Immediate (Elastic) Settlement of a Footing

Immediate settlement of a footing on an elastic soil layer from net pressure, width, Poisson's ratio, soil modulus and an influence factor for shape and rigidity.

Method: Elastic settlement S_e = qB(1 − ν²)I_f/E_s (Schleicher; Das, Principles of Foundation Engineering, 7th ed. (Cengage, 2011), ch. 5)

Input parameters

Unit system: SI

Parameter	Value	Unit
Net foundation pressure	150.00	kPa
Footing width	2.0000	m
Poisson's ratio of soil	0.30000	
Soil modulus	20.000	MPa
Influence factor (shape, rigidity, location)	0.88000	

Calculated results

Parameter	Value	Unit
Immediate settlement	12.012	mm

Notes for this case

- Influence factors for a semi-infinite layer: square flexible centre 1.12, corner 0.56, average 0.95; square rigid 0.88; circle flexible centre 1.0, rigid 0.79. Saturated clay under undrained loading: ν = 0.5. Consolidation settlement of clay is extra.

Formula and method

$$S_e = \frac{q_n B(1-\nu^2) I_f}{E_s}$$

Variables

q_n	Net foundation pressure	Pa
B	Footing width	m
ν	Poisson's ratio of soil	-
E_s	Soil modulus	Pa
I_f	Influence factor (shape, rigidity, location)	-
S_e	Immediate settlement	m

Method and standards

Elastic half-space.

Assumptions and limits

- Homogeneous elastic soil of semi-infinite depth. No correction for a stiff layer at shallow depth or for embedment; both can reduce the settlement substantially (use depth and thickness correction factors from your text).

References

- Elastic settlement S_e = qB(1 − ν²)I_f/E_s (Schleicher; Das, Principles of Foundation Engineering, 7th ed. (Cengage, 2011), ch. 5)

Report details

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

This calculator online

https://calc.firecad.com/civil/foundations/immediate-settlement-footing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.