SEPA scottish environment protection agency

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 should be complied with in order to reduce the risk of causing oil pollution. The guidelines are jointly produced by the Environment Agency for England and Wales, the Scottish Environment Protection Agency and the Environment & Heritage Service in Northern Ireland, referred to as the Agency or Agencies. Consultation with your local Agency office is advisable. Contact details will be found at the end of these guidelines.

1. GENERAL

All tanks, pipework, gauges and structures should be constructed to recognised engineering standards and in accordance with the appropriate British Standard or OFTEC Standard (See Reference 1). Installation should comply with the British Standard Code of Practice or other statutory requirements. (For further details on the construction of Bunds see References 2-4). Planning permission may be required for tank installation and bund construction. Figure 1 gives outline details of a typical storage tank installation, showing both fixed and flexible draw-offs.

It is recommended that all new installations comply with these guidelines. For existing storage facilities which do not comply, it is best to talk to local Agency staff before undertaking work and possibly making expensive mistakes. These guidelines do not cover mobile bowsers, although many of the principles will apply. The Agencies are undertaking research on mobile bowsers and proprietary tank systems (see section 6) which will result in specific guidance.

Careful consideration should be given to tank location taking into account the need for safety, security, access for deliveries and maintenance. It should be sited as far as possible from any watercourse or drain into which spilt oil could enter, and normally not less than 10 metres. Storage at or above roof level should be avoided.

2. THE STORAGE TANK

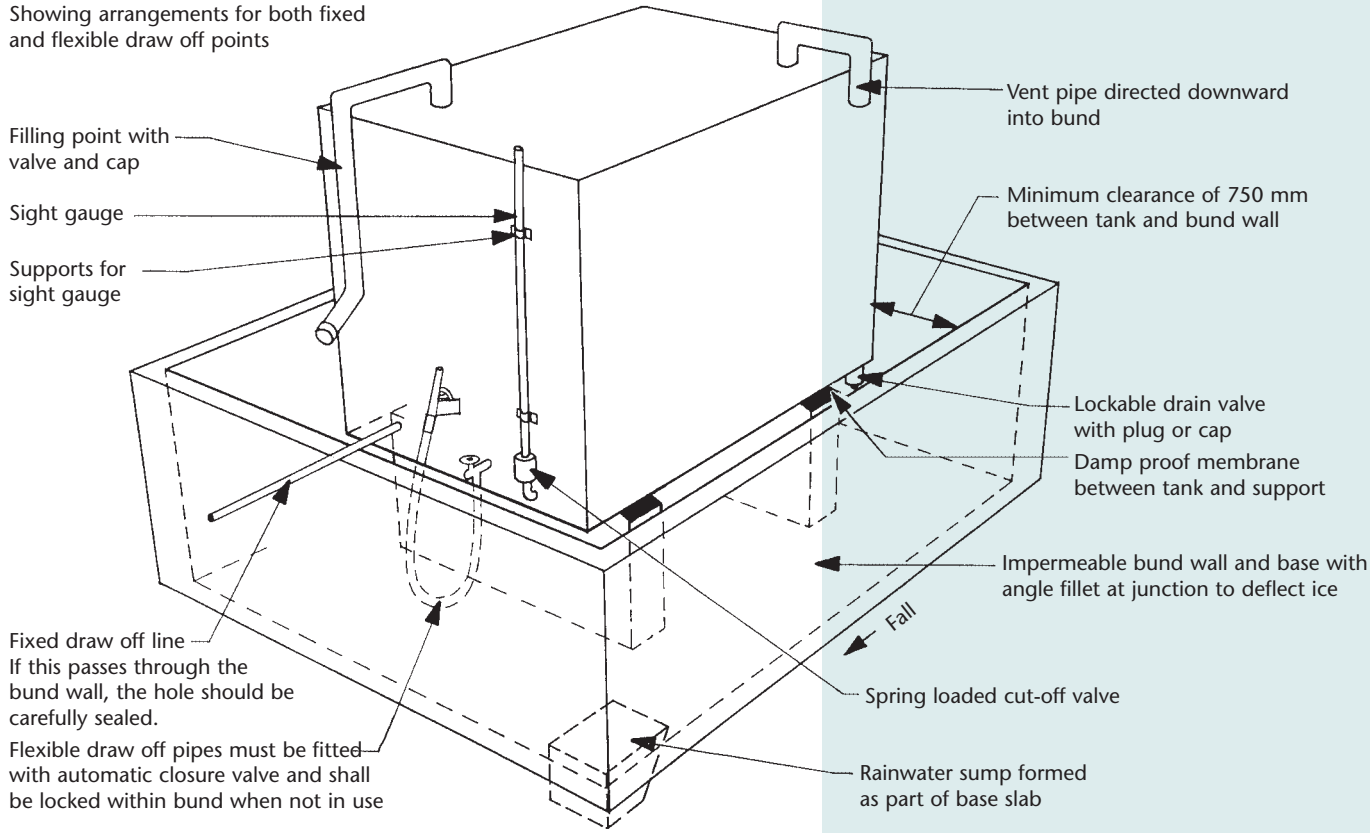
Storage tanks should be type tested to a recognised standard and produced to that standard under a quality assurance system complying with ISO 9001 or 9002. Steel tanks should comply with BS 799 : Part 5 (Reference 5). Polyethylene tanks should comply with OFS T100 (Reference 1).

