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APEA Guidance on Storage and Dispensing of High Blend Ethanol Fuels including E85 at Filling Stations

This document will be considered for inclusion in the Guidance document when re-published

"Design Construction, Modification, Maintenance and Decommissioning of Filling Stations"

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PETROL FILLING STATIONS

THE STORAGE AND DISPENSING OF HIGH BLEND ETHANOL FUELS (HBEF)

Foreword

Ethanol produced from agricultural products is one of a range of bio fuels that have been developed in response to concerns for the environmental impact of the continuing and increasing use of petroleum The purpose of this guidance note is to advise the retail petroleum industry and the Petroleum Licensing Authorities (PLA's) on the systems design details required for the storage and dispensing of high blend ethanol fuels (HBEF).

Consideration will be made for incorporation of some or all of the contents of this document in any revision of the 'Blue Book'[1].

Introduction

Safety

The applicable UK Legislation for the storage and dispensing of HBEF is the Petroleum (Consolidation) Act 1928 (Petroleum Mixtures Order 1929) and the Dangerous Substances & Explosive Atmospheres Regulations 2002 (DSEAR). Under the provisions of the 1929 Order, the storage of HBEF fuel will require a petroleum licence by virtue of the percentage content of petroleum-spirit.

As the storage of HBEF will constitute a 'material change' as defined in the model licensing conditions[2], site operators will need to seek the prior consent of the Petroleum Licensing Authority before introducing HBEF onto the site.

To comply with DSEAR, the unloading of road tankers, storage and dispensing activities will be the subject of a risk assessment and hazardous area classification to ensure that adequate control measures are in place to eliminate or minimise the risks of fires and explosions. Ensuring that all the components of the HBEF storage and dispensing facilities are alcohol compatible should form the initial stage of the risk assessment.

Environmental

The applicable UK Environmental legislation is the Environmental Protection Act 1990 and the Groundwater Regulations 1998. An environmental impact risk assessment must be carried out to ensure that the risk of any accidental spillage or leakage can be identified and reduced. Site-specific information such as proximity and sensitivity of watercourses should be included in this assessment. You should contact the Environment Agency (EA) in England and Wales 08708 506506 and Scottish Environmental Protection Agency (SEPA) in Scotland 01786 457700) or the Environment and Heritage Service in Northern Ireland (EHSNI) (028 92624234) for information on local environmental sensitivities. Guidance on protecting groundwater from stored fuels in accordance with the Groundwater Regulations is given in the Department for the

[1] Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd Edition).
[2] PETEL Circular 65/61 'Model Conditions of Licence.

Environment, Food and Rural Affairs (DEFRA) Groundwater protection code[3].[4]. The Environment Agency is the enforcing/advisory authority in England, and Wales, The Environment and Heritage Service in Northern Ireland and SEPA in Scotland.

Fuel Blends & Usage

HBEF are designated with the prefix 'E' for ethanol followed by a number representing the percentage, by volume of ethanol, in the fuel blends. Ethanol used in fuel blends can contain up to 5% hydrocarbons (either petroleum-spirit or petroleum-spirit like additives) before blending. Additional petroleum-spirit is added to the ethanol to make-up the desired percentage in the blend The most common HBEF, E85, also called 'fuel ethanol', is typically made-up of 85% denatured ethanol and 15% un-leaded petroleum-spirit.

The requirements for ethanol in automotive fuels including permitted denaturants are included in PrEn15376[5]. For HBEF the unleaded petrol element will normally need to be specifically formulated to meet the vapour pressure requirements of the final blended fuel.

HBEF can only be used in what are termed flexible fuelled vehicles (FFVs) and other vehicles that are fitted with engines that have been designed and manufactured to burn alcohol fuel. The conversion of existing vehicles is not generally feasible due to the high cost of conversion which requires changes to valve seats, injector systems, fuel pipe work, fuel pump and engine management system able to detect different ethanol-fuel blends and adjust itself to suit.

