



## STORED GRAIN MANAGEMENT

# Grain storage: Handling and maintenance

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### Loading and unloading

Silos are designed to withstand uniform downward and outward forces. Because of this they must be loaded only from the central top hatch. Loading from the top side hatch will result in unbalanced lateral forces on opposite sides of the silo. This may distort the shell of the silo, placing extreme pressure on the side of the silo holding the high side of the stack (Figure 1).

The same principles apply when unloading. Empty from the bottom central opening only. Avoid using the bagging-off chute unless the silo is designed to withstand off-centre loads.

Off-centre pressures applied to the support frame also exert uneven forces on the concrete pad. If the pad is not constructed to the correct design specifications, the foundation may fail. This will place a sudden unbalanced

distribution of forces on the silo, possibly causing failure or collapse of the silo.

### Lupins and other rounded grains

Lupins present a different management problem because of their lower angle of repose and the different forces they apply. The rounded seeds exert higher than normal pressures on the walls. When transferred to the lower sections of the silo wall, these forces may cause a crimping or pleating effect (Figures 2 and 3). This problem has been observed in elevated and flat-bottomed silos. When this occurs on only one side, the silo may lean or collapse completely.

### Maintenance

A 1989 survey conducted in the central wheatbelt showed 56 per cent of silos tested had one or more faults. Insects could survive fumigation in these silos.

Failed rubber seals on the loading and unloading hatches were the major problem. These should be replaced annually or when they are damaged.

Apart from checking for leaks and repairing them, silos must be inspected regularly for corrosion, particularly flat-bottomed concrete based or earthing types of silos. Corrosion of the lower sheets of any silo may eventually lead to failure. Leaks can be easily repaired from the outside using flexible membrane paints. Sealed silos must be checked annually for gas tightness, to ensure efficient fumigation (see Farmnote 68/03 'Sealed silos make \$ense').

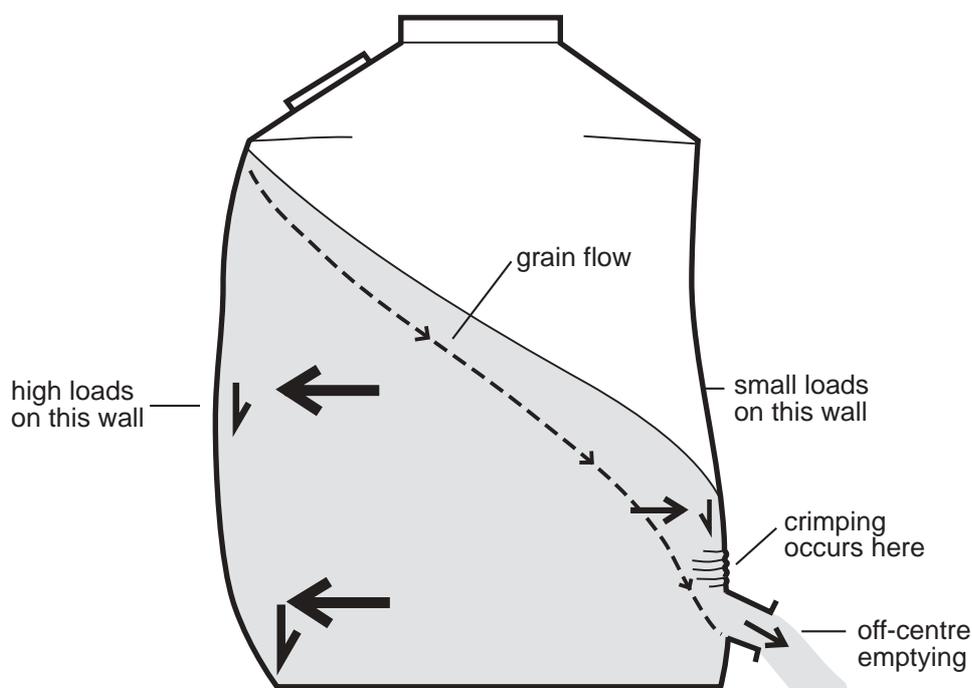


Figure 1. Off-centre filling or emptying causes uneven loadings on silo walls - a situation that could lead to failure.

### Important Disclaimer

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*Figure 2. Silo distorted when outloading lupins.*

## Safety

People - especially children - not directly involved in a grain handling operation must keep clear of the area.

Auger flighting must have efficient safety guards in place and moving belts must be adequately protected.

Sealed silos need an oil-filled pressure relief valve to allow air to move in and out of the silo. During unloading it may not let air into the silo fast enough to prevent implosion unless the hatches are also open.

When fumigating a grain store, first read the label on the phosphine container to find the venting period required before entering the silo. **Phosphine is lethal - treat it with respect.**

When entering a flat floor silo to shovel out remaining grain that has been fumigated with the tablet formulation phosphine, it is essential to wear a full face respirator. The powder residue from the tablet retains a fraction of phosphine that will only release in moisture. Ingestion of this dust while shovelling is a serious health hazard.

Do not enter a silo when the auger is operating. You can suffocate in seconds when drawn under by moving grain.

When entering a silo to clean down significant caking, beware of falling grain.

When grain is mouldy there will be a significantly higher level of CO<sup>2</sup> present; therefore, make sure the silo is adequately ventilated. In extreme cases, there may be too little oxygen present to support human life.

## Further reading

Farmnote 24/02 'Aeration : for preserving grain quality'

Farmnote 64/03 'Grain storage: Design and installation'

Farmnote 65/03 'Grain storage : Maintaining grain quality'

Farmnote 67/03 'Sealed silos make \$ense'

Farmnote 68/03 'It makes \$ense to maintain your sealed silo'

Farmnote 69/03 'Effective fumigation needs a properly sealed silo'

Farmnote 70/03 'Underground storage of grain.'