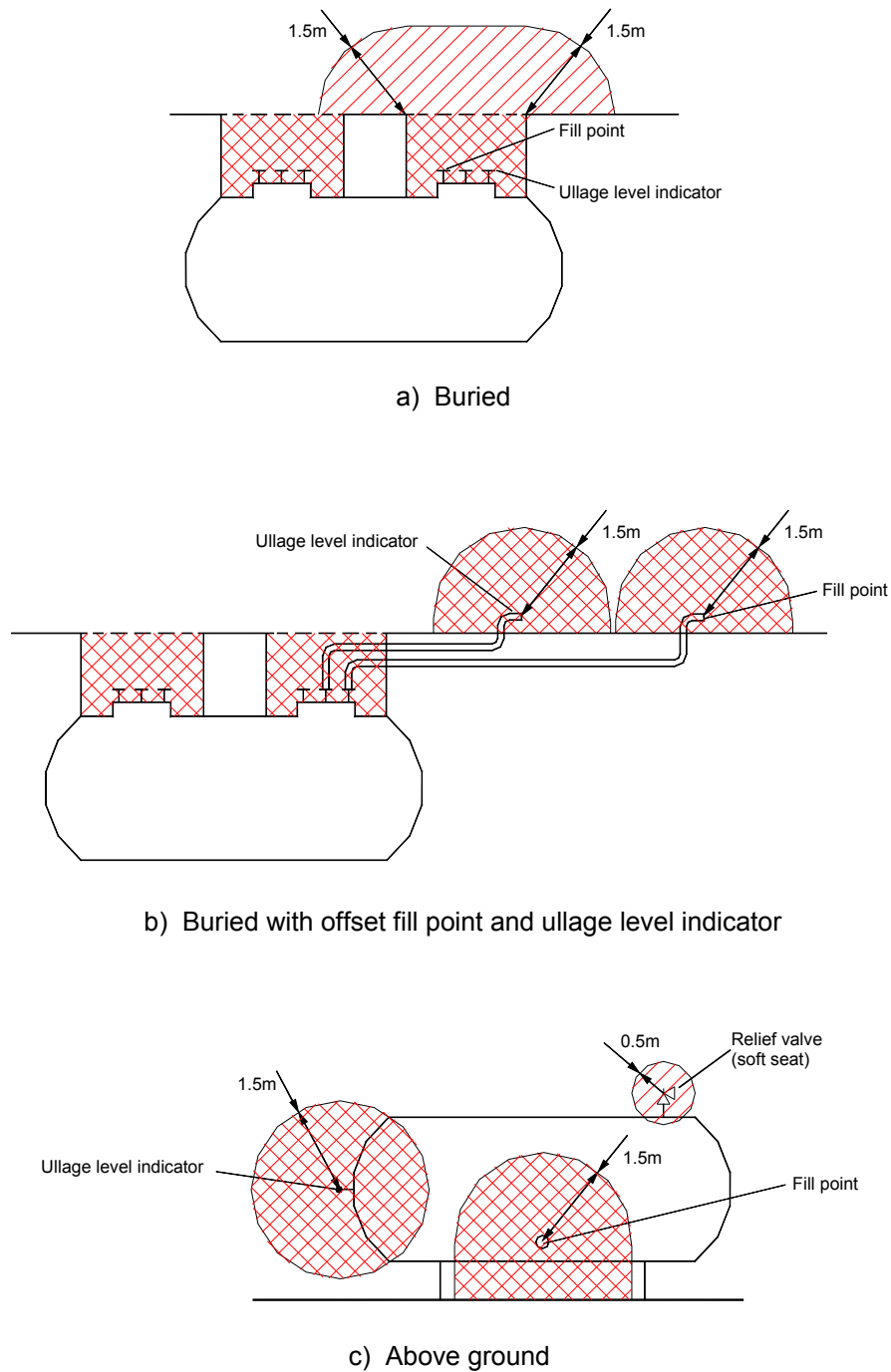


Figure 8 - Typical hazardous areas for autogas storage tanks

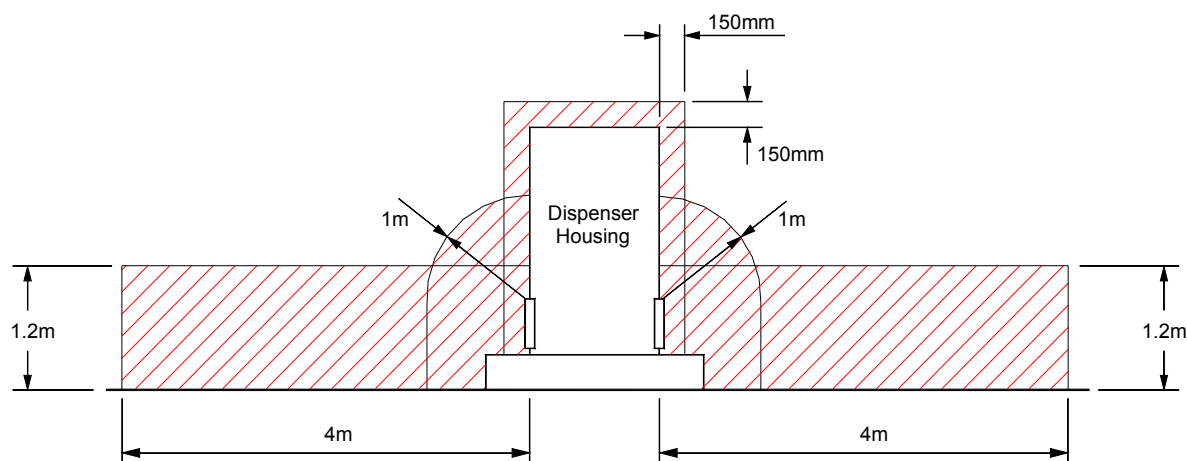


Figure 9 - Typical hazardous area around an autogas dispenser during refuelling
(for dispensers with hose length of $\leq 4\text{m}$)