Scope

This guidance note covers the safety and environmental issues associated with the storage of HBEF at new installations and at existing filling stations where any part of the petrol or diesel containment system is converted to the storage and dispensing of HBEF. The note also gives advice on the differing fire and explosion control measures (to those for petroleum-spirit) that arise from the increased flammability range of HBEF and the precautions to be taken to avoid galvanic attack that may result from the electrical conductivity characteristics of HBEF. As HBEF are soluble in water, the note covers the measures to control spillages so as to prevent groundwater and sub-soil contamination.

The guidance note does not cover the design and installation techniques for storage tanks, pipework or pumps/dispensers, which are fully covered in the Blue Book[1]. Nor does it cover environmental impact assessments for the storage and dispensing of HBEF

For the purposes of this guidance note, the term HBEF means a blend of ethanol and petroleum-spirit with the ethanol constituent ranging generally between approximately 30% and 90%.

A précis of the properties of E95 (ethanol fuel for diesel engines) and advice on storage is given in Appendix 2 to this Guidance.

[3]Groundwater Protection Code: Petrol stations and other fuel dispensing facilities involving underground storage tanks.

[4]Groundwater Protection Code: Petrol stations and other fuel dispensing facilities involving underground storage tanks.

[5] pr EN 15376 Automotive Fuels: Ethanol as a blending component. Requirements and test methods.

OVERVIEW

1 Storage and Dispensing:

1.1 Existing general control measures for the storage and dispensing of petroleum-spirit can, with certain exceptions, be equally applied to alcohol fuels such as HBEF. The guidance given in the Blue Book[1], as supplemented by this Note, should be followed for new installations, re-developments and modifications.

1.2 The physical characteristics of HBEF relative to petrol require special control measures to minimise the risk of fire or explosion and environmental contamination where the fuel is stored and dispensed. The characteristics giving rise to the need for additional control measures can be broadly categorised as: -

- Material compatibility
- Increased conductivity
- A wider flammability range; and
- Solubility with water

2 Material Compatibility:

2.1 HBEF have different properties to those of petrol, which means special considerations have to be made when choosing equipment and materials for certain components of the installation. Some conventional materials (such as aluminium, zinc and brass) used in petrol stations together with some plastic and rubber materials may be adversely affected by HBEF.

2.2 The presence of materials in the installation that are incompatible with HBEF can be the cause of: -

- Leaks due to degradation that can give rise to fire/explosion, safety and environmental concerns.
- Fuel quality problems caused by suspended matter (contamination) in the fuel resulting from the effects of corrosion and degradation of unsuitable components and fittings.

3 Increased Conductivity

3.1 Ethanol has approximately ⅓ of the conductivity of water and is at least 10 times more conductive than petrol. Whilst these characteristics reduce the risk of static accumulation the possibility of galvanic corrosion is increased and should be taken into consideration.

3.2 Particular attention must, therefore, be given to the specification and approvals of all equipment in contact with the fuel, (such as submersible pumps, tank gauge probes and overfill prevention devices or probes) as the increased conductivity may also give rise to the formation of local corrosion cells between adjacent dissimilar metals.

4 Increased Flammability Range

4.1 Ethanol and petrol have different flash points and limits of flammability (see appendix 1). An explosive gas atmosphere in an HBEF storage tank will exist across a wider temperature range than that in a petrol storage tank. There are varying published details about the temperature range but the SAE Technical Papers Series, 950401[6] gives the temperature range at which a gas atmosphere in a closed container is explosive as being: -

- Petrol -41^{o} C to -10^{o} C; and
  E85 -33^{o} C to +11^{o} C.

4.2 Petrol vapour is classified as gas group IIA and recent testing by LASI[7] has also classified HBEF vapour with an ethanol content of up to 90% as gas group IIA. The report also confirms that HBEF vapour of 90%+ ethanol content to be gas group IIB1. Therefore where HBEF of 90%+ are stored/dispensed this classification will affect the nature of the EEx approval required for electrical and mechanical equipment to be used in hazardous areas.

