

# DPI&F note

## Grain Storage - Steel Mesh Silos for on-Farm Grain Storage

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### Introduction

Short-term temporary storage may be required as a buffer in your grain handling system if existing permanent facilities become overloaded, or delivery to local depots is restricted. Steel mesh silos have proven useful for this purpose if used carefully. However they are not structurally designed to meet current Australian Standards.

Temporary on-farm storage of grain crops needs to be planned well before harvest commences. Points to be kept in mind are:

- (i) Understand the principles of storage.
- (ii) Estimate the quantity likely to be stored on farm.
- (iii) Decide method of storage and handling.

### Storage principles

#### *Moisture content*

For temporary mesh silo storages, which are unlikely to have aeration facilities, store grain at 12% moisture content or below. Mould growth and insect activity are reduced at low moisture contents.

Avoid very low moistures. There is financial loss proportional to the weight loss.

Don't store high moisture grain with low moisture grain in the same silo. This can lead to 'hot spots' where mould and insects will proliferate.

Uniform moisture throughout the silo is desirable.

#### *Temperature*

Low storage temperatures have a preserving effect on grain quality. Freshly harvested grain is often too warm for satisfactory storage. Cooling in temporary storages can be achieved by turning the grain or by aeration using portable aerators which are driven into the grain mass. These have a fan mounted on the end of a perforated tube spear and are useful for aerating 'hot spots'. Their use for long-term aeration is limited, and grain kept for long-term should be stored in permanent storages with adequate aeration facilities.

With careful management, temporary storage need not reduce the quality of your grain.

#### *Insects*

Always be alert for insect activity. Prepare your storage site by cleaning up residual grain and trash well before harvest. Spray all silos, sheds, ground dumps, augers, and trucks with approved insecticides.

#### *Inspection*

Inspect your stored grain frequently.

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Check for odours, moisture content and temperature.

### ***Site selection and silo construction***

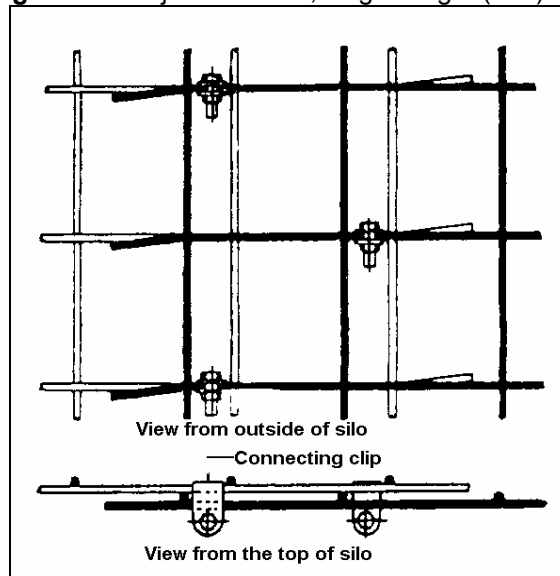
Be sure the site for the silos is well drained and has a dry, hard-packed soil base. Ground sheets can be used, but only if the base self-drains and covers are used on top of the silos. If necessary, steel conical bases can be used to aid with unloading.

The welded mesh grain silo is a structural unit. For structural stability and security, the erection instructions must be followed exactly.

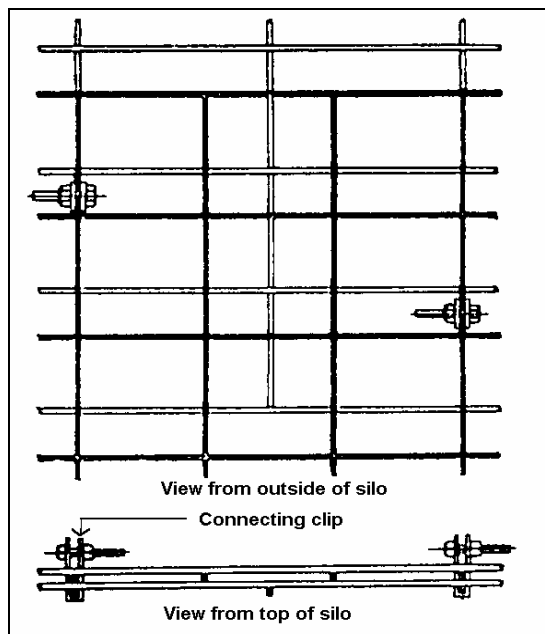
'U' clips are the only acceptable method of joining mesh for use in silos. For single height silos, 'U' clips are to be used only on the horizontal wires. The vertical wires provide little structural strength, and use of these wires for joining could lead to silo collapse. The horizontal wires should always be on the outside of the silo.

