Vertical Stress Below a Point Load (Boussinesq)

Vertical stress increase at a depth and radial distance below a point load on the ground surface by Boussinesq's solution, with the influence factor.

Method: Boussinesq (1885) elastic half-space solution

Input parameters

Unit system: SI

Parameter	Value	Unit
Point load	500.00	kN
Depth	3.0000	m
Radial distance from the load line	1.5000	m

Calculated results

Parameter	Value	Unit
Influence factor (3/2π)/(1 + (r/z)²)^{5/2}	0.27332	
Vertical stress increase	15.184	kPa

Formula and method

$$\Delta\sigma_z = \frac{3P}{2\pi z^2}\left[1+\left(\frac{r}{z}\right)^2\right]^{-5/2}$$

Variables

P	Point load	N
z	Depth	m
r	Radial distance from the load line	m
I_B	Influence factor (3/2π)/(1 + (r/z)²)^{5/2}	-
$\Delta\sigma_z$	Vertical stress increase	Pa

Method and standards

Elastic half-space.

Assumptions and limits

- Homogeneous isotropic elastic half-space.

References

- Boussinesq (1885) elastic half-space solution

Report details

Report reference	FCC-8X1R-F7B5 (the same inputs always give the same reference)
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Release checks	3 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/civil/geotechnical/boussinesq-point-load

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.