5 Solubility in Water

5.1 Water is fully and infinitely soluble in ethanol and any free water will be dissolved into solution. BS EN 228 Unleaded Petrol[8] includes a limit of 1% water and it would be reasonable to assume that standards for Ethanol blend automotive fuels will have similar strict limits on the water content. Any ingress of water into the fuel storage system from leakages in the storage tank or associated pipe work could result in the fuel specification limits being compromised.

5.2 The phenomenon of phase separation will occur when water is present in a tank at 10-15% of the alcohol present in the fuel blend, in this situation 85 to 90 % of the alcohol and water separates from the fuel blend into a water/ alcohol layer. Phase separated product cannot be re-blended on site and will need to be removed for reprocessing or disposal.

5.3 As HBEF will readily dissolve in water, oil water separators may not retain all forecourt spillages. HBEF is detrimental to all plant and animal life in water-courses primarily as a result of oxygen depletion, and therefore the operator should consult with the appropriate agency in accordance with section 7.

5.4 The solubility of the alcohol component is known to increase the rate of contaminant plume spread in soil.

[6] SAE Technical Papers Series, 950401, 'Flammability Tests of Alcohol/Gasoline Vapours'
[7] Landerausschuss Fur Arbeitsschutz und Sicherheitstechnik.
[8] BS EN 228 Automotive fuels - Unleaded petrol - Requirements and test methods.

RECOMMENDED CONTROL MEASURES

6 Suitability of Containment Equipment:

Tanks

6.1 The location of a storage tank (above or below ground) is not affected by the storage of HBEF, provided the tank construction; any (internal) linings and seals/gaskets are of compatible materials. For underground storage tanks, the following points will apply: -

- Double wall steel tanks should be constructed to BS EN 12285-1[9] with leak detection.
- If existing single wall steel tanks are to be used then a risk assessment should be carried out to ensure that the correct level of protection is applied when storing HBEF.
- Irrespective of whether a (steel) tank is double or single wall, if there is an existing corrosion problem, the conversion to the storage of HBEF will be likely to accelerate the degrading effects.
- HBEF have a high alcohol and solvent content and can have a detrimental effect on storage tanks constructed of GRP, causing the tank to soften and possibly fail. It can also cause fuel quality issues arising from degradation of the tank. HBEF should not be stored in GRP tanks unless the tank has been specifically constructed and certified for use with HBEF.

6.2 For the reasons outlined in the above bullet point steel tanks that have been lined with polyester or epoxy based materials may not suitable for ethanol blends. If there are any doubts about the compatibility of material used to line a tank, the manufacturer of the coating system or the installing contractor should be contacted to confirm that the lining has been certified for use with HBEF.

6.3 The use of above ground storage tanks should be fully risk assessed. Equipment should meet the requirements of recognized international standards for protected tanks such as UL2085[10].

Storage Tank (fittings):

6.4 All fittings and materials that will come into contact with the HBEF (or it's vapours) should be verified as suitable by the manufacturer of the equipment, on existing sites some items may have to be replaced. The following list, while not exhaustive, indicates the main components which should be considered:

[9]BS EN 12285-1:2003 Workshop fabricated steel tanks. Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids
[10]UL2085: 1997 Standard for protected above ground tanks for flammable and combustible liquids.

- Fill, vent and suction pipes
- Pressure and vacuum valves
- Flame arrestors
- Delivery calming devices
- Overfill prevention devices
- Dipsticks
- Contents gauges
- High level alarms
- Submersible pumps
- Gaskets and sealants
- Water detection systems

Contents Gauges

6.5 Capacitance probes are not suitable as gauges in any level of HBEF as they will not work in alcohol

6.6 Operators with magnetostrictive probes (or other technology) should confirm with manufacturers that construction and operation of floats are compatible with HBEF.

Pipework:

6.7 The underground pipework that will carry or come into contact with HBEF and its vapours (ie suction/pressure, off-set fill, siphon and vent pipes) should be constructed in accordance with EN 14125[11], with third party certification of material compatibility.

