Comparison of Rock Mass Properties Calculator with Rocscience Roclab

Rock Mass Properties Calculator is a specialized software designed to calculate rock mass strength parameters using the latest generalized Hoek–Brown failure criterion. It offers a straightforward and user-friendly approach, enabling users to accurately estimate rock mass properties and visualize how variations in these parameters influence failure envelopes**.**

We will compare the results generated by our calculator with those from RocLab to assess its accuracy and functionality.

See in the below the example in **Figure 1** from Roclab which we will use for comparison.

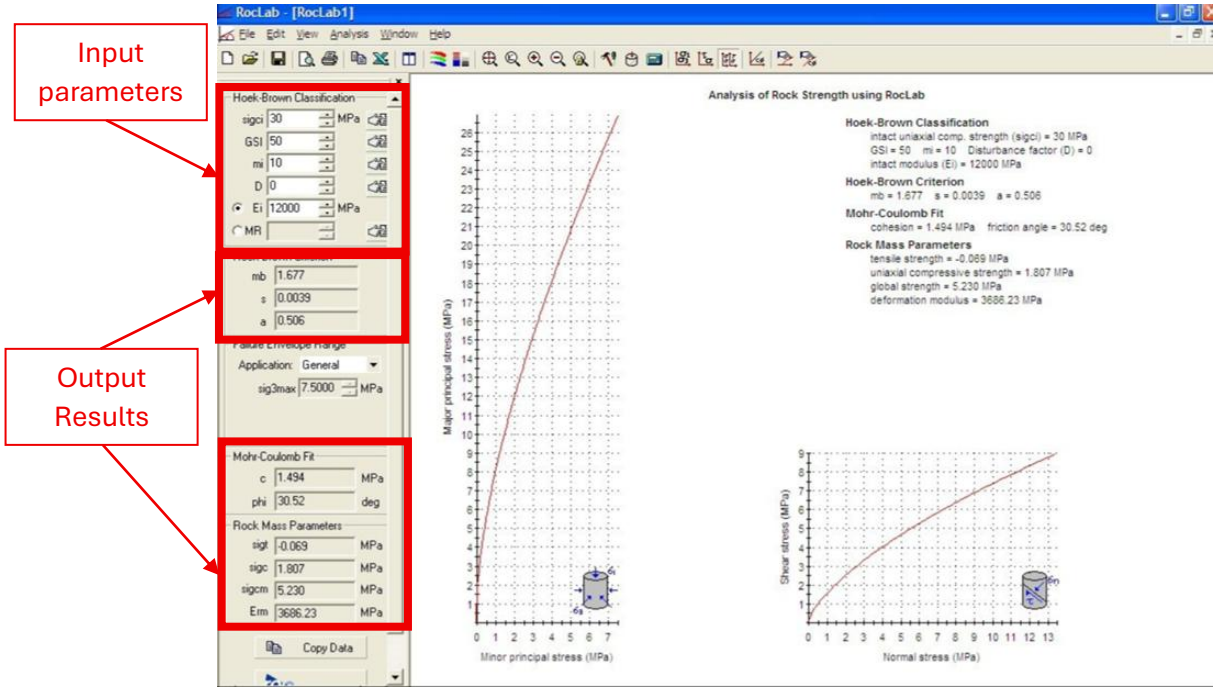


Figure 1 – Roclab Input and Output Results

Data Input/Output: Hoek-Brown Input and Output Parameters

Input Parameters

Using the following Hoek-Brown failure criteria parameters as input:

- the unconfined compressive strength of intact rock
- the geological strength index GSI
- the intact rock parameter mi and
- the disturbance factor D

Table 1 - Input Parameters of Tunnel (Depth=342.4m)

Uniaxial compressive strength of intact rock	σci	30	MPa
Young's Modulus	Ei	12000	MPa
Unit Weight	γ	25	kN/m3
Depth of Tunnel	H	342.4	m
Intact Hoek–Brown constant:	mi	10	

Geological Strength Index:	GSI	50
Disturbance factor:	D	0

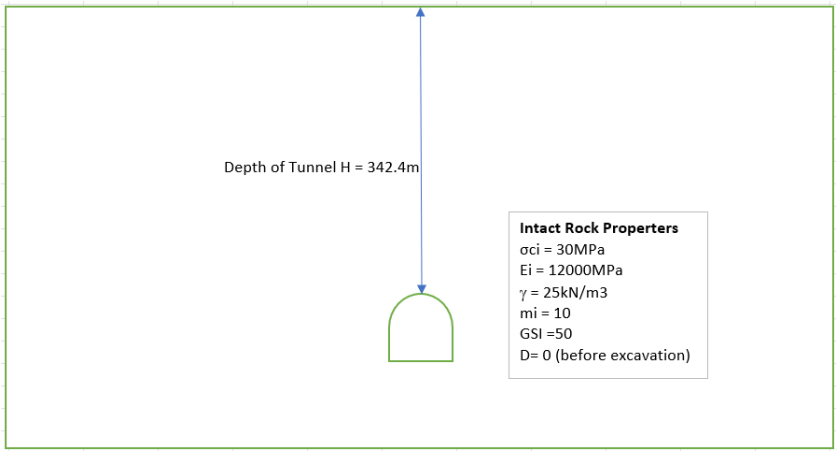


Figure 2 -Schematic Diagram of Tunnel Below Ground Surface

Now we will use the same input values in RMP calculator, used in Roclab to see the results.

