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ENVIRONMENT AGENCY

ENVIRONMENT AND HERITAGE SERVICE

ENVIRONMENTAL ALLIANCE – WORKING TOGETHER

ABOVE GROUND OIL STORAGE TANKS: PPG2

POLLUTION PREVENTION GUIDELINES

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 as the Agency or Agencies. In England, the storage of oils (except waste 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 due to be introduced in Scotland. 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 water pollutant. These guidelines are intended to help reduce pollution caused by inadequate storage of oil in fixed tank installations. Regardless of whether the Control of Pollution (Oil Storage)(England) Regulations 2001 apply (see References 1 and 2), following these guidelines will minimise the risk of your site causing water pollution. Further advice on storage in drums and intermediate bulk containers is available from the Agencies (PPG26 - Reference 3) and a range of Oil Care Campaign literature and stickers covering the complete life cycle of oil are available from the Agency.

New oil storage facilities in England must comply with the oil storage regulations from 1 March 2002. Existing oil storage facilities in significant risk locations must comply by 1 September 2003, and all other existing installations 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.

These guidelines do not cover mobile bowsers, although they are included in the regulations and many of the same principles will apply. For more information on mobile bowsers, see Reference 4. The guidance in this document is applicable to the storage of waste oil (see also PPG8 – Reference 5) and oil for agricultural use, but they are controlled under separate regulations (see References 6 and 7).

Approval from your local planning authority may also be required for new or altered facilities.

2. THE STORAGE CONTAINER

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. Tanks should be positioned, or other steps taken, to minimise the risk of damage by impact.

Ideally, oil should not be stored in significant risk locations (that is, within 10 metres of a watercourse or 50 metres of a well or borehole). Where this is unavoidable, the tanks must comply with the oil storage regulations by September 2003. Storage at or above roof level is not recommended and should be avoided.

b. General requirements

Oil should be stored in a tank of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in ordinary use. It is recommended that tanks with a design life (with proper maintenance) of 20 years are used. This is a legal requirement for agricultural oil storage (see Reference 6).

c. Proprietary tank systems

A range of prefabricated proprietary tank systems are 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, use of terms such as ‘double-skinned’ or ‘integral bunding’ to describe them can be confusing and 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 or contact the Agency for advice.

d. Tank specification

Storage tanks should be type tested to a recognised standard and produced to that standard under a quality assurance system complying with BS EN ISO 9001:2000 or BS EN 9002:1994.

Steel tanks should comply with BS 799: Part 5 (Reference 8) and should be protected against corrosion. Steel tank drain valves should be used to prevent frost damage. There is no British Standard for prefabricated steel tank systems. However, the Oil Firing Technical Association for the Petroleum Industry (OFTEC) have developed a standard for steel tanks, OFS T200 (Reference 9) which does include these.

Polyethylene tanks and tank systems should comply with OFS T100 (Reference 10). Compliance with standards for construction and manufacture does not guarantee compliance with storage regulations.

e. Tank installation and marking

It is recommended that tanks are installed by technicians registered with a professional scheme, such as that operated by OFTEC. The tank should be marked with the product type and tank capacity.

f. Tank decommissioning

Before a tank is taken out of use or removed, it should be fully drained. This work should be undertaken by suitably qualified technicians and hot work should never be carried out until the tank has been degassed and the appropriate certificate issued (Reference 11).