Joining situations are shown in Figures 1 and 2.

**Figure 1.** End join on small, single height (33 t) silo



**Figure 2.** Joining of two tiers of mesh for double height (74 t) silo



Note: The use of double height mesh bins is not recommended. They present a high risk of toppling during out-turning.

Specially-designed mesh is available for steel mesh silo construction. Lighter mesh with fewer or smaller bars may fail. Prior to using a mesh bin, inspect it for broken or rusted bars and broken welds.

## Capacities

There are three sizes of mesh silo commercially available:

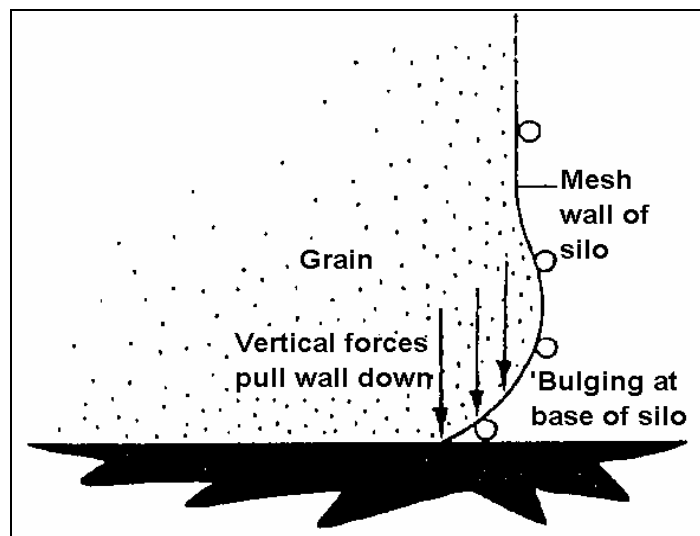
Silo Size	Mesh Size	Approx. capacity (t of wheat)
single	46G55A	33
double	44G5A bottom tier	57
'3000'	33KG4	95

Hessian or polyfabric liners are available for use with these silos.

## Silo shape

Before filling, ensure that the silo is a perfect circle. The mesh may need to be shifted slightly in the early stages of filling to achieve the require shape.

A silo that is not a perfect circle will receive uneven pressure loadings, causing bulging at the base. This bulge leads to a vertical loading at the base of the mesh, increasing as the silo fills. The vertical loading tends to pull down the wall of the silo eventually resulting in failure (Figure 3).

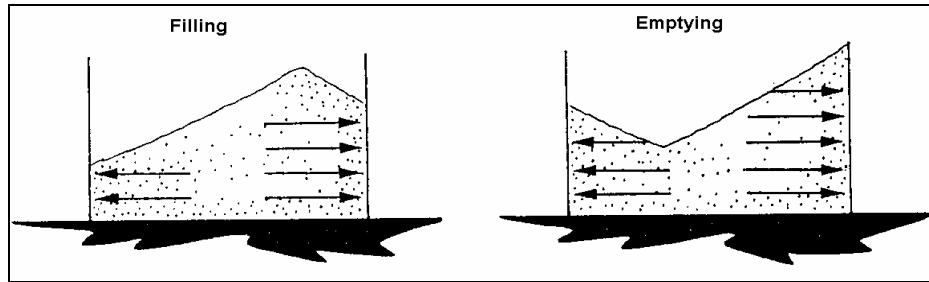


**Figure 3.** 'Bulging and wall failure if silo is not kept circular during filling

## Filling

It is important that the silo be filled from the centre to achieve an even pressure on the mesh. Filling the silo from an off-centre position will give an uneven pressure distribution around the wall of the silo (Figure 4).

Because the silo is not usually fixed to the ground in any way, uneven pressure loading can cause collapse, either through toppling or mesh failure. Although the silos are sometimes stabilised by steel posts around the base, these are no guarantee against failure due to uneven loading.



**Figure 4.** Off-centre filling or emptying results in uneven wall loading

## Emptying

Similar precautions need to be taken when emptying the silos. Mesh silos must be emptied from the centre to ensure balanced wall pressures.