6.8 Existing underground screwed galvanized steel pipe work should not be used as any corrosion at internal cut pipe ends will be accelerated and it will also be difficult to confirm that the jointing compounds are HBEF compatible.

Dispensers, Hoses & Nozzles

6.9 Existing dispensing equipment and attached components are unlikely to be compatible with HBEF. Advice should be sought from the manufacturer(s) to ensure that all the component parts of the dispenser are compatible or that those which require adaptation or replacement are identified.

In-Line Filters:

6.10 HBEF will initially act as a scouring/cleaning agent removing any debris or sludge in an existing fuel system. A regime of filter maintenance should be put in place to avoid filter blockage, slow flow, damage to meters and nozzle. The fitting of additional in line filters may be considered in the initial period.

[11]BS EN 14125:2004: Thermoplastic and flexible metal pipework for underground installation at petrol filling stations.

Fittings and Connectors:

6.11 All fittings, connectors and adaptors that will be in contact with HBEF should be manufactured with materials compatible with the fuel. The advice of the original equipment manufacturer (OEM) should be obtained.

7 Drainage

Forecourt Drainage (General)

7.1 The existing guidance of providing a separator (discharging to the foul or combined drainage system) should apply to all sites storing HBEF. There should be a method of closing-off the outlet in the event of a spillage during a road tanker delivery.

7.2 The filling points for HBEF storage tanks should be provided with a means to catch and contain any small fuel spillage that may occur during the connection and the disconnection of delivery hoses. This may be achieved by using existing water and fuel resisting chambers, or installing a spill box which can retain any spillage until it can be safely disposed of.

7.3 Additional spillage control measures during dispensing are not considered necessary for two reasons: -

- experience from petrol dispensing has shown that most such spillages are small and in dry conditions fuel quickly evaporates on the forecourt; and

- any HBEF that may reach the separator would either separate or be dissolved in the water effluent and would be dealt with in the sewerage treatment process of the water company if connected to the foul sewer.

7.4 Site operators should confirm their discharge consent levels with their sewage provider.

7.5 As ethanol may have a degrading effect on GRP oil separators, any large spillages must be cleared out promptly; both to avoid further loss from site and possible damage to the separator.

7.6 Any spillages should be reported to the sewage provider.

Forecourt Drainage to Controlled Waters (Additional Measures)

7.7 At sites where the site drainage discharges into the surface water sewer, a soak away or controlled water the site operator should seek the advice of the EA/SEPA/EHSNI (as appropriate) before introducing HBEF onto the site. It is strongly recommended that a joint meeting between the PLA and EA/SEPA/EHSNI (as appropriate) is held to agree standards before the site operates with HBEF. A minimum requirement will be a full retention system with an effective means of closure on the drainage system. Other spillage control measures may be required during a road tanker delivery.

7.8 Any spillages to controlled waters must be reported to the EA/SEPA/EHSNI (as appropriate) on the emergency hot line 0800 80 70 60.

Note:
Controlled waters and surface waters include rivers, streams/burns, dry ditches, lakes/lochs, loughs, reservoirs, ponds, canals, estuaries and coastal waters. Groundwater is all water below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

8 Increased Risk of Ignition:

8.1 As there is likelihood that a flammable atmosphere will be present in an HBEF storage tank, the following measures are required to prevent a flame (from an external fire) from travelling through pipework and into the tank.

A flame arrester should be situated at all open entries to the tank vapour space including the following positions:

- The end of or in the vent pipe
- The stage 1b vapour recovery connection
- The stage 2 vapour recovery connection between the dispenser and the vapour return line.

8.2 For new or redeveloped filling stations the regulations based on the ATEX Directive apply. This means that flame arresters must be designed and certified in accordance with BS EN12874[5].