FIGURE 10

Example of hazardous area classification
Small above ground combined tank and pump/dispenser

Example 1 'Road tanker delivery'
(Atmospheric Venting)

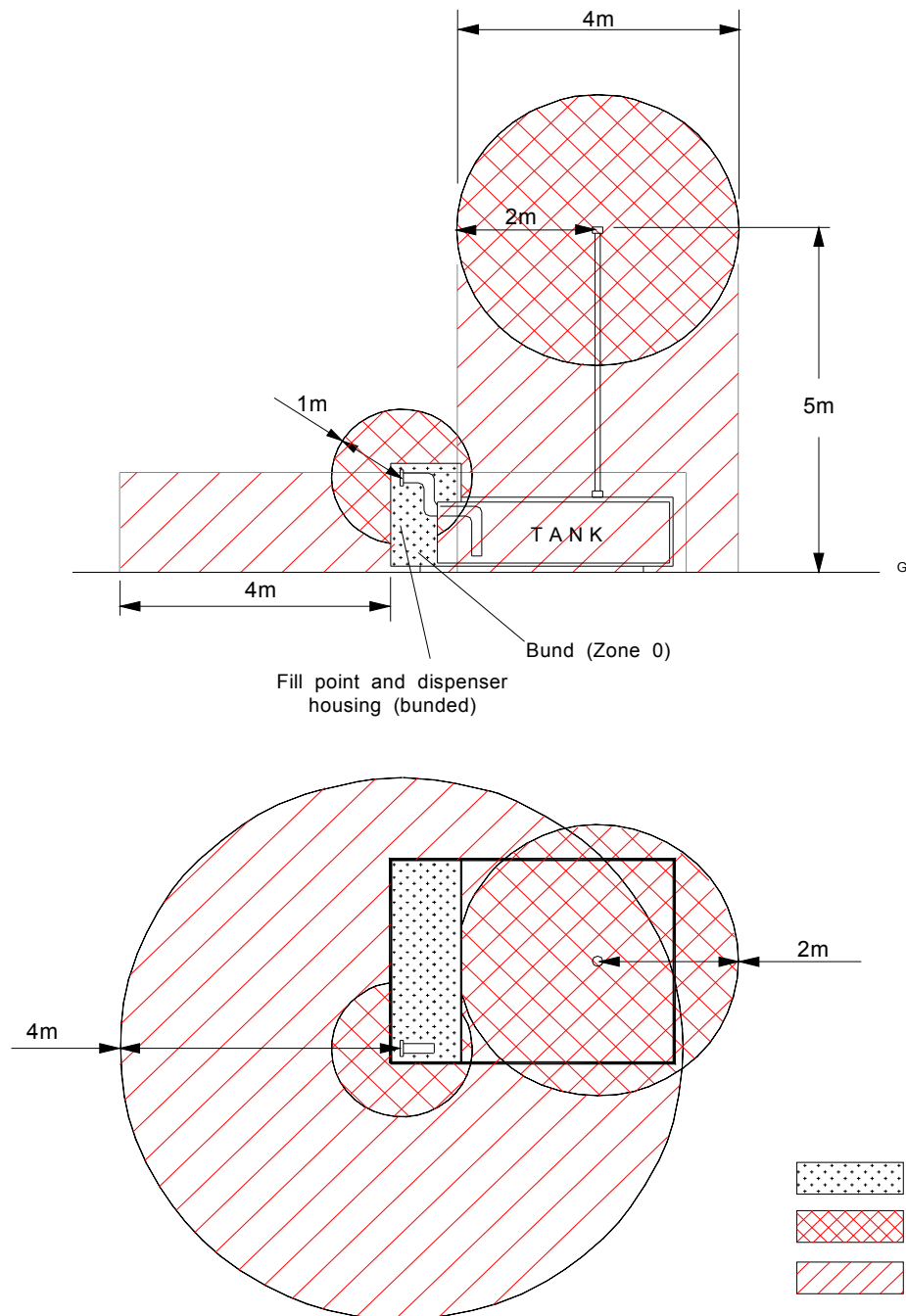
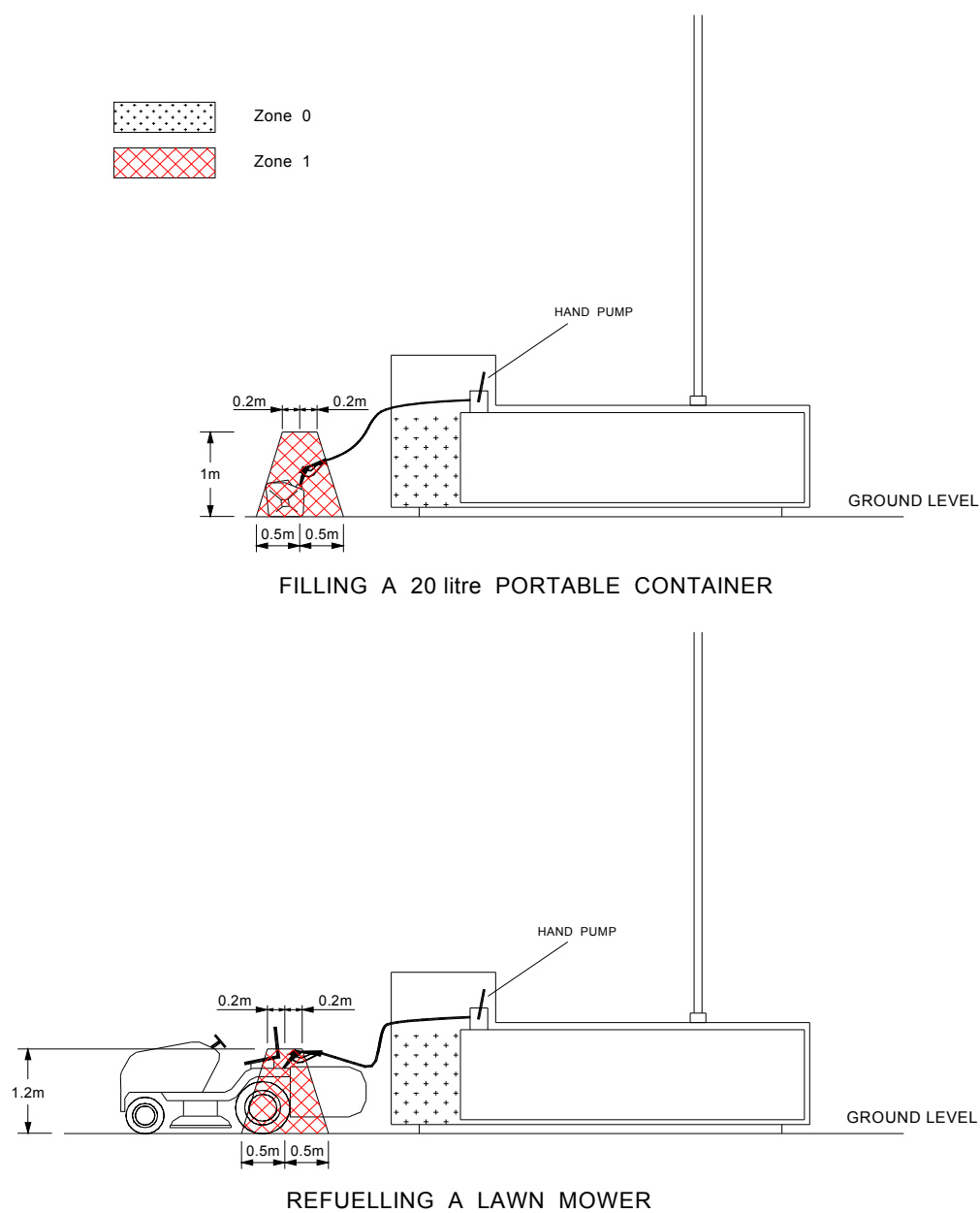