a. Corrosion protection

Steel tanks should be protected against corrosion. Water from within the tank should be drawn off regularly and steel valves used to prevent frost damage. This water will be contaminated and should be disposed of with care to ensure that no pollution occurs. If in doubt, contact the Agency. The tank should be situated within an oil tight bund and, in order that it can be inspected externally for corrosion or leaks, a minimum distance of 750mm between the tank and the bund wall and 600mm between tank and base is recommended where possible.

BUNDED OIL TANK

Showing arrangements for both fixed and flexible draw off points



b. Tank marking

The tank should be marked with the product type and tank capacity. It is recommended that a notice giving details on safe delivery procedures and what to do in an emergency is sited at the delivery point (a self adhesive notice dealing with this is available from the Agencies). Every part of the tank should be within the bund, including all valves, taps, filters, vent pipes and the filling point.

c. Overfill alarm

The provision of an overfill warning device is strongly recommended (see Section 8).

3. THE BUND

a. General

A bund provides containment for any loss of oil from the storage tank and associated pipework. It should consist of a base and surrounding walls which must be constructed of, or lined with, a material impermeable to the oil stored. Ideally, pipework should not pass through the bund wall. However, if this is unavoidable, the material used for sealing around the pipe must be resistant to attack by the oil stored and the overall integrity of the bund should not be compromised.

b. Rainwater

Although in some areas rainwater will often evaporate from within the bund, a collection sump should be included in the base. If there is a need to remove accumulated rainwater, this should be done with a manually operated pump or by baling from the sump. This water may be contaminated and should be disposed of with care to ensure no pollution occurs. If in doubt about this, contact your local Agency office for advice (see also Sections 3c on roofing the bund and 5 on maintenance).

There must be no outlet directly connecting the bund to any drain, sewer or watercourse or discharging onto a yard or unmade ground.

c. Capacity

There are two acceptable methods for calculating bund capacity. Normally, the capacity of the bund has been calculated to give containment for 110% of the total volume for single tanks and hydraulically linked tanks. Where two or more tanks are installed within the same bund, 110% of the largest tank or 25% of the total capacity of all tanks, whichever is the greater, is used.

The 10% margin is intended to take into account a range of factors, including loss of the total contents due to vandalism, sudden tank failure or leaks, overfilling, containment of fire-fighting agents, overtopping caused by surge and wave action (dynamic factors) following tank failure and an allowance for rainwater in the bund.

However, following research by the Construction Industry Research and Information Association (CIRIA) for tanks of 25m^3 or less, it has been suggested that in some circumstances this approach does not provide an adequate safety margin to give protection from loss of oil due to the factors noted above (Reference 2). 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. The alternative method makes allowance for:

i. Volume of oil

The capacity of the bund should be calculated using the maximum storage capacity of the tank or tanks.

ii. Rainfall

This component is dependent on the likely rainfall for the area. Britain can be divided into 6 zones (see Appendix A) for this purpose and the allowance for rainfall calculated accordingly - see Table 1. In high rainfall areas, or where disposal of the contaminated rainwater is difficult, the cost savings may be sufficient to justify erecting a roof over the bund to exclude rainfall altogether and so eliminate the need to dispose of potentially contaminated rainwater.

iii. Fire fighting agents

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

iv. Dynamic factors

A freeboard of 250mm 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. Assuming that the bund is inspected and cleared of rainwater weekly, the calculations give a range of freeboards as shown in Table 1 below:

Table 1 Recommended freeboard for oil tank bunds.

