Bulk Sugar Store Capacity

Sugar a prismatic bulk store holds from its width, length, side-wall height and the sugar's angle of repose, with Hugot's bulk densities (ch. 36–37).

Method: Hugot; Handbook of Cane Sugar Engineering; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Store width	40.000	m
Store length	100.00	m
Side-wall height Hugot: unbuttressed walls rarely above 3 m.	3.0000	m
Angle of repose of the sugar Hugot: 33–36° dry; up to 50–53° wet.	34.000	°
Bulk density in the pile Hugot: 800–900 kg/m³; 1 000 at 6 m depth.	880.00	kg/m³

Calculated results

Parameter	Value	Unit
Height of the pile at the ridge	16.490	m
Cross-section of sugar	389.80	m²
Volume	38,980	m³
Sugar held	34,303	t

Notes for this case

- The prism ignores the sloping ends; a store fed from a ridge belt loses a little at each end. Keep belts to the store below about 20° slope.
- The store is short for its width: the sloping ends cut the volume by roughly 9 %, more than the prism shows.
- Check that the roof clears the ridge: the pile rises 16.5 m above the floor.

Formula and method

$$h_r = h_w + \frac{W}{2}\tan\alpha, \quad A = W h_w + \frac{W^2}{4}\tan\alpha, \quad V = A\ell, \quad M = \rho V$$

Variables

W	Store width	m
ℓ	Store length	m
h_w	Side-wall height	m
α	Angle of repose of the sugar	rad
ρ	Bulk density in the pile	kg/m³
h_r	Height of the pile at the ridge	m
A	Cross-section of sugar	m²
V	Volume	m³
M	Sugar held	kg

Method and standards

Geometry of a prismatic pile.

Assumptions and limits

- Prismatic pile filled to the angle of repose; the ridge height is not checked against the roof (a note gives it).

- The sloping ends are ignored. With the pile sloping at the angle of repose at both ends too, the ends hold about $W^3 \tan \alpha/12$ less than the prism; a note gives the share when it exceeds 5 % (short stores).

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 36
- bulk storage (Fig. 36.1)
- pp. 819–820; ch. 37
- densities
- p. 832

Report details

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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/sugar-ethanol/centrifugals-sugar-house/bulk-sugar-store

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.