3. SECONDARY CONTAINMENT

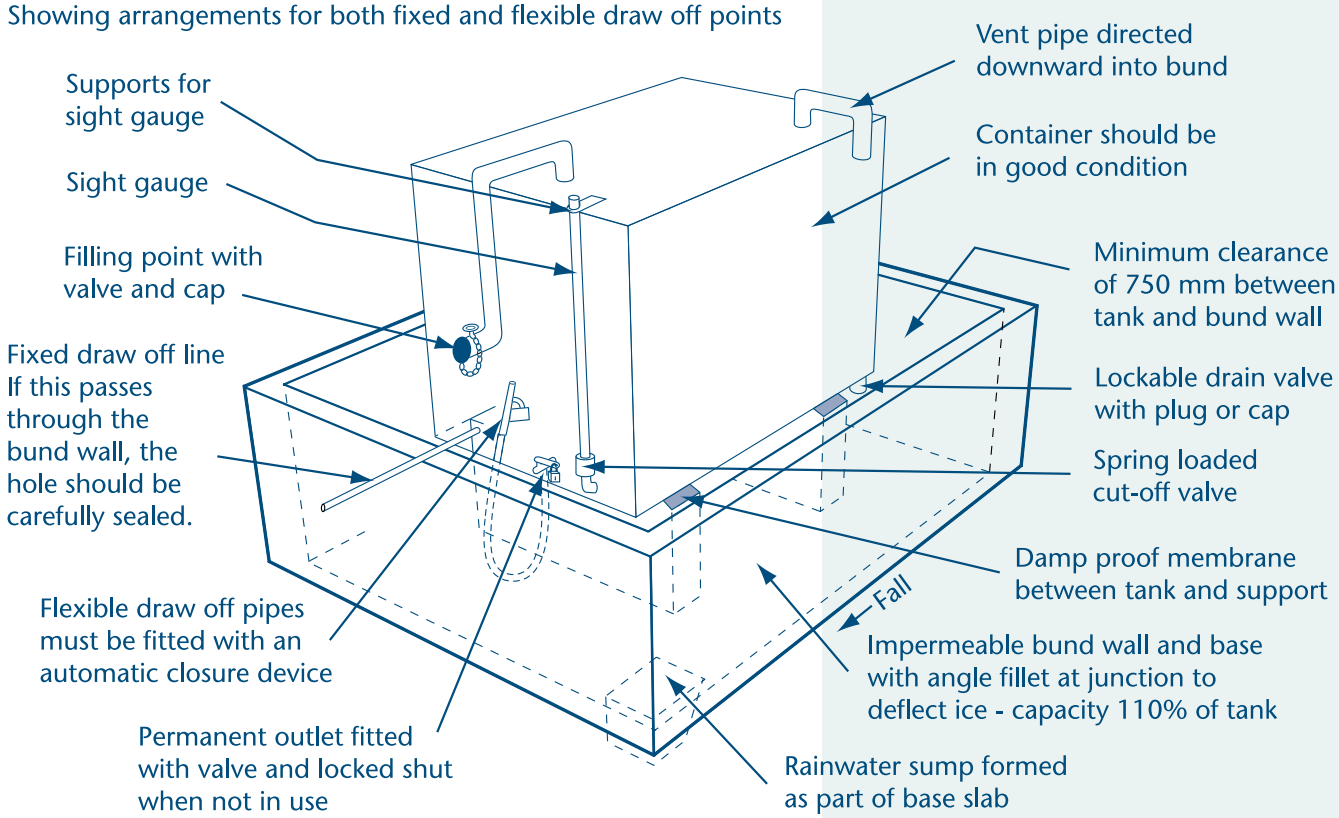
Secondary containment will prevent oil escaping to the environment in the event of leakage from the tank or ancillary equipment. All tanks and their ancillary equipment should be situated within an oil-tight secondary containment system such as a bund. The potential escape of oil beyond the bund area by jetting should be considered (see Reference 12). The risk of this can be minimised by:

- keeping the primary container as low as possible
- increasing the height of the bund wall
- building the bund as far away from the tank as possible

For illustration purposes, Figure 1 gives details of a storage tank installation, showing both fixed and flexible draw-offs. 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 Bunded 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. 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 this is unavoidable, the pipe should be sealed 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 13 and 14) 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 their total capacity, whichever is the greater.

The 10% margin is intended to take into account a range of factors. These include:

- loss of the total contents, for example due to vandalism or 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.

Construction Industry Research and Information Association (CIRIA) research (Reference 12) involving tanks of 25m^3 or less suggests that the 10% safety margin is inadequate in some circumstances to provide protection from loss of oil due to these factors. 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 level of oil retained within the bund. See Appendix B for further details.