FIGURE 11

Example of hazardous area classification
Small above ground combined tank and pump/dispenser

Example 2 'Dispensing'
(Atmospheric displacement of vapours)



APPENDIX 5 - REFERENCES

- (1) The Dangerous Substances & Explosive Atmospheres Regulations 2002. The Stationery Office Ltd.
Dangerous Substances & Explosive Atmospheres – Approved Code of Practice and Guidance (L138), HSE Books: ISBN 0 7176 2203 7.
Fire and Explosion - How Safe is Your Workplace. INDG370 'A short guide to the Dangerous Substances & Explosive Atmospheres Regulations 2002'. ISBN 0 7176 2589 3: HSE Books.
- (2) APEA/IP Guidance document for the Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd Edition). Portland Press: ISBN 0 85293 419 X (The Blue Guide)
- (3) The Petroleum (Consolidation) Act 1928 Chapter 32: The Stationery Office Ltd: ISBN 0 11 803433 2.
- (4) The Health and Safety at Work etc Act 1974 Chapter 37: The Stationery Office Ltd: ISBN 0 10 543774 3.
- (5) The Management of Health and Safety at Work Regulations 1999 Approved Code of Practice and Guidance (L21) HSE Books: ISBN 0 7176 24889.
- (6) A guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (L73) HSE Books: ISBN 0 7176 1012 8.
- (7) RIDDOR Explained HSE 31(rev1) HSE Books: ISBN 0 7176 2441 2.
- (8) Memorandum of guidance on the Electricity at Work Regulations 1989 (HSR 25) 2nd edition. HSE Books: ISBN 9780717662289.
- (9) Construction (Design and Management) Regulations 2007. HSE Books: ISBN 0 7176 0792 5.
- (10) The Construction (Design & Management) Regulations 2007. Approved Code of Practice L 144 – HSE Books 2007 – ISBN 978-0-7176-6223-4
- (11) What to expect when a health and safety inspector calls. (MISC 033) HSE Books: free leaflet.
- (12) Five steps to information, instruction and training (IND (G) 213) HSE Books: free leaflet.
- (13) A guide to information, instruction and training (IND (G) 235) HSE Books: free leaflet.