Important Note:

- *On all new petrol installations and for any installations changing to HBEF, flame arrestors certified to the correct class of BS EN 12874[5] **must** be used to reduce the risk of fire and explosion in the installation.*
- *Where the HBEF fuel has more than 60% of ethanol the storage system shall be protected by flame arrestors tested and approved for explosion group IIA as per BS EN12874[5]. For HBEF of 90% or over flame arrestors for explosion group IIB1 as per BS EN 12874[5] shall be used.*

- *The use of end of line flame arrestors to BS 7244[12] at the end outlet of the vent pipe and the vapour return line connecting point on a stage 1b system have traditionally been used in petrol installations to help protect the installation storage tanks from fire and explosion. While flame arrestors constructed to BS 7244[10] (which has now been withdrawn) have in the past been acceptable on existing petrol installation, they are not considered effective for HBEF.*

[12] BS 7244:1990 Specification for flame arresters for general use.

9 Electrical Certification for Hazardous Areas:

9.1 Unleaded petrol and HBEF of up to 90% are confirmed as gas group IIA; whereas HBEF of 90%+ has been determined to be gas group IIB. If it is intended to store and dispense HBEF of 90%+, it is important that the existing (or any new/replacement electrical equipment) installed (or used in the case of portable equipment) in the hazardous areas are checked for correct certification due to the different gas group.

10 Static Electricity:

10.1 With regard to ignition by static electricity the risk is less but the fuel should be treated as unleaded fuel for this purpose.

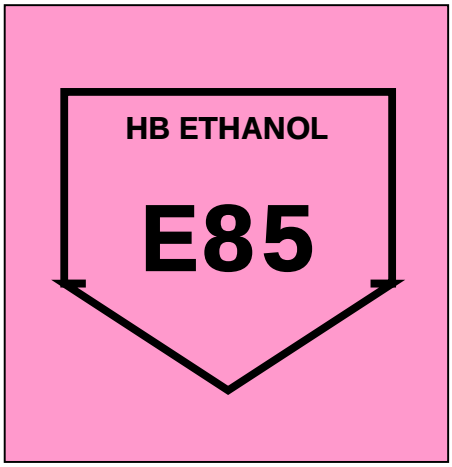
11 Fire fighting equipment:

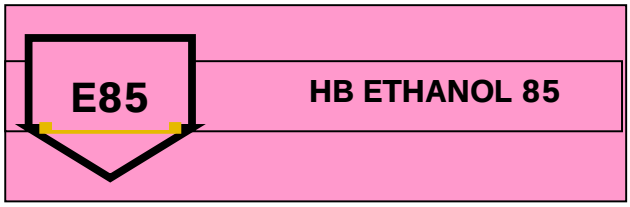
11.1 Dry powder extinguishers or alcohol resistant foam extinguishers should be provided where HBEF are stored and dispensed.

12 Signage:

12.1 At the time of writing this guidance, there are no EU or UK recognised identification signs for storage tank fill points and fuel dispensers. In the absence of an EU standard, it is recommended that the design and wording of the two signs as displayed below be used in the UK.

Storage tank fill point





Background – Pink – RAL4003
Text / block outline: Black

Note:
In order to reduce the risk of customers inadvertently dispensing HBEF, site operators should ensure that the nozzle and dispenser are conspicuously labelled

13 Converting and commissioning existing sites and ongoing maintenance

13.1 It is essential that a full survey of the existing site be carried out to identify any components that may be incompatible with HBEF. Where there is doubt reference to the OEM's equipment manual for suitability of existing equipment, and/or the replacing of unsuitable equipment as is necessary. A competent person should undertake the scrupulous cleaning of the tank(s) and product pipe work

13.2 A review of the site's (DSEAR) fire and explosion and COSHH risk assessment should be undertaken before HBEF are introduced.

13.3 Experience has shown that HBEF tend to act as a cleaner for fuel systems and as a precaution; fuel tanks and associated pipe work should be checked for sludge and where necessary cleaned before introducing HBEF to the storage tank.