The choice of method for calculating bund capacity depends on the site's sensitivity to 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

Any valve, filter, sight gauge, vent pipe or other ancillary equipment should be situated within the secondary containment system and arranged so that any discharges of oil are contained. A filter or isolating valve fitted in a gravity feed to protect the draw off pipe or down stream equipment is not considered to be ancillary to the container. But if possible these should be located within the secondary containment. To prevent the risk of the tank contents draining from a leak in a gravity feed system, top outlet draw-off pipes are preferred where possible.

a. Measurement of tank contents

An adequate means of measuring the quantity of oil within the tank should be provided. The use of electronic gauges and high level alarms is strongly recommended. Dipsticks should be calibrated properly and only used in the tank for which they are intended. Sight gauges should be supported properly and fitted 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, then they should be in a prominent position and checked regularly for accuracy. The tank maximum fill capacity should be set at no more than 95% of the brimfull capacity.

b. Deliveries

A notice giving details on safe delivery procedures and what to do in an emergency should be sited at the delivery point – an appropriate self adhesive notice is available from the Agencies. Fill pipes should be located within the confines of the secondary containment system. Extended fill pipes may retain oil following the delivery and should be fitted with a shut-off valve. Fill pipes should have a 50 mm diameter threaded connection, a lockable fill cap with a chain and be marked clearly with the product type, tank capacity and tank number.

Where a fill pipe is outside the containment system, a drip tray of an adequate capacity to contain the contents of the fill pipe should be used to catch any oil spilled during delivery. If a serviceable screw fitting or other fixed coupling is available, it should be used when filling the tank.

Remote fill points are not recommended; where unavoidable, they should comply with BS799: Part 5 (Reference 8) or OFS T100 or T200 (References 10 and 9) as appropriate. An automatic overfill prevention device should be fitted 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 15).

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, separate fill pipes should be provided for each tank.

d. Vent pipes

Air vent pipes should, where possible, be positioned so that they can be seen easily during delivery (see Section 4b) and should not be smaller than the inlet pipe. Vent pipes should be contained within the secondary containment system and arranged 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 non-return valve in its feed line
- protected from unauthorised use.

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

f. Fixed pipework

All pipework should be properly supported and pipework should be sited 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 16) as applicable. Fill pipes, draw-off pipes and vent pipes should be positioned away from any vehicle traffic to avoid collision damage. Pipework should be adequately protected against corrosion and insulated to guard against frost damage.

g. Underground pipework

The route of underground pipework should be clearly marked and adequately protected from physical damage such as that caused by excessive surface loading, ground movement or ground disturbance (see Reference 17). If mechanical joints have to be used, they should be readily accessible for inspection under a hatch or cover. Underground pipework should have adequate facilities for detecting leaks. Continuous leak detection devices should be maintained in working order and tested 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

Flexible pipes and fittings for filling vehicles and other similar tanks should comply with BS EN 1360:1997 (Reference 18). They should be fitted with a tap or valve at the delivery end, which closes automatically when not in use. Unless the pipe is fitted with an automatic shut-off device, it must not be possible to fix the tap or valve in the open position.

A flexible pipe should have a lockable valve where it 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

All bunds, tanks and pipework should be inspected regularly for signs of damage and checked at least weekly. To ensure the bund retains its integrity, any defects in the bund wall or lining should be repaired promptly using the appropriate technique. Damage to the tank or pipework should be dealt with immediately (Reference 19). Any condensation water that accumulates within the tank should be drawn off regularly and disposed of.

Although rainwater will often evaporate from within an open bund in some areas, 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 and should be inspected and repaired as appropriate. If there is a need to remove accumulated rainwater, this should be performed with a manually operated pump or by baling from the sump. This water may be contaminated and should be disposed of via a registered waste carrier. In the long term, it may be more cost-effective to roof the facility.