Appendix 5 – References Revised June 2006



- (14) Groundwater Protection Code: Petrol stations & other fuel dispensing facilities involving underground storage tanks (available from the DEFRA website www.defra.gov.uk and the Scottish Executive website www.scotland.gov.uk).
- (15) Managing Health and Safety: Five Steps to Success (INDG 275) HSE Books: free leaflet.
- (16) 5 steps to risk assessment (IND G 163) HSE Books: free leaflet.
- (17) LAC 65/34 'Leak Detection in Tanks and Pipework' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).
- (18) The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 ISBN 0 11 053999 0. The Stationery Office Ltd.
- (19) BSEN 60079-10-2003 Electrical apparatus for explosive gas atmospheres. Part 10: Classification of Hazardous Areas.
- (20) Model code of safe practice in the petroleum industry Part 15: Area classification code for installations handling flammable liquids (3rd edition 2005) ISBN 978 85293 418 0 (available from the Institute of Petroleum)
- (21) The Storage of Flammable Liquids in Containers (HSG51) HSE Books: ISBN 0 7176 1471 9.
- (22) Approved Code of Practice and Guidance 'Safe Maintenance, Repair and Cleaning Procedures (L137)'. HSE Books. (ISBN 0 7176 2202 9)
- (23) Code of Safe Practice for Retailers Managing Contractors Working on Petrol Filling Stations ISBN 0 85293 240 5 (available from the Institute of Petroleum).
- (24) Code of Safe Practice for Contractors Working on Petrol Filling Stations ISBN 0 85293 194 8 (available from the Institute of Petroleum).
- (25) Chemical manufacturing Permit-to-work systems IND G 98 HSE Books: free leaflet.
- (26) Oil Industry Advisory Committee: Guidance on permit-to-work systems in the petroleum industry HSE Books: ISBN 0 7176 1281 3.
- (27) Approved Code of Practice and Guidance 'Design of Plant, Equipment and Workplaces (L134)' HSE Books. ISBN 0 7176 2199 5
- (28) Approved Code of Practice and Guidance 'Unloading Petrol From Road Tankers (L133)'. HSE Books. ISBN 0 7176 2197 9

Appendix 5 – References

Revised June 2006



Appendix 5 – References

Revised June 2006

- (29) Flame arresters: Preventing the spread of fires and explosions in equipment that contains flammable gases and vapours (HSG158) HSE Books: ISBN 0 7176 1191 4.
- (30) Environmental Protection Act 1990 Part 1 Secretary of State's Guidance PGI/14(06) Unloading of Petrol into Storage at Petrol Stations: <http://www.defra.gov.uk/environment/ppc/localauth/pubs/guidance/notes/pgnotes/pdf/pg1-14.pdf>
- (31) Offloading Procedures for Split Compartment Deliveries of Petrol Between Service Station Tanks ISBN 0 85293 353 3 (available from the Institute of Petroleum).
- (32) Guidelines for the Control of Hazards Arising from Static Electricity (second edition) ISBN 0 85293 353 8 (available from the Institute of Petroleum).
- (33) LAC 65/39b 'Petrol Filling Stations - Road Tanker Deliveries - Ignition of Petrol Vapour by Thermite Reaction' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).
- (34) Cleaning and gas freeing of tanks containing flammable residues (CS15) HSE Books: ISBN 0 7176 1365 8.
- (35) Approved Code of Practice, Regulations and Guidance: Safe Work in Confined Spaces, Confined Regulations 1997. (L101) HSE Books: ISBN 0 7176 1405 0.
- (36) Performance specification for underground pipe work systems at petrol filling stations (TP46) (second edition) ISBN 0 85293 323 1 (available from the Institute of Petroleum).
- (37) Code of practice for a product identification system for petroleum products (TP52) (fourth edition) ISBN 0 85293 307 X (available from the Institute of Petroleum).
- (38) Guidelines for uplift of product from retail filling stations and customer's tanks (TP30) ISBN 0 852923 146 8 (available from the Institute of Petroleum).
- (39) The Public Health Act 1961 (Section 73) ISBN 0 10 8502147 The Stationery Office Ltd.
- ~~(40) LAC 65/51 'Petrol Filling Stations - Dispensing Control Measures' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector). Withdrawn. See PETEL 65/59~~
- (41) Approved Code of Practice and Guidance 'Storage of Dangerous Substances (L135)', HSE Books: ISBN 0 7176 2200 2.



