Flat Rolling: Draft, Reduction, Contact Length and Roll Force

Draft, reduction, roll contact length and approximate roll force for flat rolling from entry and exit thickness, roll radius, width and mean flow stress.

Method: Flat rolling: L = √(RΔh); F ≈ σ̄ w L (Kalpakjian; Groover)

Input parameters

Unit system: SI

Parameter	Value	Unit
Entry thickness	25.000	mm
Exit thickness	20.000	mm
Roll radius	250.00	mm
Strip width	300.00	mm
Mean flow stress in the pass Average of the flow stress over the strain of the pass, at the rolling temperature.	180.00	MPa

Calculated results

Parameter	Value	Unit
Draft	5.0000	mm
Reduction	20.000	%
Contact length √(RΔh)	35.355	mm
Roll force σ̄ w L	1,909.2	kN

Notes for this case

- Frictionless estimate; friction raises the force (roughly 20 % more for typical passes).

Formula and method

$$\Delta h = h_0 - h_f, \quad L = \sqrt{R\Delta h}, \quad F = \bar{\sigma} w L$$

Variables

h_0	Entry thickness	m
h_f	Exit thickness	m
R	Roll radius	m
w	Strip width	m
$\bar{\sigma}$	Mean flow stress in the pass	Pa
Δh	Draft	m
r	Reduction	-
L	Contact length √(RΔh)	m
F	Roll force σ̄ w L	N

Method and standards

Slab estimate.

Assumptions and limits

- Plane strain, no friction.
- The largest draft the rolls can bite, about $\mu^2 R$, is not checked (no friction input), and roll flattening, which lengthens the contact under high force, is ignored.

References

- Flat rolling: L = √(RΔh)
- F ≈ σ̄ w L (Kalpakjian; Groover)

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/mechanical/manufacturing/rolling-force

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.