

Environmental Alliance – working together

Pollution Prevention Guidelines

Above Ground Oil Storage Tanks: PPG2

These guidelines are intended to assist those responsible for above ground oil storage tanks at sites other than oil refineries and distribution depots. They are jointly produced by the Environment Agency for England and Wales, the Scottish Environment Protection Agency and the Environment and Heritage Service in Northern Ireland, referred to here as the Agency or Agencies.

In England, the storage of oils (except waste mineral oils) is regulated under the Control of Pollution (Oil Storage)(England) Regulations 2001. The regulations apply to industrial, commercial and institutional sites storing more than 200 litres of oil and private dwellings storing more than 3,500 litres. Highlighted text in these guidelines indicates areas that must be complied with under these regulations. Similar regulations are expected to be introduced in Scotland during 2004 and may follow in Wales and Northern Ireland. Further advice may be obtained from your local Agency office. Contact details can be found at the end of these guidelines.

1. Introduction

Oil is the commonest pollutant in the UK. These guidelines are intended to help reduce pollution caused by inadequate storage of oil in above ground tank installations.

In cases where the Control of Pollution (Oil Storage) (England) Regulations 2001 do not apply (see References 1 and 2), following these guidelines will minimise the risk of your site causing pollution. Further advice on storage in drums and intermediate bulk containers is available from the Agencies (PPG26; Reference 3). A range of Oil Care Campaign literature and stickers covering the complete life cycle of oil is also available from the Agencies.

In England, oil storage containers brought into use since 1 March 2002 and those in locations at significant risk must comply with the Oil Storage Regulations. All other existing installations must comply by 1 September 2005. The Environment Agency is responsible for enforcing the regulations throughout England and may serve a notice requiring inadequate facilities to be brought up to standard.

Appendix A contains a checklist to help you decide whether improvements are needed to your oil storage to ensure compliance with the Control of Pollution (Oil Storage) (England) Regulations 2001.

Specific measures for mobile bowsers are outlined in Section 6 and further information is available in References 2 and 4. The guidance in this document is applicable to the storage of all waste oils (see also PPG8; Reference 5) and oil for agricultural use, but these may be controlled under separate regulations (see References 6 and 7).

New or altered facilities may also require approval from your local planning authority. New or altered domestic oil tanks may come under the Building Regulations (see Reference 8) and advice/approval should be sought from your local planning authority.

2. The storage container

NOTE: The Agencies do not endorse or approve any particular oil storage products and express no preference for the material used.

a. Location

Safety, security, access and maintenance needs must be considered when storing oil.

Position tanks or take other steps to minimise the risk of damage by impact. If possible, do not store oil in significant risk locations (these can include within 50 metres of a spring, **within 10 metres of a watercourse or 50 metres of a well or borehole**). If this is unavoidable, the tanks must comply with the Oil Storage Regulations. Avoid storage at or above roof level. Ensure the surface of the area where deliveries are made and oil is dispensed is protected by a surface impermeable to the oil stored and isolated from surface water drainage systems. This will reduce the risk of spilt oils causing pollution by preventing the downward passage of fuel and/or contaminated water into the soil and groundwater below the site directing any spilt liquids away from surface waters.

Oil storage containers located on a flood plain may float in a flood, causing pipelines to break and oil to be spilled. If possible, avoid placing tanks in areas at risk from flooding. If there is no alternative, ensure the container is secured so it cannot lift from its base as water rises. Contact your local Agency office to check if your tank is located in a flood plain.

b. General requirements

Store oil in a tank of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in ordinary use. Provide the tank with appropriately designed and constructed supports. If possible, use tanks with a design life of 20 years (with proper maintenance). This is a legal requirement for agricultural oil storage (see Reference 6).

c. Proprietary tank systems

A range of prefabricated proprietary tank systems is available. These are made from either steel or plastic and have a primary container with some form of integral secondary containment (see Reference 4). However, the use of terms such as 'double-skinned' or 'integral bunding' to describe them can be confusing as some products may not be designed to provide adequate secondary containment for the tank and its ancillary equipment. Please consult the manufacturer for details of design and performance to determine the appropriate use of these systems. Alternatively, contact the Agencies for advice.

d. Tank specification

Storage tanks should be type tested to a recognised standard and manufactured to that standard under a quality assurance system complying with BS EN ISO 9001:2000.