- (42) LAC 65/55 'Petrol Filling Stations – Safety Implications of Leaking Drop Tubes & Vapour Retention Devices' (available from HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector).
- (43) The Control of Substances Hazardous to Health Regulations 2002 SI 2002/2677 The Stationery Office 2002 ISBN 0 11 042919 2.
- (44) LAC 65/59 'Petrol Filling Stations – Dispensing Control Measures' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector)
- (45) LAC 65/61 'Petroleum (Consolidation) Act 1928 (PCA) - Petrol Filling Stations – Model Conditions of Licence' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector)
- (46) Regulatory Reform (Fire Safety) Order 2005, SI 2005/1541. The Stationery Office, 2005. ISBN 0 11 072945 5.
- (47) Fire (Scotland) Act 2005, ISBN 0 10 590078 8.
- (48) Health & Safety In Construction - HSG105 – HSE books – ISBN 0-7176-6182-2

Appendix 5 – References

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Appendix 5 – References

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* Formerly the Institute of Petroleum

APPENDIX 6 – GLOSSARY OF TERMS

Approved arrangements: means those arrangements on the licensed premises that will accord with those shown on the deposited plans and related correspondence and includes buildings, installations, equipment and the operation of the licensed premises.

Approved Code of Practice (ACoP): is a code of practice approved by the Health and Safety Commission, with the consent of the Secretary of State. ACoPs give practical advice on how to comply with the law. If an employer (site operator) follows the advice he will be doing enough to comply with the law in respect of the matters specified on which the ACoP gives advice. An employer may use alternative methods to those set out in the ACoP in order to comply with the law.

ACoPs have a special legal status. If an employer is prosecuted for breaches of health and safety law, and it is proved that he did not follow the relevant provisions of the ACoP, he will need to show that he has complied with the law in some other way or a court will find him at fault.

Attendant operated: A petrol station where an attendant directly operates and controls the dispensing equipment.

Attended self-service: A petrol station where customers operate the dispensing equipment, which is activated, supervised and may be shut off in an emergency by an attendant in a control point.

Automatic stock reconciliation: A system of leak detection for tanks and pipework. A tank gauging system is linked to dispensers and automatically reconciles the amount of product dispensed to the amount delivered, thereby providing a reliable indication of any leakage.

Bottoming out: Removing residual petrol from a tank.

Breakaway coupling: A coupling designed to separate without damaging the dispenser or allowing excessive fuel spillage if a vehicle drives away with the nozzle still inserted in the filler neck. The type and location of the coupling depends on the type of refuelling nozzle and the hoses being used.

Bund: An enclosed permanent wall system or other temporary measure to retain spilt liquid.

Child: means a person who is not over compulsory school age, construed in accordance with section 8 of the Education Act 1996

Check valve: A type of non-return valve used in suction lines, which prevents petrol falling back from the line into the tank and so keeps the system primed.

Commissioning: The process of bringing a petrol station and equipment into use. This may include testing of equipment and preparing operation instructions, carrying out initial training, etc.

Appendix 6 – Glossary of Terms Revised June 2006

Appendix 6 – Glossary of Terms

Revised June 2006

Competent person: A person with enough practical and theoretical knowledge, training and actual experience to carry out a particular task safely and effectively. The person should have the necessary ability in the particular operation of the type of plant and equipment with which they are concerned, an understanding of the relevant statutory requirements and an appreciation of the hazards involved. They should also 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. A *person* can be taken to mean more than one, or a body corporate or incorporate. It is therefore possible to appoint appropriate organisations (e.g. insurance companies or inspection bodies) to carry out tasks designed for competent persons.

Control point: A position in a kiosk or other building at an attended self-service station from which an attendant can adequately view and supervise dispensing activities, activate the equipment and shut it off in an emergency.

Constructed Wetland (Reed Beds): An environmentally alternative to oil separators. Bacteria living in the soil around the roots of the reeds break down any hydrocarbon products contained in the surface water drainage system directed to the wetland.

Controlled Waters: include all watercourses, lakes, coastal waters and water contained in underground strata (groundwater).

Dipping: Checking the liquid level of product in a tank with a dipstick.

Direct fill pipe: A fill point for a tank, which is directly above the tank.

Dispenser (Metering pump): A measuring system designed to draw fuel from a supply tank and dispense it into fuel tanks or suitable containers.

Double skin tank/pipe (also double wall): A storage tank or pipework system, which is essentially a tank within a tank or pipe within a pipe, with a small space (the interstice) between the two.

Drainage system: A system, normally below ground, for carrying foul and surface water to a disposal point.

Electrical installation: All electrical/electronic equipment and telecommunications equipment located within the boundary of the site. All electrical equipment in hazardous area must be constructed to a suitable explosion protection standard and can be certified as such by a certification body.

Fill point: The inlet through which a storage tank is filled from a road tanker.

Fire wall: A wall of fire-resisting construction eg brick or concrete block which separates fill points from the rest of the site.

Appendix 6 – Glossary of Terms

Revised June 2006

Flame arrester: A device typically fitted to the opening(s) of petrol tank vent pipes, which prevents flames from entering or spreading in the pipework system.

Gauge: A device for measuring the level of liquid in a tank.

GRP: Glass reinforced plastic.

Hazard: Anything that can cause harm.

Hazardous area: An area where flammable or explosive gas or vapour-air mixtures (also known as explosive gas-air mixtures) are, or may be expected to be, present in quantities which require special precautions to be taken against the risk of ignition.

Hazard zone: The classified part of a hazardous area representing the degree of likelihood of flammable or explosive gas-air mixtures being present.

Hydraulic pressure testing: A pressure testing method using only a liquid (usually water) as the pressurising medium. Hydraulic testing used as a leak detection technique minimises the explosive energy that could be released following a failure of tanks or pipework under test.