Rainfall Zone (See appendix A)	1 driest	2	3	4	5	6 wettest	Covered Bund
	FREEBOARD (in mm)						
Dynamic factors	304	315	345	370	481	538	250
non dynamic factors	154	165	195	220	331	388	100

The decision about which method to choose for calculating bund capacity depends on site sensitivity with regard to water pollution. In low risk situations, bunding using the 110% principle may be adequate but where tanks are sited in higher risk locations, the alternative method is recommended. If you are in any doubt about the sensitivity of a site please consult your local Agency office.

An example of the difference in bund freeboard height for a standard 2.27m^3 rectangular primary storage tank using the two different methods is shown in Appendix B.

4. BUND CONSTRUCTION

The use of un-reinforced materials is **not** recommended for bund wall construction. Detailed specifications and drawings for bunds of reinforced construction using concrete, bricks and blocks are available (References 3 & 4) and should be referred to for specific advice. The bund should not have any damp proof course.

5. MAINTENANCE

Bunds, tanks and pipework should be inspected regularly for signs of damage and should be checked at least weekly. Any accumulated rainwater, oil or debris should be removed and any defects to the bund wall or lining should be repaired promptly using the appropriate technique to ensure the bund retains its integrity. Damage to the tank or pipework should be dealt with immediately. (See also Reference 6)

6. PROPRIETARY TANK SYSTEMS

A range of prefabricated proprietary tank systems are available in either steel or plastic. However, terms such as double skinned or integrally bunded tanks may be confusing. There is no British Standard for prefabricated steel tank systems. Prefabricated polyethylene tank systems should comply with OFS T100.

Before Purchasing, it is important to establish from the supplier/ manufacturer what degree of protection is afforded against loss of oil from overfilling, primary tank leak or failure, unauthorised use, vandalism, corrosion, material degradation, leaking valves, gauges or pipework, dispensing activities and physical damage. Some systems do not offer the total secondary containment that a conventional, in-situ constructed bund provides and may be no more than an inner tank connected to an outer skin. These systems could therefore be regarded as “high specification primary storage tanks” rather than bunded installations providing adequate secondary containment as detailed in this guidance note.

The use of these proprietary systems may be acceptable in certain situations - contact your local Agency office for advice. Where they are installed the following should be noted:

a. provision of collision protection may be necessary.
b. it is a minimum requirement that surface water drainage from refuelling areas should pass through an oil separator (see Reference 7 for further details)
c. flexible dispensing pipes and filling pipes should be contained in a vandal resistant cabinet if not otherwise contained within the bund. It is recommended that all fill and draw off pipes should be taken through the top of the tank rather than passing through the outer wall.
d. the tank should be fitted with an overfill prevention device.

You should be aware that **the Agencies do not endorse or approve** any of these proprietary systems or any particular manufacturer’s products.

Specific regulations apply for agricultural fuel oil (Reference 8), the requirements of which may not be fulfilled by some of these systems. For further guidance see Reference 9.

7. PIPEWORK

All pipework should be sited above ground where possible, in order to make inspection and repair easier. The pipework should also be protected against corrosion; insulated to guard against frost; be effectively supported and safeguarded against damage. Where a pipeline has to be laid underground it should be resistant to corrosion and placed in a protective sleeve or a duct with open grating covers for inspection purposes.

The route of underground pipework should be clearly marked and protected from mechanical damage, excessive surface loading and ground movement or disturbance. Such pipelines should be subjected to regular inspection and periodic pressure tests to check their integrity.

a. Fill pipes

Separate fill pipes should be provided for each tank unless the tanks are interconnected by a balance pipe of greater flow capacity than the fill pipe. The fill pipes should have a 50mm diameter threaded connection and should be clearly marked with the product type, tank capacity and a tank number where more than one tank is involved. They should also be located within the confines of the bund and be fitted with a suitable lockable fill cap with chain.