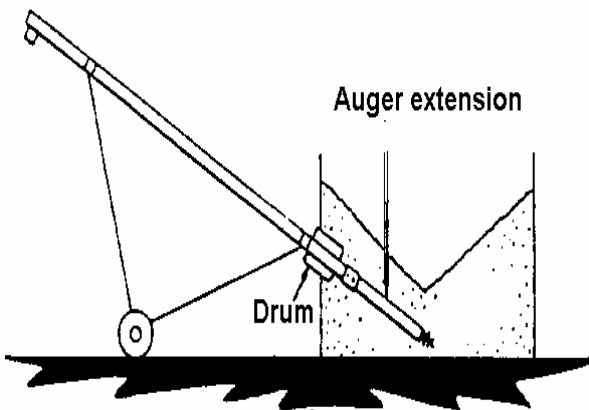
The emptying method shown in Figure 5 requires a hole in the mesh wall and a tube inserted at an angle between the wall and centre of the silo. When cutting an access hole for the auger, do not cut more than three horizontal bars and leave at least the bottom four bars uncut. The tube or drum must be inserted before filling the silo.

A second method, shown in Figure 6 uses a tube across the floor of the silo. An auger screw is slid into this tunnel and connected to the main auger through a universal joint.

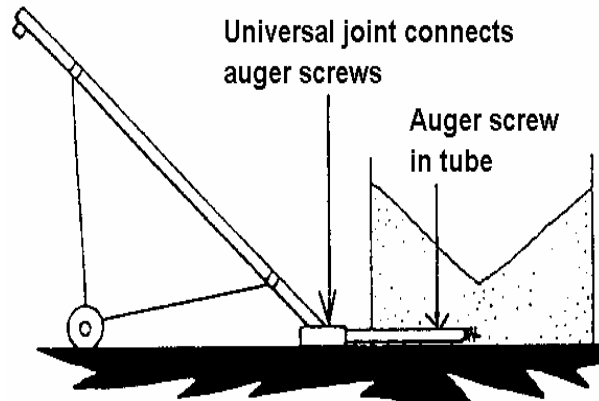
### Safety Notes:

- It is advisable to reinforce around any openings cut in the silo wall
- When emptying steel mesh silos, keep other equipment well clear of the mesh bin
- All personnel should be kept well clear and under no circumstances should people stand between the bin and other structures where movement of the bin may cause them to be crushed.

**Fig 5:** One method of emptying steel mesh silos

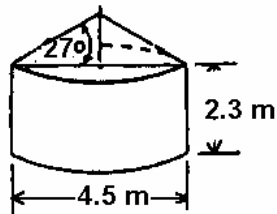


**Fig 6:** Another method of emptying silos

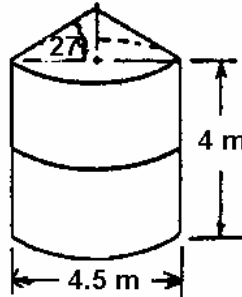


## Dimensions of silos

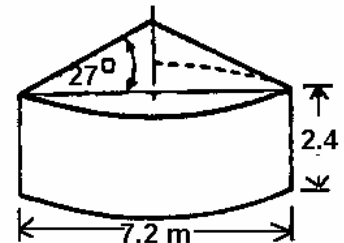
Single weldmesh ring (heaped grain)



Double height weldmesh (heaped grain)



Single weldmesh ring (heaped grain)



Volume:	43(cubic metres)	74	124
Tonnes of wheat (approx.) depending on height of peak and moisture content:			
	33	57	95
Minimum height and reach of augers to achieve central filling:			
Height (m)	4.0	6.5	5.0
Reach at 30 degrees (metres):			
	6.9	11.2	8.6
Length (m)	8	13	10

## Summary

- Erect silos according to instructions .
- Reinforce auger outlets with extra mesh .
- Ensure silo is a perfect circle in the early stages of filling. 4. Fill and empty silos centrally.

## Further information

If you require further information: .....

- DPI&F website [www.dpi.qld.gov.au/fieldcrops/3947.html](http://www.dpi.qld.gov.au/fieldcrops/3947.html)
- DPI&F Call Centre open from 8.00am to 6.00pm Monday to Friday. Phone: 13 25 23 for the cost of a local call for Queensland callers.