

Underground storage

Underground pits are an effective, low-cost method of long-term grain storage. Their most common use is for storing drought feed reserves on farms, and grain for this use has been recovered in good condition after more than 10 years. The main drawback of underground storage is the difficulty of removing grain.

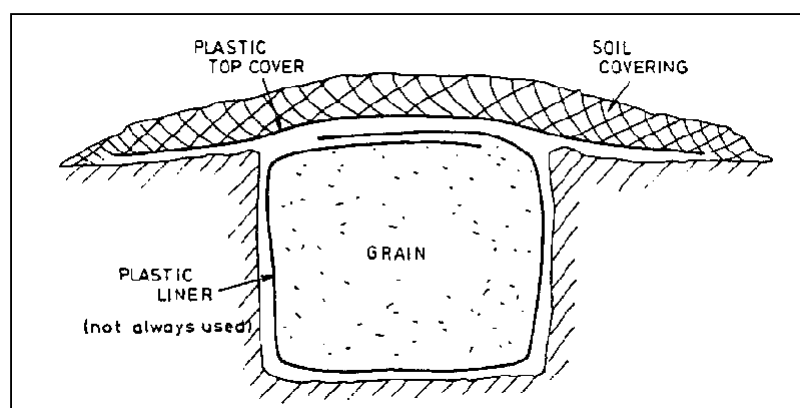
What does underground pit storage have to offer?

Underground pits have been used for long-term storage since the earliest grain harvests. This is a method for conserving grain for animal feed rather than for human consumption. The pit is hermetically sealed and, due to low temperature and reduced oxygen levels, there should be little insect activity, although aluminium phosphide could be introduced initially. Grain which is overmoist or becomes damp in the storage will be tainted, but this should not affect its feed value if it is airtight. It is said that in some parts of the world local people prefer the taste of pit stored grain to that of normal fresh grain.

Alan Andrews (1996) has given the following description in *Storing, Handling and Drying Grain*:

The grain moisture should be less than 12%. The pit must be located on a well drained site with the immediate surrounds graded to prevent run-off collecting in the pit area. Keep adjacent pits at least 10 metres apart to prevent seepage from an empty pit to a full one. The pit should be not more than 3 metres wide. This allows the covering soil to be placed and removed by a front-end loader without having to drive over the top of the grain. The pit may be lined with polythene and loaded by an augur or a tipper. After filling, the pit should be sealed with a top cover and this in turn should be covered with straw, sand and soil shaped to run-off. Always unload the entire contents once the pit is opened as it may be very attractive to pests and prone to water damage.

Figure 6: A method of sealing top and bottom covers



Covering the pit

The following extract is from Agriculture Protection Board *Infonote No. 1*, November 1984, by Bevan Uren.

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Covering the pit

If pits are lined, all horizontal joints must overlap with the higher sheets outside the lower ones. Water will then flow down the outside of the sheets without entering the grain. The pit should be filled with grain to ground level at the sides, sloping up to a ridge of grain along the centre line to encourage water shedding.

Before covering with soil, lay polythene sheet across the ridged grain and for about 2

metres either side of the pit. Sheets should overlap at least 20cm at the edges and full sections should be used without cross joins. Medium grade 0.1mm polythene will resist breakage by lumpy overburden better than 0.05mm.

Sheeting is generally not reused as the cost is small and damage during uncovering is inevitable.

Care over forming a water-shedding cover is the most important aspect of underground storage after the selection of a dry site. Quick run-off from a smooth covering mound is the main aim together with sufficient depth of soil to exclude air and insulate the grain from large temperature changes. The soil cover needs to be about 1.3m deep, sloping to ground level well clear of the pit. Peg the corners to allow easy location when emptying.

A modified cover which speeds up the opening of a pit is to attach the polythene to sections of welded steel mesh. These are long enough to span the pit in one section and are placed overlapping in the reverse order of removal. Once the overburden has been reduced to about 20cm deep by blade or loader, the mesh sections and remaining soil can be towed off with little soil contamination to grain.

During the first winter the soil cover may need to be re-formed and smoothed after settling to eliminate cavities and promote run-off. Little else is needed except to see that after all the earthmoving and traffic no depressions which hold water remain near the pit. Periodic checking for rats and mice may be necessary but they are generally deterred by a well-compacted soil cover.

Safety

When emptying the pit with an auger operated from the ground surface there is a risk of injury to anyone falling into the cone of grain. This risk is increased by irregular edges to pits, deep grain and slippery polythene. Great care should be taken when moving near the pit, and if left open for any period, pits should be fenced or refilled with soil to avoid the hazard to people and stock.

Bag storage

It is relatively easy to store bags on pallets and to fumigate a stack of bags covered with plastic sheets.

Fumigation under sheets. Sheets should overlap by 1 metre and should be held down with chains or sandsnakes (a tube of polythene packed with sand).

What are the conditions which lead to improved gastightness?

- Stacks must be built on impermeable floors, preferably with a underlying sheet.
- Proper fumigation sheets, preferably reinforced PVC or coated woven polythene 200–250 μm thick, must be used.
- Standard stack sizes should match the sheet size.
- There must be complete and easy access to the sides and tops of stacks, with at least 1 metre between stacks.
- Sheets must be inspected and holes repaired.
- Overlapping sheets must be sealed with rolled joints and clip.
- Sheets must give a metre overlap on the ground.
- The stack must be checked for leaks after the fumigant is put in.
- The commodity must be dry enough to be sealed without sweating.

- An adequate dose of phosphine must be used.

For bags held in a warehouse, it may be possible to keep the stacks under polythene film, but only if the commodity is cool and very dry. Bags may also be kept in cooled, air-conditioned warehouses, or in sealed rooms.

We now turn to Grain handling equipment. Make your choice from the sidebar.