Hydrostatic pressure testing: The testing of a vessel by means of a pneumatic test in which the explosive energy, which would be released if the vessel failed, is reduced by almost filling the vessel with water.

Impact valve: A device, which incorporates a weakened section, which will shear on impact and close to prevent a flow of product or vapour.

Inerting: Rendering a flammable atmosphere incapable of supporting combustion by reducing the oxygen content to below 5%. This may be achieved, for example, by diluting the flammable mixture with nitrogen or other inert gas.

Interceptor (also known as an Oil Separator): A device installed in a surface water drainage system to separate out any petrol to prevent it reaching public drains, sewers or water courses.

Interstice: The space between the inner and outer skins of a double skin tank or pipe into, which monitoring equipment can be fitted to continually monitor for leaks.

Leak alarm: A device, which is capable of triggering an audible and/or visual alarm if a leak is detected.

Leak detection system: An automated system for detecting product leaks from tanks and pipework.



Limiting devices: Fitted to dispensing facilities at unattended sites to prevent the continuous operation of any dispenser. They may operate on a timing, volume or cash limit.

LACs: Local authority circulars issued by the Petroleum Enforcement Liaison Group, through the Health and Safety Executive's local authority unit, to advise petroleum licensing authorities on enforcement matters. LACs on other local authority enforcement subjects that are designated as 'open' are available to petrol filling station operators and other interested parties to read/download from the HSE's website: www.hse.gov.uk/lau/lacs

Material change: A change to any specified matter, which was part of the application for consent, or anything concerning the construction or design of the site, which is capable of materially affecting safety at the site.

Maximum working capacity: The safe working capacity of a storage tank, defined as 97% of the total capacity.

Monitoring system: An automatic system used in double skin tanks and pipework for detecting failure of either of the containment walls.

Nozzle: A device for controlling the flow of fuel during dispensing.

Observation well: A slotted or screened tube or pipe positioned vertically in the ground around an underground storage installation that permits an operator to check conditions in the excavation to determine whether there may be a leak in the installation.

Offset fill pipe: The fill point for a storage tank, which is remote from the tank it fills.

Orifice plate: A plate or component with an engineered central opening used to control the flow rate of vapour out of the petrol tank ventilation pipe with a maximum size of orifice not exceeding 10mm diameter / 78.5mm². The plate is fitted in an appropriate accessible position in the final leg of the storage tank ventilation pipe before release to atmosphere. A pressure relief valve set at +35mbar is fitted on a parallel vent leg, by-passing the orifice plate, in order to allow the safe release of vapour pressure in the event of any blockages in the vapour return during a road tanker delivery.

At low vapour/air flow rates during normal breathing and when fuel is drawn from the tank, the orifice plate allows for normal air / vapour movement in and out so as to allow the storage tank to be maintained at atmospheric pressure. During a delivery of petrol into the storage tank the orifice plate restricts the amount of vapour which can exit through the vent thereby creating a preferential vapour flow path to the connected road tanker. A 10mm orifice plate when associated with standard 75mm vapour return line, poppet valve and other standard fittings to the road tanker ensures losses to atmosphere during deliveries are maintained below 0.01% w/w as required by the Stage 1b vapour recovery controls in the Pollution Prevention and Control Regulations.

Appendix 6 – Glossary of Terms

Revised June 2006



Appendix 6 – Glossary of Terms

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An orifice plates should be inspected as part of the normal testing and maintenance requirements set out in the PP&C Regulations.

Overfill prevention device: A device or system designed to automatically shut off and prevent a delivery of fuel overfilling a tank (or compartment of a tank) beyond its maximum working capacity.

Petrol or petroleum-spirit: Means petroleum which, when tested in accordance with Part A.9. of the Annex to the European Commission Directive 92/69, has a flash point (as defined in that Part) of less than 21°C.

Petroleum filling station (retail): Means premises used, or intended for use, for dispensing petroleum-spirit to the public for use in motor vehicles, ships or aircraft by ways of sale.

Petroleum filling station (non-retail): Means premises used, or intended for use, for dispensing petroleum-spirit for use in motor vehicles, ships or aircraft, but it does not include any retail petroleum filling station.

Petrol vapour: Gaseous material released from petrol by evaporation.

Petroleum Licensing Authority: The Authority responsible for enforcing the Petroleum (Consolidation) Act 1928 and the Dangerous Substances & Explosive Atmospheres Regulations 2002 insofar as the Regulations apply to dangerous substances dispensed into the fuel tanks of motor vehicles at petrol filling stations.

Petroleum Inspector: A person acting on behalf of the Petroleum Licensing Authority who is empowered to enforce the Petroleum (Consolidation) Act 1928 and the Dangerous Substances & Explosive Atmospheres Regulations 2002.

Pipework: All pipes, lines and fittings designed to carry petrol and petrol vapour.

Poppet valve: A mushroom shaped valve, located in the vapour balance pipe connection adaptor, that is lifted from its seating by the spigot located in the coupling of the vapour balance hose.

Pressurised system: A system in which petrol is pumped under pressure from the storage tank to the dispenser.

