

Bunding and spill management

Updated June 2007*

EPA 080/07: This guideline applies to facilities that use or store liquids above ground, and provides information on bunds or spill containment systems to minimise the risk of environmental harm from liquid spills and leaks.

Introduction

Bunding should be used for the storage of all liquids except rainwater. All operators working with bunds should know how to carry out preventive maintenance and use standard operating procedures to stop escaping substances from entering the environment.

Legislation

The principal legislation addressing pollution in South Australia is the *Environment Protection Act 1993* (the Act). In particular, Section 25 imposes the general environmental duty on all persons undertaking an activity that may pollute to take all reasonable and practicable measures to prevent or minimise any resulting environmental harm.

The new *Environment Protection (Water Quality) Policy 2003* (Water Quality Policy) offers the most specific protection for the state's waters. It prohibits the pollution of the stormwater system and our natural waters. The Water Quality Policy has general obligations with which every person, business and industry must comply, as well as specific obligations for particular activities. Failure to comply with any of these obligations may result in the issue of a \$300 fine, environment protection order, and/or prosecution.

Clause 17 of the Water Quality Policy states that a person must not discharge or deposit a pollutant listed in Schedule 4 of the Policy into any waters or onto land where it might enter any waters. The pollutants listed in Schedule 4 include:

- agricultural chemicals
- cleaning agents

* Updates to *Bund heights and tank distance from wall* and *Common problems observed with bunds*.

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- detergents and their byproducts
- engine coolant
- fuel dispensing area washwater
- motor vehicle servicing or repair waste
- oil, grease, lubricants and petroleum products
- photographic chemicals
- rubbish
- solvents.

For more information on the Water Quality Policy, visit the South Australian Environment Protection Authority (EPA) website <www.epa.sa.gov.au> or telephone (08) 8204 2004.

Where applicable, the construction of bunds must comply with the requirements of the *Dangerous Substances Act 1979*, and with standards published by Standards Australia for a number of classes of dangerous substances.

What is a bund?

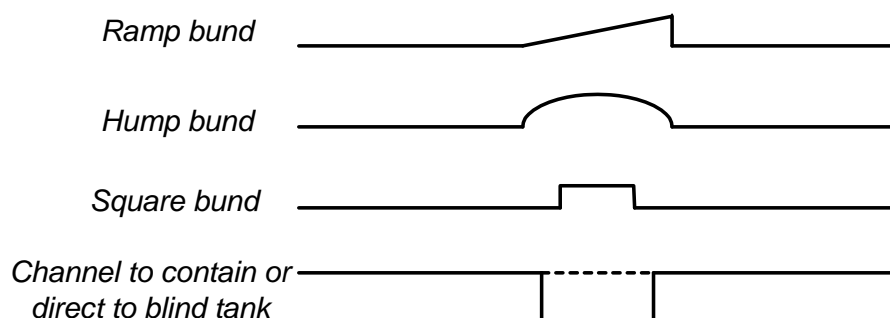
A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound and provides a barrier to retain liquid. Since the bund is the main part of a spill containment system, the whole system (or banded area) is colloquially referred to within industry as the 'bund'. The bund is designed to contain spillages and leaks from liquids used, stored or processed above ground, and to facilitate clean-up operations. As well as being used to prevent pollution of the receiving environment, bunds are also used for fire protection, product recovery and process isolation.

Type of facility

The requirement for bunding should be determined on a site-by-site basis. Facilities that should have banded areas include:

- storage facilities for chemicals, pesticides or petroleum
- electrical transformers containing oil and/or PCBs
- facilities used to transfer stored liquids (such as transport facilities)
- drum storage areas, either temporary or permanent
- processing areas
- wineries, breweries and milk processing plants
- any other facilities that store substances other than water or uncontaminated stormwater
- any other locations where spills are common, including transfer points, workshops, factories, service stations, wash bays, and other areas in which a material is transferred from its container.

There are several different types of bunds:



Designing and constructing bunds

Some general rules should be followed when designing and constructing bunds; the two diagrams below illustrate many of the points that should be incorporated into bund design.