Remote fill points are not recommended, but where unavoidable they should comply with BS799: Part 5 (Reference 5) or OFS T100 as appropriate and an overfill alarm should be fitted. Surface drainage from such areas should pass through a suitably sized oil separator of an approved design (see Reference 7).

b. Draw off pipes

Pipes used for supplying oil to fixed appliances should comply with the requirements of BS 5410 : Part 1 or 2 (Reference 10) as applicable.

Flexible pipes and fittings for filling vehicles and other similar tanks should comply with BS3395 (Reference 11). They must be fitted with an automatic closure valve and locked within the bund when not in use.

Pump sets sited outside the bund should, where possible, be fitted with a non return/check valve installed in the feed line. For detailed guidance on the drainage of fuelling areas see Reference 12.

c. Vent pipes

Air vent pipes should, where possible, be positioned so they can be seen easily during delivery. They should not be smaller than the inlet pipe, should be well supported and directed so that any discharge from them (eg. in the event of the tank being overfilled) passes into the bund (see References 1,4 & 10).

8. TANK CONTENTS MEASUREMENTS

a. An adequate means of measuring the quantity of oil should be provided. The use of electronic gauges and high level alarms is strongly recommended.

b. Dip sticks should be properly calibrated and only used in the tank for which they are intended.

c. If used, sight gauge tubes should be well supported and fitted with valves which are resistant to unauthorised interference and vandalism. The valve should automatically return to the off position when level readings are not being taken.

d. Dial gauges, where fitted, should be in a prominent position and regularly checked for accuracy.

9. VALVES OR COCKS

a. These should be as resistant to unauthorised interference and vandalism as possible, with lockable or removable hand wheels.

b. They should be of steel and arranged so that there can be no discharge outside the bund wall. They should be marked to show whether they are open or closed, kept locked when not in use and fitted with a blanking cap or plug.

c. Where appropriate, a notice should be displayed requiring that valves and trigger guns be kept locked when not in use.

10. DEALING WITH SPILLS

Where oil is stored on industrial and commercial sites, it is recommended that the risks of a spillage are considered and a contingency plan prepared. It is advisable to keep a stock of absorbant materials (e.g. sand or earth) and commercially available booms on site to deal with spillages. If a spill should occur, immediate action should be taken to contain the oil to prevent it from 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.

11. REFERENCES

1. OFS T100 Polyethylene Oil Storage Tanks and Bunds for Distillate Fuels:
OFTEC (Oil Firing Technical Association for the Petroleum Industry),
Telephone 01737 373311

2. Construction of bunds for oil storage tanks, Report 163:
CIRIA (Construction Industry Research and Information Association)
Telephone 0171 222 8891