Ensure that steel tanks comply with BS 799-5:1987 (Reference 9) and are protected against corrosion. Use drain valves to prevent frost damage. There is no British Standard for prefabricated steel tank systems. However, the Oil Firing Technical Association (OFTEC) has developed a standard for steel tanks, OFS T200 (Reference 10), which does include them.

Ensure that polyethylene tanks and tank systems comply with OFS T100 (Reference 11).

Compliance with standards for construction and manufacture does not guarantee compliance with the Oil Storage Regulations.

e. Tank installation and marking

Use technicians who are registered with a professional scheme, such as the one operated by OFTEC to install tanks. Mark the tank with its capacity and the type of product stored.

f. Tank decommissioning

Ensure that a tank is fully drained before it is taken out of use or removed. Suitably qualified technicians should undertake this work. Never carry out hot work until the tank has been degassed and the appropriate certificate issued (Reference 12).

After decommissioning or removal, check the area to ensure the procedure has not caused soil or groundwater contamination (this includes taking soil and groundwater samples). If contamination is found, take action as soon as possible to remove the pollution. For further information, refer to PPG27 (Reference 13) or your local Agency office.

3. Secondary containment

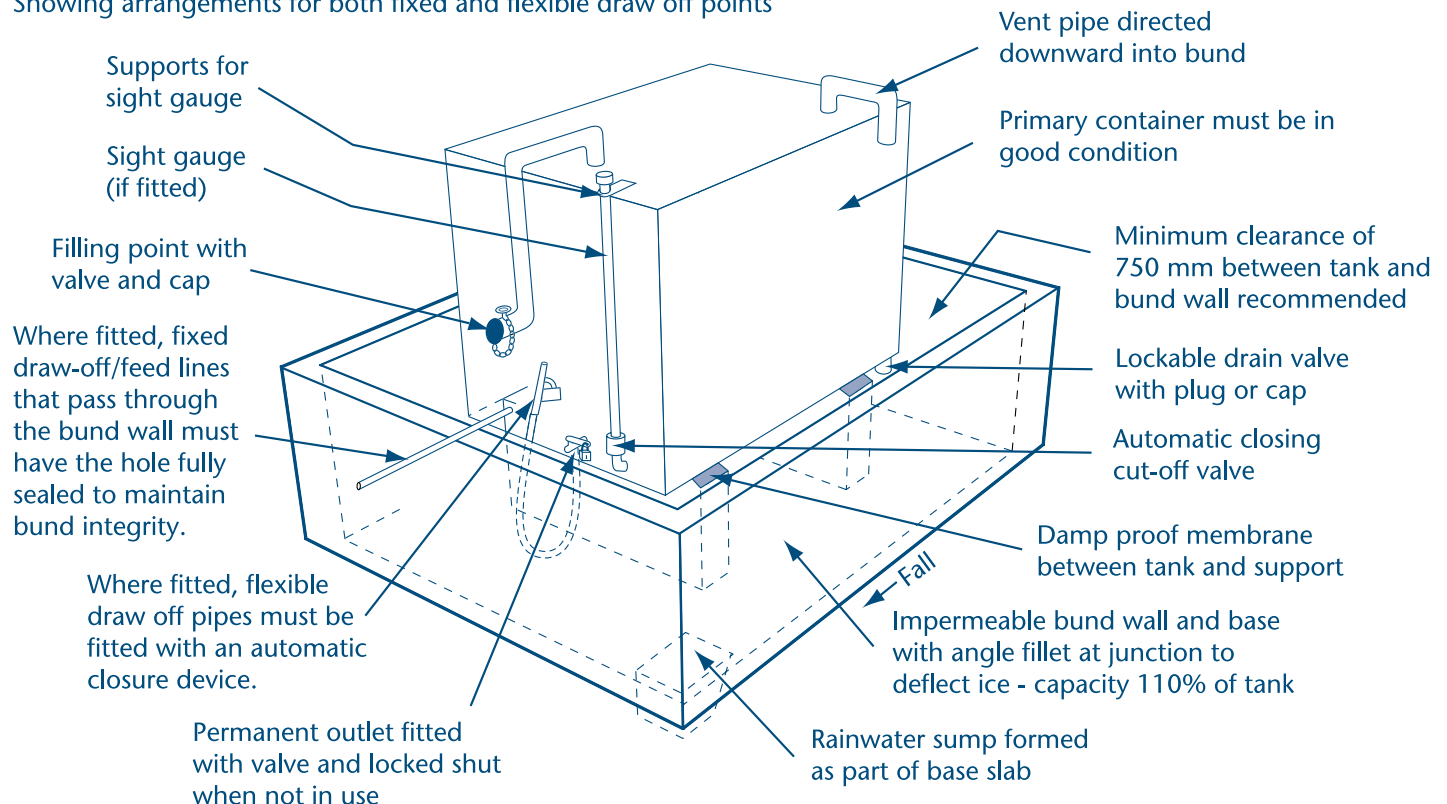
Secondary containment will prevent oil escaping to the environment in the event of leakage from the tank or ancillary equipment. **Situate all tanks and their ancillary equipment within an oil tight secondary containment system such as a bund.** It is necessary to consider the potential escape of oil beyond the bund area in the event of the tank developing a hole (known as jetting) (see Reference 14). The risk of this can be minimised by:

