Time for Consolidation (Terzaghi Time Factor)

Time for a clay layer to reach a degree of consolidation from the coefficient of consolidation and drainage path, by Terzaghi's time factor, or the degree reached.

Method: Terzaghi one-dimensional consolidation; time-factor approximations (Das, Principles of Geotechnical Engineering)

Input parameters

Unit system: SI

Parameter	Value	Unit
Coefficient of consolidation From the oedometer test; often quoted in m²/year.	2.0000	m²/a
Layer thickness	4.0000	m
Drainage	Double (top and bottom): H_d = H/2	
Degree of consolidation wanted	90.000	%
Elapsed time (for the degree reached)	365.25	d

Calculated results

Parameter	Value	Unit
Drainage path	2.0000	m
Time factor for U	0.84800	
Time to reach U	619.46	d
Degree reached after the elapsed time	76.396	%

Notes for this case

- Uses the standard approximations T_v = (π/4)U² for U ≤ 60 % and T_v = 1.781 − 0.933 log(100 − U%) above.

Formula and method

$$t = \frac{T_v H_d^2}{c_v}, \quad T_v = \frac{\pi}{4} U^2 \ (U \le 0.6), \quad T_v = 1.781 - 0.933 \log_{10}(100 - U\%)$$

Variables

c_v	Coefficient of consolidation	m²/s
H	Layer thickness	m
$\mathrm{drainage}$	Drainage	-
U	Degree of consolidation wanted	-
t	Elapsed time (for the degree reached)	s
H_d	Drainage path	m
T_v	Time factor for U	-
t_U	Time to reach U	s
$U(t)$	Degree reached after the elapsed time	-

Method and standards

Terzaghi theory with standard fits.

Assumptions and limits

- Uniform initial excess pressure.
- c_v is entered in m²/s; divide a value in m²/year by 3.156 × 10⁷.

References

• Terzaghi one-dimensional consolidation; time-factor approximations (Das, Principles of Geotechnical Engineering)

Report details

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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/consolidation-time

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.