Pile Capacity by the Hiley Driving Formula

Ultimate and safe load of a driven pile from hammer weight, drop, efficiency, final set, temporary compression, pile weight and coefficient of restitution.

Method: Hiley pile-driving formula

Input parameters

Unit system: SI

Parameter	Value	Unit
Hammer (ram) weight	40.000	kN
Drop of the hammer	1.0000	m
Hammer efficiency	80.000	%
Final set per blow	2.5000	mm
Total temporary compression (pile, cap, soil)	15.000	mm
Pile weight (with helmet)	35.000	kN
Coefficient of restitution	0.40000	
Factor of safety	2.5000	

Calculated results

Parameter	Value	Unit
Ultimate driving resistance	1,945.6	kN
Safe load	778.24	kN
Efficiency of the blow	60.800	%
Energy per blow at the pile	19.456	kJ

Notes for this case

• Hiley equates the energy delivered to the pile, η_hWh times the efficiency of the blow, to the work done against the soil resistance over the permanent set plus half the temporary (elastic) compression: R_u = η_hWh·η_b/(s + c/2). For W > e_rP, η_b = (W + e_r²P)/(W + P); for heavier piles a further term is subtracted. Measure the set as the average over the last ten blows and the temporary compression from a pencil trace on the pile. Dynamic formulas are unreliable in clay (set-up and relaxation); confirm by load tests or dynamic monitoring.

Formula and method

$$R_u = \frac{\eta_h W h}{s + c/2} \cdot \frac{W + e_r^2 P}{W + P}$$

Variables

W	Hammer (ram) weight	N
h	Drop of the hammer	m
η_h	Hammer efficiency	-
s	Final set per blow	m
c	Total temporary compression (pile, cap, soil)	m
P	Pile weight (with helmet)	N
e_r	Coefficient of restitution	-
F	Factor of safety	-
R_u	Ultimate driving resistance	N
R_a	Safe load	N

η_b	Efficiency of the blow	-
E	Energy per blow at the pile	J

Method and standards

Hiley formula.

Assumptions and limits

- Impact theory with restitution; sand or gravel ground; set from the final blows.

References

Hiley pile-driving formula

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/foundations/hiley-pile-driving-formula

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.