Flexible Pavement Thickness from Subgrade CBR

Total flexible pavement thickness over a subgrade, and the cover needed over a sub-base, from wheel load, tyre pressure and CBR by the CBR design equation.

Method: California Bearing Ratio design equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Design wheel load	40.000	kN
Tyre pressure	0.70000	MPa
Subgrade CBR (%)	5.0000	
Sub-base CBR (%)	20.000	

Calculated results

Parameter	Value	Unit
Contact area	571.43	cm²
Total thickness over subgrade	353.64	mm
Thickness over sub-base	132.75	mm
Sub-base thickness	220.89	mm

Notes for this case

• CBR equation t = √(P/(8.1·CBR) − A/π) (P in lb, CBR in %, 8.1 psi per CBR %), here in SI. It reflects the original design for moderate traffic; current methods size layers for cumulative standard axles and use them for heavier traffic.

Formula and method

$$t = \sqrt{\frac{P}{8.1\,CBR} - \frac{A}{\pi}}, \quad A = \frac{P}{p}$$

Variables

P	Design wheel load	N
p	Tyre pressure	Pa
CBR_s	Subgrade CBR (%)	-
CBR_{sb}	Sub-base CBR (%)	-
A	Contact area	m²
t	Total thickness over subgrade	m
t_{sb}	Thickness over sub-base	m
$t - t_{sb}$	Sub-base thickness	m

Method and standards

CBR design.

Assumptions and limits

- Single wheel; moderate traffic.

References

California Bearing Ratio design equation

Report details

Report reference	FCC-91S2-WXFG (the same inputs always give the same reference)
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Calculator	Flexible Pavement Thickness from Subgrade CBR
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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/roads/cbr-pavement-thickness

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.