13.4 Care should be taken to eliminate water and remedy any causes of water entry in tanks that will be used for HBEF storage. As water will readily mix with the alcohol in the fuel, there will be no free water for the tank (contents) gauge to detect; so the water detecting capability of this device will be effectively redundant. Wet Stock control processes or reconciled gauge systems that will detect and alarm on indication of an unaccountable product increase can provide a

control measure. In addition to the leak detection measures, a regular check should be made of the seals and gaskets of tank lids and their fittings i.e., fill caps, probes and other equipment to ensure continued integrity.

Note:
If water-detecting paste is used it should be formulated for ethanol/alcohol fuels.

13.5 When converting a tank from the storage of unleaded petrol to an HBEF blend it should be completely emptied of product and any water that may have accumulated at the bottom should be removed so that the tank is liquid free as far as is practicable. The tank should then be filled as close to capacity as possible with HBEF, to minimize the effect of any small amounts of water that may remain following cleaning.

13.6 If diesel was stored the tank that will be used for the HBEF, it must in be cleaned as diesel causes some particulates to settle out and form sludge. Introducing alcohol into these tanks will place this sludge into suspension and can lead to serious problems with filter blocking. Guidance on the cleaning of tanks is provided in clause 8.8.2.2 of the Blue Book[1] and more detailed guidance is provided in HSE Guidance CS15[13] and the Model Code of Safe Practice No 16 Tank Cleaning Safety Code[14].

14 Vapour Recovery:

14.1 HBEF are considered to be 'volatile organic compounds' and are subject to the same requirements as petrol with regard to unloading and dispensing and as such the guidance provided in the Blue Book[1] and PG1/14[15] for stage 1b and stage 2 will apply.

15 Comments:

15.1 Comments on any aspect of this Guidance Note should be addressed to the APEA's Technical Chairman at: -
technicalchairman@apea.org.uk

[13]Health and Safety Executive's Guidance Note CS15: The Cleaning & Gas Freeing of Tanks Containing Flammable Residues;
[14] Institute of Petroleum's Model Code of Safe Practice No 16 Tank Cleaning Safety Code.
[15]Process Guidance Note 1/14(06) Unloading Petrol into Storage at Petrol Filling Stations.

APPENDIX 1

Properties of HBEF, Gas Groups and References

Properties of HBEF

Vapour Density': Ethanol vapour, like petroleum-spirit vapour, is heavier than air and tends to accumulate in the lowest levels surrounding any release of the fuel. Unlike petrol vapour, ethanol fuel vapour disperses rapidly.

'Solubility in Water': Fuel ethanol will mix with water. Where the concentration of water is high, the ethanol will separate.

'Energy Content': For identical volumes, fuel ethanol possesses less energy than petroleum-spirit.

'Flame visibility': A fuel ethanol vapour flame, although not as bright as a petrol vapour flame, is easily discernable in daylight.

'Specific Gravity': Pure ethanol and ethanol fuel blends are heavier than petroleum-spirit and lighter than water.

'Electrical Conductivity': Fuel ethanol conducts electricity. Petroleum-spirit, by contrast, is an electrical insulator.

'Stoichiometric Fuel-to-Air Ratio': E85 needs more fuel/kg of air than petroleum-spirit; therefore cannot be used in a conventionally fuelled vehicle.

'Toxicity': Ethanol is less toxic than petrol or methanol. Although carcinogenic compounds are not present in pure ethanol, the 15% blend of petroleum-spirit in fuel ethanol (E85) is considered to make the substance potentially carcinogenic.

'Flash Point': Less than -40^0C.

'Limits of Flammability': 3.3% (LEL) to 19% (UEL). At a low temperature (0^0C), HBEF vapour is more flammable than petrol vapour whilst at normal temperatures it is less flammable due to its higher auto-ignition temperature. The auto-ignition temperature of E85 is 360^0C compared with 270^0C for petrol.

Gas Groups

Gases and vapours are categorised in terms of their ignition energy or the maximum experimental safe gap; the latter in respect of flameproof protection for electrical equipment. With this system of categorisation, highly flammable gases and vapours are assigned to one of four groups. The table below shows the groups with the typical gases or vapours for each group. Gases or vapours falling into group IIC present a more significant (ignition) hazard than those falling into group IIA.