3. Concrete bunds for oil storage tanks: Environment Agency/CIRIA

4. Masonry bunds for oil storage tanks: Environment Agency/CIRIA

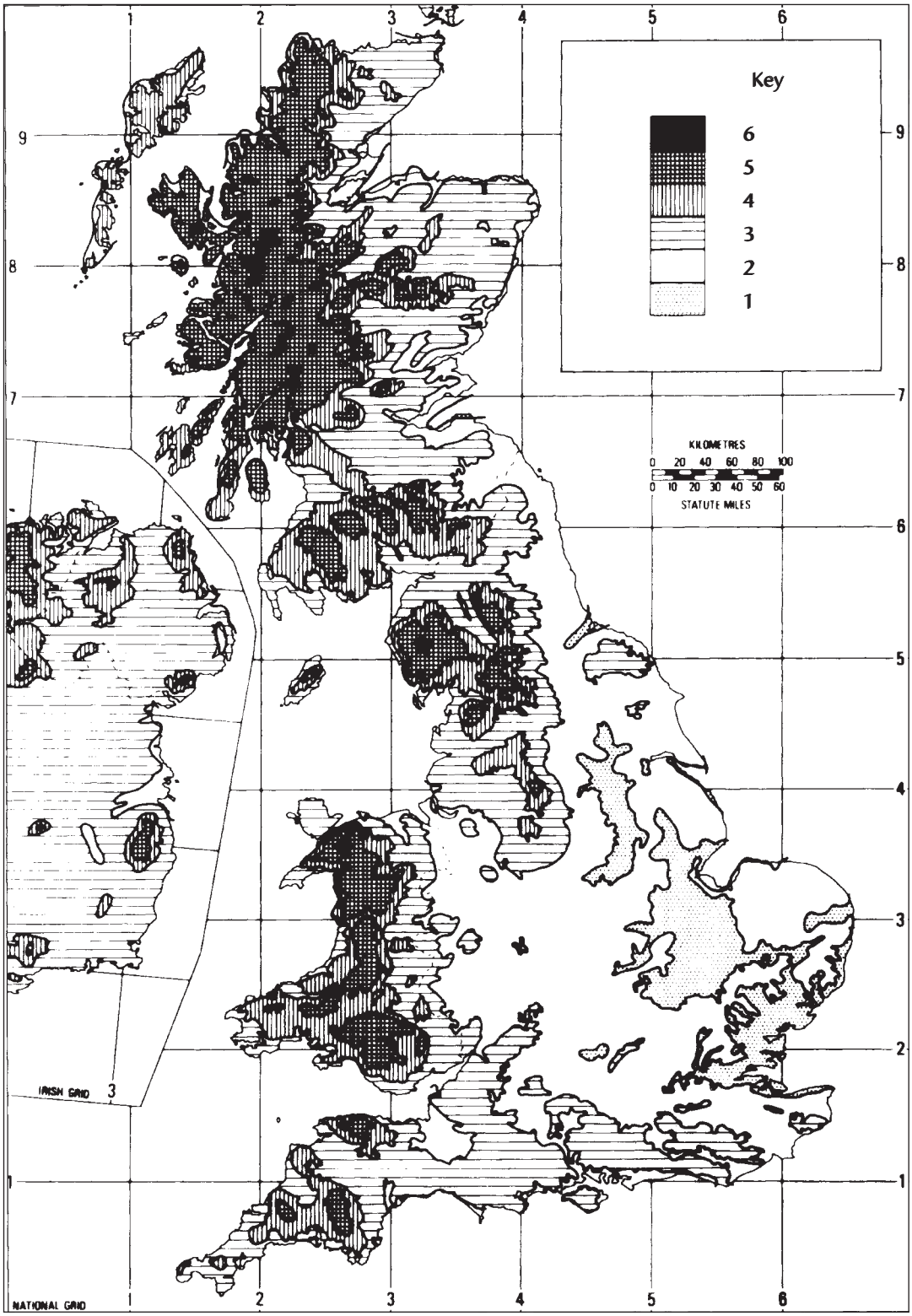
5. BS 799 : Part 5 Oil burning equipment: British Standards Institution
Telephone 0181 996 7000

6. Oil storage tank and supply pipework maintenance: Technical information sheet TI/120; OFTEC, Telephone 01737 373311

7. PPG3: The use and design of oil separators in surface water drainage systems

8. The Control of Pollution (Silage, Slurry & Agricultural Fuel Oil) Regulations 1991 for England and Wales. (In Scotland The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil (Scotland) Regulations 1991)

Appendix A



Region	Standard Annual Average Rainfall (mm)	Rainfall depth (mm) 10 year return period	
		24 hour duration	8 day duration
1	< 600	29	54
2	600 - 800	32	65
3	800 - 1200	41	95
4	1200 - 1600	52	120
5	1600 - 3200	88	231
6	> 3200	106	288

9. Code of Good Agricultural Practice for the Protection of Water: Ministry of Agriculture, Fisheries and Food and the Environment Agency
Code of Good Practice for the Prevention of Environmental Pollution from Agricultural Activity: Scottish Office Agriculture, Environment and Fisheries Department
Water - Preventing Pollution, series of 11 leaflets: Department of Agriculture for Northern Ireland

10. BS 5410 : Part 1 Code of practice for oil firing: British Standards Institution
Telephone 0181 996 7000

11. BS 3395:1989 Specification for Electrically Bonded Rubber Hoses and Hose Assemblies for Dispensing Petroleum Based Fuels: British Standards Institution
Telephone 0181 996 7000

12. PPG7: Fuelling stations: Construction & Operation

References 3,4,7, and 12 are available, free of charge, from the Agencies.

Appendix B

An example of the difference in bund freeboard for a standard retangular 2.27m^3 (base 1.83m x 1.22m) tank using the 110% principle and the alternative method for calculating bund capacity. In both cases a distance of 750mm between tank and bund wall is allowed for inspection access.

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

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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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