- keeping the primary container as low as possible;
- increasing the height of the bund wall;
- leaving sufficient space between the tank and bund walls;
- not siting one tank above another;
- providing screens or curtains.

For illustrative purposes, Figure 1 shows a banded storage tank installation constructed in situ, with both fixed and flexible draw-off pipes. It does not show features relating to a closed integrally banded storage tank. For steel tanks in open bunds, a minimum distance of 750 mm between the tank and the bund wall and 600 mm between the tank and the base is recommended to allow access for external inspection.

Figure 1 Open banded oil tank

Showing arrangements for both fixed and flexible draw off points



a. General integrity

The secondary containment system should be impermeable to oil and water, and there should be no direct outlet:

- connecting the bund to any drain, sewer or watercourse;
- discharging onto a yard or unmade ground.

Ideally, pipework should not pass through the bund wall. If unavoidable, seal the pipe into the bund with a material that is resistant to attack by the oil stored to ensure the bund remains leak-proof.

The use of un-reinforced materials is not recommended for bund wall construction. Detailed specifications and drawings are available (References 15 and 16) for bunds of reinforced construction using concrete, bricks and blocks. These should be referred to for specific advice. The bund should not have a damp-proof course.

b. Capacity

The secondary containment system must provide storage of at least 110% of the tank's maximum capacity. If more than one container is stored, the system must be capable of storing 110% of the biggest container's capacity or 25% of the total tank capacity within the bund, whichever is the greater.

When calculating bund capacity, take account of any volume taken up by tank supports within the bund and consider the volume of any of the primary tank, pipework or pumps.

The 10% margin is intended to take into account a range of factors, including:

- loss of the total contents, for example due to vandalism or an accident;
- sudden tank failure or leaks;
- overfilling;
- containment of fire-fighting agents;
- dynamic factors such as overtopping caused by surge and wave action following tank failure;
- an allowance for rainwater in the bund.

Research by the Construction Industry Research and Information Association (CIRIA) involving tanks of 25 m³ or less suggests that, in some circumstances, the 10% safety margin is inadequate to provide protection from loss of oil due to these factors (Reference 14). This research provides an alternative method for calculating bund capacity and height, and introduces the concept of the 'freeboard'. The freeboard is the height of bund wall standing above the maximum level of oil retained within the bund and taking into account typical rainfall volumes for the area. See Appendix B for further details.