Mining Industry	Surface and Petrochemical Industry		
Group I	Group II		
Methane	IIA	IIB	IIC
	Propane & Petrol	Ethylene	Hydrogen

References:

[1]Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd Edition). Published jointly by the APEA and the Energy Institute. ISBN 0 85293 419X.

[2]PETEL Circular No.65/61 'Petroleum (Consolidation) Act 1928 - Petrol Filling Stations – Model Conditions of Licence'. http://www.hse.gov.uk/lau/lacs/65-61.htm

[3]Groundwater protection code: Petrol stations and other fuel dispensing facilities involving underground storage tanks. http://www.defra.gov.uk/environment/water/ground/petrol/index.htm
Underground Storage Tanks for Liquid Hydrocarbons Code of practice for the owners and operators of underground storage tanks (and pipelines)
http://www.scotland.gov.uk/about/ERAD/WEU/00015561/Guidance.aspx

[4]pr EN 15376 Automotive Fuels: Ethanol as a blending component. Requirements and test methods. (March 2006).

[5]SAE Technical Papers Series, 950401, 'Flammability Tests of Alcohol/Gasoline Vapours'

[6]Landerausschuss Fur Arbeitsschutz und Sicherheitstechnik. ISBN 3-936415-49-8.

[7]BS EN 12784 Flame Arrestors: Performance, test methods and limits for use.
[8]BS EN 228 Automotive fuels - Unleaded petrol - Requirements and test methods.
[9]BS EN 12285-1:2003 Workshop fabricated steel tanks. Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids.

[10]UL2085: 1997 (with later revisions) Standard for protected above ground tanks for flammable and combustible liquids.

[11]BS EN 14125:2004: Thermoplastic and flexible metal pipework for underground installation at petrol filling stations.
[12]BS 7244:1990 Specification for flame arresters for general use. (now withdrawn).

[13]Health and Safety Executive's Guidance Note CS15: The Cleaning & Gas Freeing of Tanks Containing Flammable Residues.
[14]Institute of Petroleum's Model Code of Safe Practice No 16 Tank Cleaning Safety Code.

[15]Process Guidance Note 1/14(06) Unloading Petrol into Storage at Petrol Filling Stations.
http://www.defra.gov.uk/environment/ppc/localauth/pubs/guidance/notes/pgnotes/pdf/pg1-14.pdf

APPENDIX 2

Ethanol Fuel for Diesel Engines also known as E95

Introduction:

A1 E95 is a fuel developed for diesel engines and is being used primarily in the UK to run buses.

A2 The fuel is 95% Ethanol and 5% ignition enhancers (polyethylene glycol; methyl-t-butyl ether (MTBE); isobutanol), and is usually red in colour.
The fuel has a flash point of 9ºC.
The limits of flammability are 3%LEL to 15%UEL
Auto ignition temperature of 360º C

Licensing:
A3 The fuel is **not** classified as a petroleum mixture as no petroleum is mixed with the ethanol; therefore is not subject to a petroleum-licensing regime.

Advice:
A4 The advice provided for both the environmental and safety issues in this guidance is applicable for the storage of E95. In particular the need to ensure the correct gas group for both electrical equipment and flame arrestors is specified and installed.

A5 Storage of E95 below ground should be in accordance with the guidance in the Blue Book[1]. HSG176[16] would be the recommended code for any above ground storage of the fuel.

A6 The Health & Safety at Work etc Act 1974 and DSEAR will apply to the storage facility. The enforcing authority will be the authority responsible for enforcing the HSWA at the site; ie, the Health & Safety Executive or the local authority (environmental health department); dependant on the enforcement allocation.

A7 The Petroleum Licensing Authority will be the enforcing authority for DSEAR if petrol is also stored and dispensed on the site for other vehicles.

[1]Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations (2nd Edition).
[16] HSG176 'The Storage of Flammable Liquids in Tanks' published available from HSE Books. ISBN 0-7176-1470-0.