Principal contractor: The firm or individual under the provisions of the Construction (Design and Management) Regulations 1994 who has a duty to take account of health and safety issues when preparing and presenting tenders or similar documents for construction work. He also has a duty to develop the health and safety plan for the site and to co-ordinate the activities of all contractors to ensure they comply with health and safety legislation. Principal contractors also have duties to check on the provision of information and training for employees and for consulting with employees, and the self-employed on health and safety.

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Radio-frequency (r.f.) transmitters: Electromagnetic waves produced by radio-frequency transmitters (e.g. mobile telephone masts and the emergency services radios) will induce electrical currents in any conducting structure on which they impinge. The magnitude of the induced current depends on the shape and size of the structure relative to the wavelength of the transmitting signal and on the strength of the electromagnetic field. When parts of the structure normally in contact are caused to break or separate momentarily, a spark may occur if the induced voltage and current at the break are sufficiently large. If this happens in a place where a flammable atmosphere is present, the spark may have sufficient energy to cause ignition.

British Standard BS 6656: 1991 'Prevention of Inadvertent Ignition of Flammable Atmospheres by Radio-frequency Radiation' details a methodology for the assessment and elimination of r.f. induced ignition. Such an assessment should be carried out before fixed radio transmitters are installed at petrol filling stations.

Reasonably practicable: The degree of risk in a particular job or workplace, balanced against the time, trouble, cost and physical difficulty to taking measures to avoid or reduce the risk.

Risk: The chance that someone will be harmed by a hazard.

Risk assessment: A careful examination of what could cause harm to people so that an evaluation can be made as to whether enough precautions have been taken to prevent harm, or whether more should be done.

Secondary containment: An additional protection of the primary system of storage tanks or pipework eg double skin tanks.

Separation distance: the distance between an above ground vessel containing a 'dangerous substance' (ie petrol or LPG) and occupied buildings, other facilities, process areas and the site boundary. The purpose of a separation distance is to:

- protect the vessel from heat radiation should there be a fire involving nearby properties or facilities;
- provide a sufficient distance from potential ignition sources to allow the safe dispersal of vapours arising from any leakages or spillages;
- protect nearby properties etc from the effects of a fire involving the storage vessel so as provide sufficient time for emergency evacuation;
- ensure that the minimum number of people are exposed to any potential explosion; and
- safe access is available for rescue and fire-fighting purposes.

A separation distance is the horizontal measurement between the nearest part of the storage tank and any specified feature.

Separation distances are also applied to the filling and dispensing points associated with the storage vessels.

NB: The term 'separation distance' should not be confused with the distances involved in the zones derived from a 'hazardous area classification', which are used to exclude non-protected equipment and other ignition sources. However, separation distances from storage vessels etc will always be equal to or greater than their associated hazardous zones.

Spigot: see poppet valve.

Stage 1b vapour recovery system: A system designed to capture vapour displaced from inside the storage tank during petrol deliveries. The system prevents vapour from escaping into the air, and returns it to the road tanker via a vapour tight connection line.

Stage 2 vapour recovery system: A system designed to capture the vapour displaced from inside the vehicle fuel tank during petrol deliveries. The system involves special adaptation to the installation to return the vapour to the underground storage tank.

Suction system: A system where petrol is pumped from the storage tank to a dispenser by a pump fitted at the dispenser.

Thermite Reaction: A thermite spark, or thermite reaction, occurs when there is an impact between a light metal, or an alloy of that metal (e.g. a aluminium hose coupling used for road tanker deliveries), and rust on the surface of steel, or when some aluminium is smeared on a rusty steel object and that object impacts a hard surface; e.g. a concrete kerbstone.

Ullage: The difference between the maximum working capacity of a storage tank and the quantity of petrol in it at any given time.

Unattended self-service: A petrol station where dispensing equipment is activated and operated by customers without the supervision of an attendant. The term 'unattended self service' is used at those sites that alternatively operate as 'attended self service' during normal working hours.

Unmanned petrol filling station: A petrol station where dispensing equipment is activated and operated by customers without the supervision of an attendant. Unmanned petrol filling stations will normally have no attended self service facilities.

Vapour lock: Vapour lock is a phenomenon that can occur during a road tanker delivery and is identified by a stoppage in the flow of product before the road tanker's compartment is fully discharged. There are two possible causes of vapour lock:

i) Where there is an insufficient head of product in the road tanker compartment to force the air/vapour mixture in the delivery hose and fill pipe through the residual product in the storage tank. This cause of vapour lock can affect both atmospheric (free venting) and vapour balanced deliveries.

ii) Where there is a back flow of vapour into the delivery hose from a leak in the storage tank's internal fill pipe. This cause will only arise during vapour-balanced deliveries.

Verification: is the confirmation that all the measures (including fixed equipment/plant and operational/emergency procedures) to prevent the ignition of flammable vapours in the designated hazardous places are suitable and adequate. The verification process can be carried out by a competent person or organization.

Wetstock: The amount of petrol stored in a tank at any given time.

Westock reconciliation: Systems for checking and keeping records of the petrol stored and dispensed, and comparing the two to identify any discrepancies, which might indicate a leak.

Wet test: is a close visual inspection, using tissue paper, to ascertain the sealing of certain pipework joints and fittings on the storage tank lid and in the dispenser housing that cannot be pneumatically or hydraulically leak tested at the commissioning stage or when modifications or repairs have been carried out.