The choice of method for calculating bund capacity depends on the risk of causing water pollution. **Bunding using the 110% principle is the minimum capacity that is required.** However, the alternative method is recommended where tanks in open bunds are sited in locations with a greater risk, such as high rainfall areas. If you are in any doubt about the sensitivity of a site, please consult your local Agency office.

4. Ancillary equipment

Make sure that any valves, filters, sight gauges, vent pipes or other ancillary equipment are situated within the secondary containment system and arranged so that any discharges of oil are contained.

Under the Oil Storage Regulations, any filter or isolating valve fitted in a gravity-feed system is not considered ancillary to the container. Such equipment is used to protect the draw-off pipe or down stream equipment and should be located within the secondary containment where possible.

To prevent the risk of the tank contents draining from a leak in a gravity-feed system, top outlet draw-off pipes and feed lines are preferred where possible.

a. Measurement of tank contents

Provide an adequate means of measuring the quantity of oil within the tank. The use of electronic gauges and high level alarms is strongly recommended. Calibrate dipsticks properly and only use them in the tank for which they are intended. **Support sight gauges properly and fit them with a valve that will close automatically when not in use. The sight gauge should be situated within the secondary containment system.** If dial gauges are fitted, ensure they are in a prominent position and check them regularly for accuracy.

The tank maximum fill capacity should not be more than 95% of the tank capacity when full to the brim.

b. Deliveries

Supervise all deliveries to oil tank(s) to help avoid spillages, prevent damage to the environment and save valuable raw materials. Hold detailed discussions with your oil delivery company on risk assessment practices to agree safe delivery and emergency procedures. Position a notice giving details on safe delivery procedures and what to do in an emergency at the delivery point (an appropriate self-adhesive notice is available from the Agencies). Locate fill pipes within the confines of the secondary containment system. Fit a shut-off valve to extended fill pipes because they may retain oil following the delivery. Ensure that fill pipes have a 50 mm diameter threaded connection, a lockable fill cap with a chain and are marked clearly with the product type, tank capacity and tank number.

Where a fill pipe is outside the containment system, use a drip tray of an adequate capacity to contain the contents of the fill pipe and **to catch any oil spilled during delivery.** Put this drip tray in a cabinet that can be locked when not in use to protect it from vandalism and rainwater damage. Check the drip tray after each delivery and empty it if it contains any oil. **If available, use a serviceable screw fitting or other fixed coupling when filling the tank.** Confirm with your delivery company that they are happy with both the health and safety and the pollution prevention aspects of your tank installation.

Remote fill points are not recommended, but where they are unavoidable, they should comply with BS 799-5:1987 (Reference 9), OFS T200 (Reference 10) or OFS T100 (Reference 11) as appropriate. **Fit an automatic overflow prevention device if the tank and any vent pipe cannot be seen by the person controlling the delivery.** Surface drainage from the delivery area should pass through a suitably sized oil separator of an approved design (see PPG3: Reference 17).

c. Deliveries to more than one tank

Unless the tanks are connected by a balance pipe with a greater flow capacity than the fill pipe, provide separate fill pipes for each tank.

d. Vent pipes

Where possible, position air vent pipes so that they can be seen easily during delivery (see Section 4b). They should not be smaller than the inlet pipe. **Contain vent pipes within the secondary containment system and arrange them so that any discharge is directed vertically downwards into it.**

e. Pump sets

Any pump should be:

- **positioned to minimise the risk of collision damage;**
- **fitted with a check valve in its feed line** to prevent the tank contents emptying in the event of damage to the pump or feed line;
- **protected from unauthorised use.**

Unless the oil has a flash point of less than 32°C, it is recommended that pump sets be installed within the secondary containment system

f. Fixed pipework

Support all pipework properly and site it above ground to make inspection and repair easier. Pipes used for supplying oil to fixed appliances should comply with the requirements of BS 5410: Part 1 or 2 (Reference 18) as applicable. **Position fill pipes, draw-off pipes, feed lines and vent pipes away from any vehicle traffic to avoid collision damage. Protect pipework adequately against corrosion** and insulate it to guard against frost damage.

g. Underground pipework

The use of double skinned pipes or ducting is recommended. Mark the route of underground pipework clearly both on the ground and on site plans and **protect pipework from physical damage** such as that caused by excessive surface loading, ground movement or ground disturbance (see Reference 19).