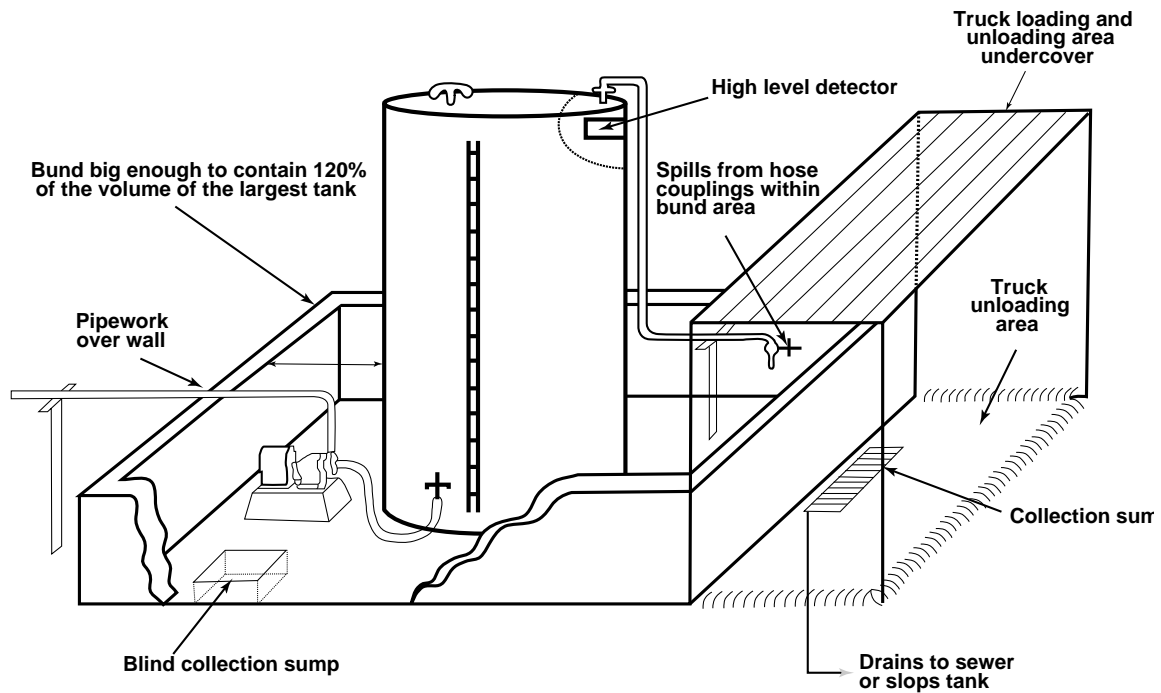


Figure 1 Example of bunding for bulk liquid storage tanks (adapted from Victorian and NSW EPA)

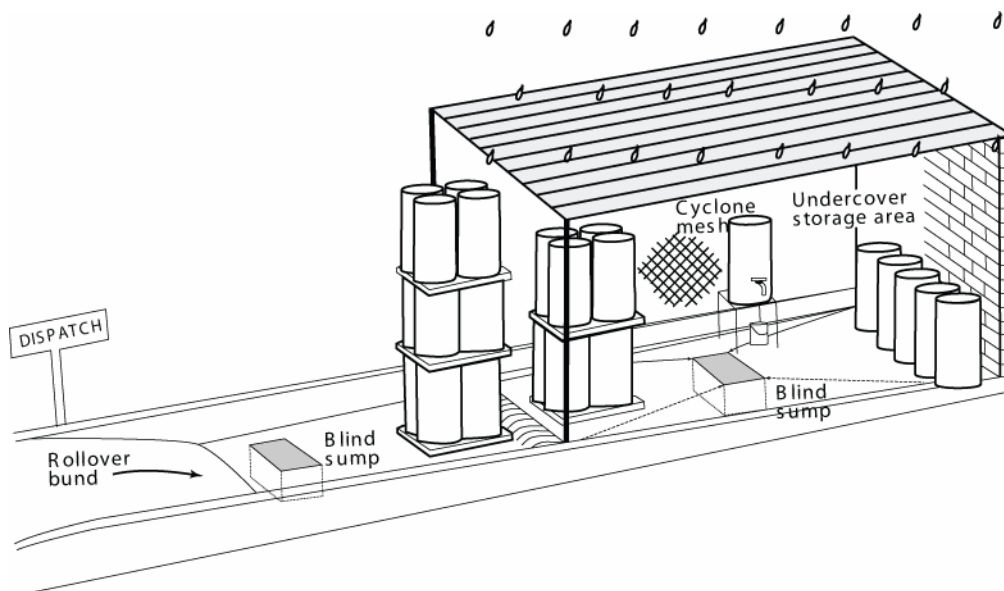


Figure 2 Example of bunding for drums and containers (adapted from Victorian and NSW EPA)

Approvals

Before any work starts on the construction of bunds, consider whether the local planning authority should be approached for necessary approvals.

