P.E.S.T.
Pest Education Services & Training

STORAGE CAPACITY

Different grains have different densities and settle to different angles in the bulk pile. As well, the angle changes with moisture content. The grain also settles during storage. Therefore, all figures given are approximate. To obtain storage capacity in tonnes, multiply the storage facility volume (in cubic metres) by the appropriate conversion factor from Table 2.

Example: A weldmesh silo with a heaped grain volume of 124 cubic metres will hold 93 tonnes of wheat ($124\ m^3$ x 0.75 = 93 tonnes).

*To convert tonnes of one grain in storage to tonnes of another crop **divide** the tonnes of the first crop by its conversion factor and **multiply** by the appropriate factor for the second crop*.

Example:

A storage holding 93 tonnes of wheat will hold:

$\frac{93 \times 0.62}{0.75}$ = 76.88 tonnes of barley.

Grain product	Conversion factor
Barley	0.62
Canary	0.70
Chickpea	0.60
Faba Bean	0.75
Linseed	0.73
Lupin	0.75
Oat	0.50
Pea	0.75
Rapeseed	0.67
Rye	0.71
Safflower	0.53
Triticale	0.69
Wheat	0.75

Table 2. Factors for converting capacity in cubic metres to tonnes for selected grain products

DETERMINING STORAGE CAPACITY

Flat pads

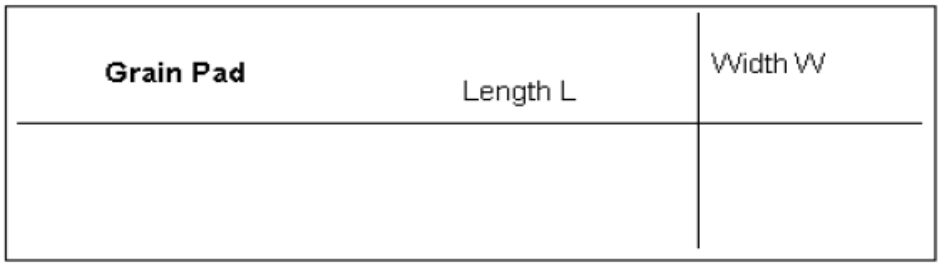
When working out the volume of grain stacked on a pad, the **angle of repose** for each grain type must be known.

Table 3 gives angle of repose for grain stored at safe moisture contents. These angles will increase for wet grain and may also vary slightly depending on grain quality and its admixture content.

Grain	Angle	Grain coefficient
Barley	30^0	0.578
Linseed	25^0	0.466
Safflower	24^0	0.445
Wheat	28^0	0.531

Table 3. Angle of repose for different grains, and coefficients based on the angle for calculating volume of grain.

Given the length (L) and width (W) the volume of a pad can be calculated.



$$\text{Volume of pad} = \frac{W2 \times (L - W) \times C}{4} + (1.05 \times C \times (\tfrac{1}{2}W)^3)$$

where W = width of pad

L = length of pad

C = grain coefficient

Example: Volume of wheat

Pad dimensions width — 10 m

length — 30 m

grain coefficient — 0.531

$$\text{Volume} = \frac{102 \times (30 - 10) \times 0.531)}{4} + (1.05 \times 0.531 \times (5^3))$$

$$= 265.5 + 69.7$$

$$= 335.2\ m^3$$

Tower silo

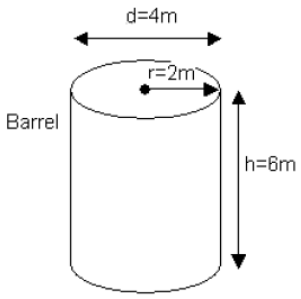
To determine the storage capacity of a tower silo, segment the silo into a barrel or cylinder and a cone.

The barrel's flat circular end has a:

• diameter (d) — 4 m;

• radius (r) (half the diameter) — 2 m;

• barrel height (h) — 6 m.

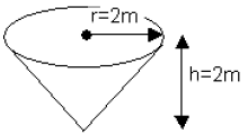


The flat circular top of the cone has similar dimensions to the barrel:

• diameter (d) — 4 m;

• radius (r) — 2 m;

• cone length (h) — 2 m.



The volume of the barrel of the silo = $\pi r^2 h$

= $\frac{22 \times 2 \times 2 \times 6}{7}$

= 75.4 m^3

The volume of the cone of the silo = $^1/_3 \pi r^2 h$

= $\frac{1 \times 22 \times 2 \times 2 \times 2}{3 \times 7}$

= 8.4 m^3

Total volume of the silo = (75.4 + 8.4) m^3

= 83.8 m