The preferred method of running pipes below ground is in a concrete duct with removable covers. Installation of oil pipes through a larger sleeving pipe can be used as an alternative in some situations. **If mechanical joints have to be used, ensure they are readily accessible for inspection under a hatch or cover.**

Adequate facilities for detecting leaks from underground pipework are essential. Maintain continuous leak detection devices in working order and test them at appropriate intervals. As a minimum:

- **pipework should be tested before use;**
- **pipework with mechanical joints should be tested every five years;**
- **all other pipework should be tested at least once every ten years.**

h. Flexible pipework

Ensure that flexible pipes and fittings for filling vehicles and other similar tanks comply with BS EN 1360:1997 (Reference 20). Fit them with a tap or valve at the delivery end, which closes automatically when not in use. Where the pipe is not fitted with an automatic shut-off device, it must not be possible to fix the tap or valve in the open position. **Fit a lockable valve where the flexible pipe leaves the container. This valve should either be locked shut when not in use and kept within the secondary containment system, or enclosed in a secure cabinet equipped with a drip tray.**

5. General maintenance

Inspect all bunds, tanks and pipework regularly for signs of damage and check them at least weekly. To ensure the bund retains its integrity, repair any defects in the bund wall or lining promptly using an appropriate technique. Deal with damage to the tank or pipework immediately (Reference 21). Draw off any condensation water that accumulates within the tank regularly and dispose of it in accordance with relevant legislation.

Although rainwater will often evaporate from within an open bund, a collection sump should be included in the base. If there is no rainwater in the bund after heavy rainfall, the bund may not be sealed properly and should be inspected and repaired as appropriate. If it is necessary to remove accumulated rainwater, perform this with a manually operated pump or by baling from the sump. This water may be contaminated and should be disposed of in accordance with relevant legislation. In the long term, it may be more cost-effective to roof the facility.

Do not use bunds to store materials or wastes, as this will reduce their capacity. Any accumulated oil or debris should be removed and disposed of in accordance with relevant legislation (see below).

In all cases where wastes are removed, the waste producer is obliged under the Duty of Care (Reference 22) to ensure that the waste is described appropriately and is disposed of properly. Waste contaminated with oil may be hazardous waste and may also be designated as 'special waste', for which a rigorous consignment note system applies. For further details of the issues arising from waste oils, see either PPG8 (Reference 5) or the Agencies websites.

6. Mobile bowers

In addition to the general requirements for primary and secondary containment, the following specific guidance related to mobile bowers:

- **any flexible pipe, tap or valve must be fitted with a lock where it leaves the container and be locked shut when not in use;**
- **flexible delivery pipes must be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use;**
- **the pump or valve must have a lock and be locked shut when not in use.**

7. Security

Oil storage areas should be as resistant as possible to unauthorised interference and vandalism. **Fit any permanent taps or valves through which oil can be discharged from the tank to open areas with a lock and lock them shut when not in use.** Where appropriate, display a notice telling users to keep valves and trigger guns locked when they are not in use. **Pumps should also be protected from unauthorised use.**

Taps or valves should be made of steel and marked to show whether they are open or closed. **When not in use, they should be locked shut** and fitted with a blanking cap or plug.

8. Dealing with spills

Those storing and using oils are advised to consider the risks of a spillage and to prepare a contingency plan (see PPG21; Reference 23). Keep a stock of absorbent materials (e.g. sand, earth or commercial products) on site to deal with spillages and train staff in their use.