Net capacity of the bund

The net capacity of a bunded compound in a storage facility must be at least 120% of the net capacity of the largest tank. Take into consideration the capacity displaced by other tanks within the same bunded area and any foundations. Treat interconnected tanks as a single tank of equivalent total volume for the purposes of the bund design criteria.

For flammable liquids, bund capacity should be at least 133% of the net capacity of the largest tank. For the storage of any flammable materials, refer to Australian Standard 1940 *The storage and handling of flammable and combustible liquids*, and to the *Dangerous Substances Act 1979*. If an automatic fire sprinkler system is installed in or over any bunded tank or drum storage compound, the capacity of the bund should be increased either by a volume equal to the output from the sprinkler system for a period of at least 20 minutes, or to 133% of the capacity of the largest tank, whichever is greater.

Packaged storage

If the material to be bunded is contained in drums (or other small containers), the bunded area must contain at least 25% of the total volume of the stored products. In addition, provide for the containment of firewater on-site by designing and constructing adequate drainage controls, and by formulating emergency response plans.

Materials used for bunding

The bund floor and wall must be built of materials impervious to the contents of any tank or container within the bund. It should be of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in ordinary use, and should not have a damp course. The use of un-reinforced materials is not recommended for bund wall construction.

The bunded area must be capable of preventing the migration of any spillage or leakage to the surrounding environment. Earthen bunds are not recommended, except where there is no other viable alternative.

Bund heights and tank distance from the wall

Wall-type bunds at tank storage facilities should be from 0.5 m to 1.5 m high, depending on the required containment capacity and the distance to the tank—the closer the wall to the tank, the higher the wall has to be. The distance between the tank and bund walls must be at least 1 m. If the bund walls are more than 1 m above the compound floor, provide steps or ladders for quick escape. For bund walls close to the tank or higher than 1.5 m, apply the rules for confined spaces. If vehicles will need access to the bunded area, use ramps, a change in grade, or speed humps to maintain an effective bund height.

Designers should consult *AS 1940–1993 Figure 5.2* to ensure that bund wall heights between bund walls and tanks are adequate where inventories are elevated.

Storage of liquid classed as a dangerous substance

If the liquid to be stored is classed as a dangerous substance, make an allowance for the trajectory of a liquid leak, assuming a full tank with an elevated point of leakage. You might need to install a splatter shield, or have a generous distance between the tank and the bund wall; half the height of the tank would be appropriate.

Drainage

A collection sump must be provided in the bund floor to make it easy to remove liquids, and the floor must be graded in such a way that liquids collect in the sump. The sump must not be connected to stormwater or sewer drainage systems—it is only a collection point

from which to pump out the liquid; there must be no access to the stormwater system within the bund. Bund drain valves must not be installed, and the pump controls must be outside the banded area. Although rainwater will often evaporate from within an open bund, if there is no rainwater in the bund after heavy rainfall the bund may not be properly sealed and should be inspected and repaired as appropriate.

Removal of accumulated rainwater should be done with a manually operated pump or by baling from the sump. This water may be contaminated and must not be disposed of to the stormwater drainage system. Options for the treatment and disposal of this water are:

- re-use on site
- off-site disposal by an authorised liquid waste contractor
- disposal to a sewer with SA Water Trade Waste approval, or to a septic tank effluent disposal scheme (STEDS).

Piping and pumping facilities

Piping and pumping facilities must be arranged so that no leaks can escape the confines of the bund, and so that the pumps will still operate when the bund is full of liquid. All pipework should go over the bund walls, not through them. All valves, filters, sight gauges, vent pipes and other ancillary equipment should be situated within the bund and arranged so that discharges are contained.

All pipework should be sited above ground and properly supported to make inspection and repair easier. Fill pipes, draw-off pipes and vent pipes should be positioned away from vehicle traffic to avoid collision damage.

Roof design

If possible, provide a roof to stop rainwater entering the bund. Make sure that the roof will not cause a build-up of dangerous or poisonous gases, or restrict the application of water in an emergency.

Incorporate an overhang, 12 degrees from vertical, to help stop rain entering the bund from the side. Professional risk assessment and planning processes should be done on a case-by-case basis; they should explore the options of roofing or of safely disposing of rainwater that might collect in an open bund.

Temporary storage

It is sometimes acceptable to store drums temporarily on spill containment pallets. Each pallet should be capable of capturing the contents of at least one of the drums if there is a leak. If these pallets are to be used, the drums must be stored in a level area (to ensure full spill storage capacity), and they must be covered so that the pallets do not fill with rainwater.

