Grain Mill Power by Bond's Law

Specific energy and power for size reduction by Bond's third theory from the work index, the 80 % passing sizes of feed and product and the throughput.

Method: Bond (1952) W = 10 W_i (1/√P₈₀ − 1/√F₈₀); sizes in µm

Input parameters

Unit system: SI

Parameter	Value	Unit
Bond work index (per metric tonne) Per metric tonne. Bond's tables are per short ton: multiply those by 1.1023. The default is a starting value, not a measured figure for grain.	12.000	kWh/t
Feed 80 % passing size	4.0000	mm
Product 80 % passing size	0.80000	mm
Throughput	12.000	t/h

Calculated results

Parameter	Value	Unit
Specific energy	2.3453	kWh/t
Mill power	28.143	kW

Notes for this case

- Bond's law was built for ores; for grain use a work index from your own mill tests.

Formula and method

$$W = 10\,W_i \left(\frac{1}{\sqrt{P_{80}}} - \frac{1}{\sqrt{F_{80}}} \right)$$

Variables

W_i	Bond work index	J/kg
F_{80}	Feed 80 % passing size	m
P_{80}	Product 80 % passing size	m
$\dot{m}$	Throughput	kg/s
W	Specific energy	J/kg
P	Mill power	W

Method and standards

Bond's law.

Assumptions and limits

- Sizes in µm.
- The work index is per metric tonne; Bond's original values are per short ton and must be multiplied by 1.1023. The default 12 kWh/t has no particular source; Bond's law was built for ores, so back-calculate the index from your own mill.

References

- Bond (1952) W = 10 W_i (1/√P₈₀ − 1/√F₈₀)
- sizes in µm

Report details

Report reference	FCC-XHY4-DTEC (the same inputs always give the same reference)
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Software release	FireCAD Calc, release of 17 November 2026
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/ethanol/grain-mill-bond-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.