If a spill should occur, immediate action should be taken to contain the oil to prevent it entering any drains or watercourses. Notify the Agencies by calling the Emergency Hotline on 0800 80 70 60. Do not hose the spillage down or use any detergents. For details on how to legally dispose of used absorbent materials see Reference 5; PPG 8.

9. References

1. Oil storage regulations leaflet. Environment Agency
2. Guidance note for the Control of Pollution (Oil Storage) (England) Regulations 2001. Department for Environment, Food and Rural Affairs (DEFRA), Tel: 0870 1226 236 or <http://www.defra.gov.uk/environment/water/quality/oilstore/index.htm>
3. PPG26: Storage and handling of drums and intermediate bulk containers
4. Above-ground proprietary prefabricated oil storage tank systems. C535. ISBN 0-8601-7535-9. Construction Industry Research and Information Association (CIRIA)
5. PPG8: Safe storage and disposal of used oils
6. Silage, slurry and agricultural fuel oil leaflet. Environment Agency, SEPA and EHS
7. Code of good agricultural practice for the protection of water, with addendum. DEFRA/Environment Agency (DEFRA Publications, Tel: 08459 556000; <http://www.defra.gov.uk/farm/farmindx.htm>)
Prevention of environmental pollution from agricultural activity (code of good practice). Scottish Executive Environment and Rural Affairs Department (SEERAD). Tel: 0131 556 8400. <http://www.scotland.gov.uk>
Code of good agricultural practice for the prevention of pollution of water: Department of Agriculture and Rural Development for Northern Ireland (DARD). Tel: 028 9052 4592. <http://www.dardni.gov.uk>
8. Domestic oil storage in England and Wales leaflet. Environment Agency
9. BS 799-5:1987 Oil burning equipment. Specification for oil storage tanks. British Standards Institution (BSI)
10. OFS T200 Oil firing equipment standard – steel oil storage tanks and tank bunds for use with distillate fuels, lubrication oils and waste oils ((2nd edition, 2002). Oil Firing Technical Association (OFTEC)
11. OFS T100 Oil firing equipment standard – Polyethylene oil storage tanks and bunds for distillate fuels (2nd edition, 2002). OFTEC
12. Cleaning and gas freeing of tanks containing flammable residues. Guidance note CS15. ISBN 0-7176-2166-9. Health and Safety Executive (HSE)
13. PPG27: Installation, decommissioning and removal of underground storage tanks
14. Construction of bunds for oil storage tanks. R 163. ISBN 0-8601-7468-9. CIRIA
15. Concrete bunds for oil storage tanks. Agencies/CIRIA
16. Masonry bunds for oil storage tanks. Agencies/CIRIA
17. PPG3: The use and design of oil separators in surface water drainage systems
18. BS 5410-1:1997 Code of practice for oil firing. Installations up to 45 kW output capacity for space heating and hot water supply purposes. BSI
19. Technical information sheet TI/134: installing oil supply pipes underground. OFTEC
20. BS EN 1360:1997 Rubber hoses and hose assemblies for measured fuel dispensing. Specification. BSI
21. Technical information sheet TI/120: oil storage inspection and maintenance. OFTEC
22. Waste management, the Duty of Care, a code of practice (revised 1996), ISBN 0-11-753210X. The Stationery Office. Tel: 0870 600 5522 (see also <http://www.defra.gov.uk/environment/waste/management/doc/>)
23. PPG21: Pollution incident response planning

References 1, 3, 5, 6, 8, 13, 15, 16, 17 and 23 are available from the Agencies.

References 4 and 14 are available from CIRIA, Tel: 020 7549 3300

References 9, 18 and 20 are available from BSI, Tel: 020 8996 9001

References 10, 11, 19 and 21 are available from OFTEC. Tel: 0845 65 85 080. <http://www.oftec.org.uk>

All Pollution Prevention Guidance Notes are available to download from the Agencies' websites (see the details at the end of this Guidance Note).