Bunds should not be used to store materials or wastes as this will reduce their capacity. Any accumulated oil or debris should be removed and disposed of properly.

In all cases where wastes are removed, the waste producer is obliged under the Duty of Care (Reference 20) to ensure that the waste contractor removing the waste is a registered waste carrier and that the waste is disposed of properly. Waste contaminated with oil may be designated as a "special waste", for which a rigorous consignment note system applies.

6. SECURITY

Oil storage areas should be as resistant as possible to unauthorised interference and vandalism. Any permanent taps or valves through which oil can be discharged from the tank to open areas should be fitted with a lock **and** be locked shut when not in use. Where appropriate, a notice should be displayed 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.

7. DEALING WITH SPILLS

Users are advised to consider the risks of a spillage and to prepare a contingency plan (see PPG21-Reference 21). It may be advisable to keep a stock of absorbant materials (e.g. sand, earth or commercial products) on site to deal with spillages.

If a spill should occur, immediate action should be taken to contain the oil to prevent it entering any drains or watercourses. Notify the Agency by calling the Emergency Hotline on 0800 80 70 60. Do not hose the spillage down or use any detergents.

8. REFERENCES

1. Oil storage regulations leaflet: Environment Agency
2. Guidance note for the Control of Pollution (Oil Storage) (England) Regulations 2001: DEFRA, Tel: 0870 1226 236
3. PPG26: Storage and handling of drums and intermediate bulk containers
4. Review of proprietary prefabricated oil storage tanks, RP603: 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
   Silage, slurry and agricultural fuel oil leaflet, SEPA
7. Code of good agricultural practice for the protection of water: Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency
   Code of good practice for the prevention of environmental pollution from agricultural activity: Scottish Executive Rural Affairs Department, Tel: 0131 556 8400
   'Water - preventing pollution', series of 11 leaflets: Department of Agriculture for Northern Ireland
8. BS 799: Part 5 Oil burning equipment: British Standards Institution (BSI)
9. OFS T200 Oil firing equipment standard – steel oil storage tanks and tank bunds for use with distillate fuels, lubrication oils and waste oils (2001): OFTEC
10. OFS T100 Polyethylene oil storage tanks and bunds for distillate fuels: OFTEC
11. H&S guidance note CS15: Cleaning and gas freeing of tanks containing flammable residues, ISBN 0-11-883518 1
12. Construction of bunds for oil storage tanks, RP 163: CIRIA
13. Concrete bunds for oil storage tanks: Agencies/CIRIA
14. Masonry bunds for oil storage tanks: Agencies/CIRIA
15. PPG3: The use and design of oil separators in surface water drainage systems
16. BS 5410: Part 1 Code of practice for oil firing: BSI
17. Installing oil supply pipes underground: Technical information Sheet TI/134: OFTEC
18. BS EN 1360:1997 Rubber hoses and hose assemblies for measured fuel dispensing. Specification: BSI
19. Oil storage tank and supply pipework maintenance: Technical information Sheet TI/120: OFTEC
20. Waste management, the Duty of Care, A code of practice (revised 1996), ISBN 0-11-753210X: The Stationery Office, Tel: 08706 005522
21. PPG21: Pollution incident response planning

References 3, 5, 13, and 14, 15 and 21 are available from the Agencies.

References 4 and 12 are available from CIRIA, Tel: 020 7222 8891

References 8, 16 and18 are available from BSI, Tel: 020 8996 7000

References 9, 10, 17 and 19 are available from OFTEC, Tel: 01737 373311

Appendix A

Checklist for oil storage tanks

Completing this checklist will help you decide whether you need to improve your oil storage facilities.

General requirements	✔or ✗	**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 ✗	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 (*if significant*) 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.

Appendix B

CIRIA alternative method for calculating bund capacity.

This method makes allowance for:

a. Volume of oil

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

b. Rainfall

This component depends on the likely rainfall for the area. 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 m^3 (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

All the Agencies' pollution prevention guidance notes are available on the web sites listed below.

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

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