Temporary bunding arrangements should ensure that there is only localised contamination in the event of a spill. An example of temporary bunding is that needed for storage of fuel during forestry or mining operations.

Operation and maintenance of bunds

Testing and disposing of bund water

When the bund needs to be emptied it must be pumped or baled out by a licensed waste contractor, or by an approved method to a sewer, never emptied through a drain valve or disposed of to stormwater. The Trade Wastes section of SA Water should be contacted to determine an acceptable disposal method.

Contaminated water must be disposed of at a liquid waste disposal facility, or treated to an acceptable level for discharge to the sewer, with the permission of the responsible authority.

General maintenance**Common problems observed with bunds**

All bunds should be routinely inspected to ensure maintenance of their integrity. A routine inspection and maintenance program must be tailored to suit the specific installation; common problems that have been observed by the EPA are listed below:

- 1 Chemical resistant linings on bunds have been damaged.
- 2 Stormwater has been allowed to accumulate in bunds thereby reducing the effective volume.
- 3 Spills of material stored within the bund have been allowed to accumulate in bund thus reducing the effective volume.
- 4 Spills of acidic material stored in concrete bunds have been allowed to accumulate resulting in chemical attack leading to loss of bund integrity.
- 5 The flexible joints between concreted sections have shrunk resulting in gaps in the bund.
- 6 Concreted sections have been poured without any jointing material between them resulting in gaps in the bund.
- 7 Concrete bunds have cracked due to movement or damage from mobile plant.
- 8 Besser blocks have been used to build a bund (the porosity of besser blocks and the large number of mortar joints result in a low integrity bund).
- 9 Pipework has been installed through bund walls or floors without any specific design provision to isolate the bund from pipework movement.
- 10 The bund has been installed with stormwater drainage holes (or valves) in the walls.
- 11 An earthing system has been installed through the bund walls.
- 12 Material such as pallets or drums has been stored in the bund.
- 13 Bunds have been used as a rubbish dump.
- 14 A bund has been used as a process vessel.
- 15 Pipes, pipe fittings such as valves or flanges, or hoses have been installed on top of or outside bund walls.

Further reading

The following standards are available from Standards Australia—telephone 131 242; fax 1300 65 49 49; email <sales@sai-global.com>; website <www.standards.org.au>.

- AS 1940–1993 *The storage and handling of flammable and combustible liquids*
- AS 4326–1995 *The storage and handling of oxidising agents*
- AS 4081–1993 *The storage, handling and transport of liquid and liquefied polyfunctional isocyanates*
- AS 2714–1993 *The storage and handling of hazardous chemical materials—Class 5.2 substances (organic peroxides)*
- AS 3780–1994 *The storage and handling of corrosive substances*
- AS 2507–1984 *The storage and handling of pesticides*
- AS 2865–1986 *The safe working in a confined space*
- AS/NZS 4452–1997 *The storage and handling of toxic substances*
- AS/NZS 5667.1:1998 *Water quality sampling*.

Relevant legislation and policies that should be consulted are:

- *Environment Protection Act 1993*
- *Environment Protection (Water Quality) Policy 2003*
- *Water Resources Act 1997*
- *Dangerous Substances Act 1979*
- *Bunding Tradewaste Guideline No 4 (SA Water)*

Acknowledgements

The SA Environment Protection Authority (EPA) wishes to acknowledge the New South Wales EPA and Victorian EPA for material and diagrams used in this guideline.

New South Wales EPA 2001, Bunding and Spill Management, viewed 26 March 2007, <www.epa.nsw.gov.au/mao/bundingspill.htm>.

Victorian EPA 1992, *Bunding Guidelines*, viewed 26 March 2007, <www.epa.vic.gov.au/publications>.

Currency of these guidelines

These guidelines offer advice to assist with compliance with the general environmental duty and specific environmental policies. They are subject to amendment and persons relying on the information should check with the EPA to ensure that it is current at any given time.

FURTHER INFORMATION

Legislation

Legislation may be viewed on the internet at: <www.legislation.sa.gov.au>

Copies of legislation are available for purchase from:

Service SA Government Legislation Outlet	Telephone:	13 23 24
101 Grenfell Street	Fax:	(08) 8204 1909
Adelaide SA 5000	Internet:	< shop.service.sa.gov.au >

For general information please contact:

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Adelaide SA 5001	Freecall (country):	1800 623 445
	Internet:	< www.epa.sa.gov.au >
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