Additional information

Oil Care Campaign contact details:

England and Wales

www.environment-agency.gov.uk/oilcare

Scotland

www.oilcare.org

These Notes are for guidance only and following the good practice described does not remove the reader's obligation to ensure relevant legislation is complied with at all times and that their activities do not result in the release of polluting matter to the environment. Pollution of the environment is a criminal offence and compliance with one or more Guidance Note(s) is not a defence to such offences. It is recommended that references to other sources of guidance are checked to ensure they are still current.

Checklist for oil storage tanks

Completing this checklist will help you decide whether you need to improve your oil storage facilities in order to comply with the Oil Storage Regulations.

For each * refer to the guidance or contact your local Agency office to find how to correct this point.

General requirements	✓ or X	Comments
Is the tank "fit for purpose" and in good condition (unlikely to leak or burst in ordinary use)?		
Is the tank situated more than 10 m from a watercourse or 50 m of a well or borehole? If unsure, contact the Agencies.		If no, then the tank must comply with the Regulations by 1 September 2003.
Is the tank situated within a secondary containment system?		
Is the tank/containment system located or protected so that it cannot be damaged by an impact or a collision?		
Secondary containment: storage capacity		
For a single tank, is the secondary containment at least 110% of the maximum storage capacity of the tank?		See calculation table opposite.
For two or more tanks in one secondary containment system, is the secondary containment at least 110% of the biggest tank's maximum storage capacity or 25% of the total maximum storage capacity of all the tanks, whichever is the greatest?		
Secondary containment: integrity		
Is the secondary containment impermeable to water and oil?		
Is the containment system intact and without openings or valves for drainage?		Ensure any cracks or other damage are carefully repaired.
Are any draw-off pipes and fill pipes that pass through the containment system sealed adequately?		
Tank ancillary equipment		
Are all valves, filters, sight gauges, vent pipes and taps within the secondary containment system?		
If the tank has a sight gauge, is it supported properly and fitted with a valve that closes automatically when the gauge is not in use?		
Are fill and draw-off pipes located or protected so that they cannot be damaged by an impact or a collision?		
And, if applicable, protected from corrosion?		
And, if above ground, supported properly?		
Are vent pipes, taps and valves arranged so that any oil lost will be retained within the containment system?		
Are all taps and valves fixed to the storage tank, through which oil can be discharged to the open, fitted with locks and locked shut when not in use?		
Deliveries to the tank (filling)		
Is the fill pipe situated within the secondary containment system, or if not, is a drip tray of adequate capacity provided to contain any oil that may remain in the pipework after filling?		Ensure the drip tray is emptied after the tank is filled.
Can the tank and vent be seen from the point where the filling operation is controlled, or if not, is the tank fitted with an automatic overfill prevention device?		
If the tank has a screw fitting or other fixed coupling, is it in good condition?		
Are fittings/couplings being used when the tank is filled?		You may need to discuss this with your oil supplier.

Underground pipes (for filling and/or draw-off)	✓ or X	Comments
Are underground pipes for filling or draw-off protected from physical damage?		
Are all mechanical joints situated at a place accessible for inspection?		For example under a hatch or cover.
Are there adequate facilities for detecting leaks?		
If permanent leak detection is provided, is it maintained in working order and tested at appropriate intervals?		
If permanent leak detection is not provided, have the pipes been tested before use?		
Is pipework with mechanical joints tested every five years?		
Is all other pipework tested at least every ten years?		
Flexible draw off pipes		
Is the flexible draw-off pipe fitted with a tap or valve at the delivery end that closes automatically when the draw-off pipe is not in use?		If the tap or valve is capable of being fixed in the open position, it should have an automatic shut-off device.
Is the pipe kept within the secondary containment system when not in use or enclosed in a secure cabinet equipped with a drip tray?		
Is there a lockable valve where the pipe leaves the container which is locked shut when not in use?		
Pump set draw-off (non gravity draw off)		
Is the pump set fitted with a non-return valve in the feed line to the pump?		
Is the pump set protected from unauthorised use (locked or isolated when not in use)?		
Is the pump set located or protected so that it cannot be damaged by an impact or a collision?		