Young person: means any person who has not attained the age of 18

Appendix 6 – Glossary of Terms

Revised June 2006



Appendix 7 – Glossary of Acronyms & Abbreviations

APPENDIX 7 - GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ACoP	Approved Code of Practice
APEA	Association of Petroleum and Explosives Administration
BS	British Standard
CB	Citizens Band (Radio)
CDGR	Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004
CDM	Construction (Design & Management) Regulations 2007
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations 2002
FSA	Fire (Scotland) Act 2005
HSE	Health and Safety Executive
HSWA	Health and Safety at Work etc Act 1974
IP	Institute of Petroleum (now known as the Energy Institute but still publishing codes of practice and guidance under the IP banner)
LAC	Local Authority Circular
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MHSWR	Management of Health and Safety at Work Regulations 1999
PLA	Petroleum Licensing Authority
RIDDOR	Reporting of Injuries, Disease and Dangerous Occurrences Regulations 1995
RRO	Regulatory Reform (Fire Safety) Order 2005
SIR	Statistical Inventory Reconciliation
SMS	Safety Method Statement
UK	United Kingdom



APPENDIX 8 – AMMENDMENTS

- 1) August 2003: Section 8.5 'Dispensing' - Now reproduces guidance given in PETEL circular 65/51 'Petrol Filling Stations – Dispensing Control Measures'.
 - 2) December 2003: Section 6 'Managing the Risk' – The HSE leaflet 'Managing Health and Safety: Five Steps to Success' (INDG 275) has replaced '5 Steps to Successful Health and Safety Management' as reference material.
 - 3) December 2003: Section 7.2 'Control of Ignition Sources' – The Approved Code of Practice 'Storage of Dangerous Substances' has been included as reference material under the subheading 'On-Site Storage and Sale of Other Flammable Substances'.
 - 4) January 2004: Section 8.1 (paragraph 7 and 12), Section 8.2 (paragraph 24) and Section 8.3 reproduces some of the guidance given in PETEL circular 65/55 'Petrol Filling Stations – Safety Implications of Leaking Drop Tubes & Vapour Retention Devices'.
 - 5) January 2004: Section 7.2 paragraphs 5 to 12 gives advice on the verification requirements of Regulation 7.4 of DSEAR.
 - 6) November 2004: Sections 7.1 (paragraph 5) and 8.5 (various paragraphs) revised to harmonise with the guidance given in PETEL circular 65/59 'Petrol Filling Stations – Dispensing Control Measures'
 - 7) November 2004: Sections 7.1 (paragraph 5) and 8.5 (various paragraphs) revised to harmonise with the guidance given in PETEL circular 65/59 'Petrol Filling Stations – Dispensing Control Measures'
 - 8) June 2006: Section 7.2 was revised to: -
 - Remove the text covering the phased introduction of regulation 7 of DSEAR;
 - and
 - Insert the EX warning sign and Ex symbol.
- Appendix 4 and the diagrams were revised to harmonise with the revised guidance given in Section 3 of the 2nd edition of the Blue Guide².
- 9) August 2006: Section 8.5 (Dispensing) was amended in paragraphs 16 and 17 to harmonise with the Model Licensing Conditions published in the PETEL circular 65/61 'Petroleum (Consolidation) Act 1928 (PCA) – Petrol Filling Stations – Model Conditions of Licence'⁴⁵
 - 10) November 2006: Section 2 was revised by replacing an outline of the employers duties under the Fire Precautions (Workplace) Regulations 1997 with an outline of the 'responsible persons' duties under the Regulatory Reform (Fire Safety) Order 2005 and the Fire (Scotland) Act 2005.

² APEA/IP Guidance document for the Design, Construction and Operation of Petrol Fillings Stations. Portland Press: ISBN 0 85293 217 0.

⁴⁵ LAC 65/61 'Petroleum (Consolidation) Act 1928 (PCA) - Petrol Filling Stations – Model Conditions of Licence' (available from the HSE's website www.hse.gov.uk/lau/lacs or the local Petroleum Inspector)

Appendix 8 - Amendments

11) June 2007:

- Section 8.2 (Unloading & Venting) was revised to make reference to the use of orifice plates as a means to prevent pressure build-up in storage tanks. These devices are now acceptable as a Stage 1b control technique in section 6.6 of PG1/14(06)³⁰.
- Section 8.3 (Storage) was revised to include guidance on investigating suspected leaks before leak testing is carried out.
- Section 8.5 (Dispensing) was revised to include guidance on the control measures for multiple portable container filling.
- Other amendments were made to update references to other relevant legislation and guidance where changes have taken place.

12) CFA Liability clause reviewed and replaced by CFA HQ and document format updated in line with current CFA document standards.

13) October 2009

Tables 2 and 5 (Static electricity). Corrections made to the values of electrical resistance. 108 Ω corrected to 10⁸ Ω .

14) November 2009

Two drawings added to Appendix 4 showing example hazardous area classifications for small above ground tanks.

15) May 2012

CFA affiliation and liability clause removed from the document.

³⁰ Environmental Protection Act 1990 Part 1 Secretary of State's Guidance PGI/14(06) Unloading of petrol into Storage at Petrol Stations:
<http://www.defra.gov.uk/environment/ppc/localauth/pubs/guidance/notes/pgnotes/pdf/pg1-14.pdf>