Calculation of capacity for existing secondary containment systems

The capacity of a tank located within an open containment system can be calculated by making the measurements shown in the table below. If the tank supports take up significant space, the calculation must take this into account.

Where the tank is enclosed within a proprietary system, you will have to refer to the manufacturer for this information.

Calculation	Result	
Maximum capacity of primary tank(s) If unknown, use tank length x width x depth in metres and multiply by 1000 to convert to litres.	..... litres	A
Containment capacity = length x width x depth of secondary container in metres	..... m ³	
Then multiply by 1000 to convert to litres	..... litres	B
Volume lost due to tank supports (<i>if significant</i>) in cubic metres	..... m ³	
Then multiply by 1000 to convert to litres	..... litres	C
Actual containment capacity = B – C (C = 0 if tank supports do not occupy a significant volume.)	..... litres	D
Minimum containment capacity (110%) = (110/100) x A	..... litres	E

If **D** is **equal or greater** than **E**, then the containment system volume is adequate and **will comply with the Regulations**. Note that the Agency may require additional containment volume in some environmentally sensitive situations.

If **D** is **less** than **E**, then the containment system capacity is insufficient **and will not comply with the Regulations**.

Note that for installations where the tank takes up a significant part of the bund, the capacity available in the event of overfilling may be inadequate. This will require consideration of delivery procedures and alarm systems if the risk is to be managed.

Appendix B

CIRIA alternative method for calculating bund capacity

Volume of oil or more details relating to this method for calculating bund capacity.

This method makes allowance for:

a. Flexible pipework

Bund capacity is calculated using the maximum storage capacity of the tank or tanks.

b. Rainfall

This component depends on the likely rainfall for the area. Great Britain can be divided into six zones for this purpose and the allowance for rainfall calculated accordingly. In high rainfall areas or where disposal of the contaminated rainwater is difficult, the cost savings may justify covering the bund to exclude rainfall eliminating the need to dispose of potentially contaminated rainwater.

c. Fire-fighting agents

A 100 mm freeboard is recommended to retain fire-fighting foam.

d. Dynamic factors

A freeboard of 250 mm is recommended to reduce the risk of loss due to surge in the event of sudden failure or wind-driven waves.

In practice, these factors are not additive. An example of the difference in bund freeboard for a standard rectangular 2.27 m³ (base 1.83 m x 1.22 m) tank using the 110% principle and the alternative method for calculating bund capacity is shown below. These calculations assume that the bund is inspected and cleared of rainwater weekly and that any oil spilled is removed within a day. In both cases, a distance of 750 mm between the tank and the bund wall is allowed for inspection access.

	110%	Rainfall zones						Roofed
		1	2	3	4	5	6	
Maximum freeboard (mm) Including dynamic effects	24	279	282	291	302	338	394	250
Minimum freeboard (mm) Excluding dynamic effects	24	129	132	141	172	319	394	100

ENVIRONMENT AGENCY
GENERAL ENQUIRY LINE

0845 9 333 111

ENVIRONMENT AGENCY
EMERGENCY HOTLINE

0800 80 70 60

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water in England, Wales, Scotland and Northern Ireland

Pollution Prevention Guidance notes (PPGs) are available to download from the Agencies' websites, see details below.

Environment Agency
www.environment-agency.gov.uk

Scottish Environment
Protection Agency
www.sepa.org.uk

Environment and
Heritage Service
www.ehnsni.gov.uk

HEAD OFFICE
Rio House
Waterside Drive
Aztec West
Almondsbury
Bristol BS32 4UD
Tel: 01454 624 400
Fax: 01454 624 409

CORPORATE OFFICE
Erskine Court
The Castle Business Park
Stirling FK9 4TR
Tel: 01786 457 700
Fax: 01786 461 425

HEAD OFFICE
Calvert House
23 Castle Place
Belfast BT1 1FY
Tel: 028 9025 4868
Fax: 028 9025 4777



ENVIRONMENT
AGENCY