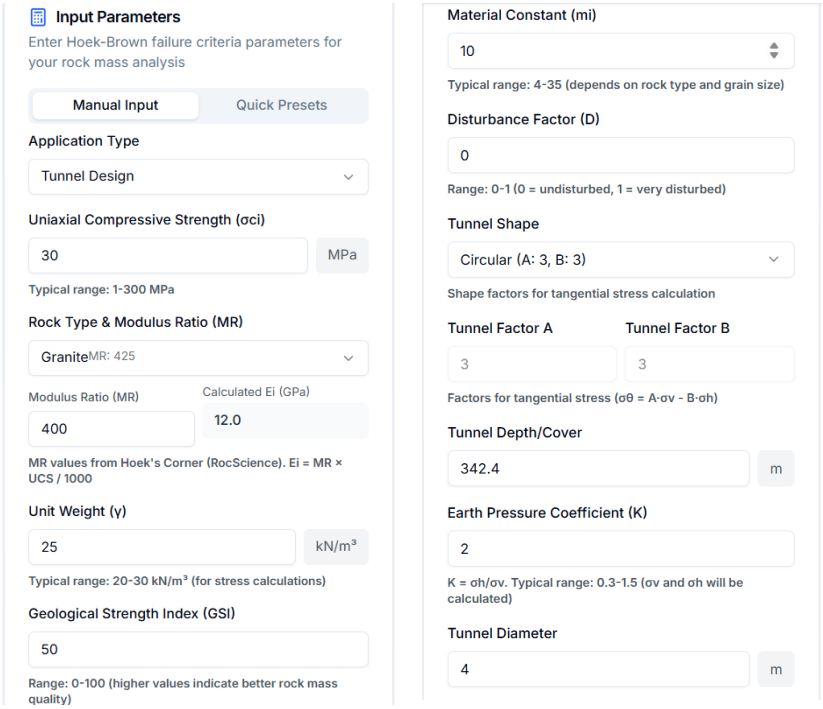
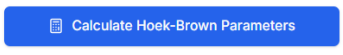


Figure 2 - Rock Mass Properties Calculator Input parameters

After incorporating all the input parameters, we need to click 

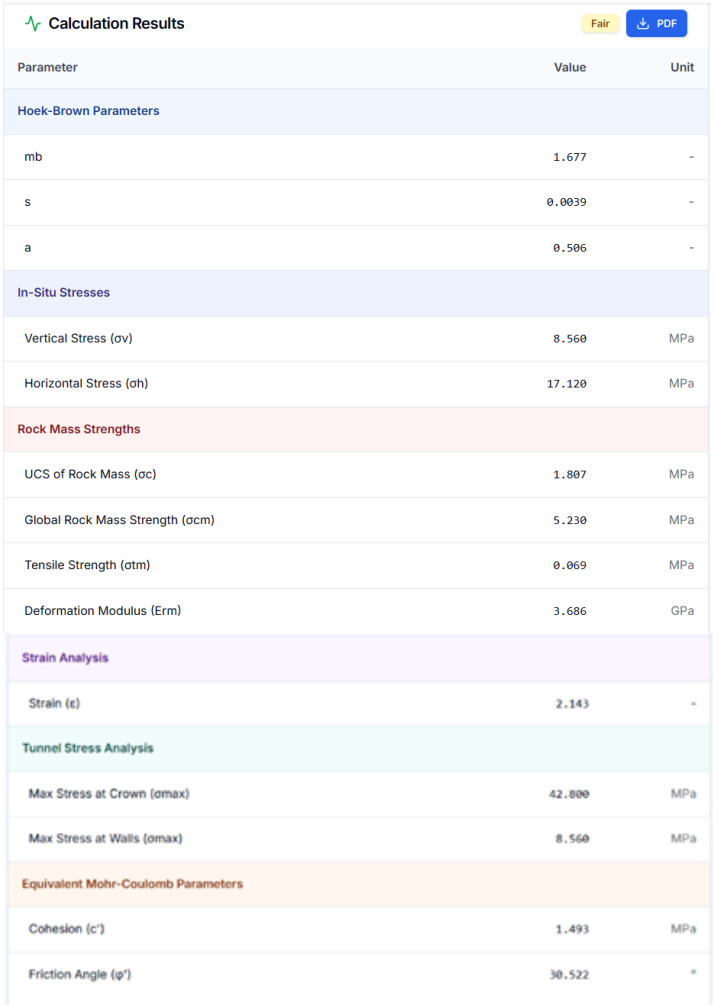
to get the results.

Output Parameters

Table 3- Output Results of Tunnel from RocLab

mb	*Hoek's Constant*	*1.677*
s	Hoek's Constant	0.0039

a	Hoek's Constant	0.506	
Ed	Modulus of Deformation	3686.23	Mpa
σ_c	UCS of Rockmass	1.807	MPa
σ_t	Tensile strength of the rock mass	-0.069	MPa
σ_{cm}	Global Rock Mass Strength	5.23	MPa
σ_{3max}	Maximum horizontal Stress	7.5	MPa
ϕ	Friction Angle of Rockmass	30.522	°
c'	Cohesion of Rockmass	1.493	Mpa



Calculation Results

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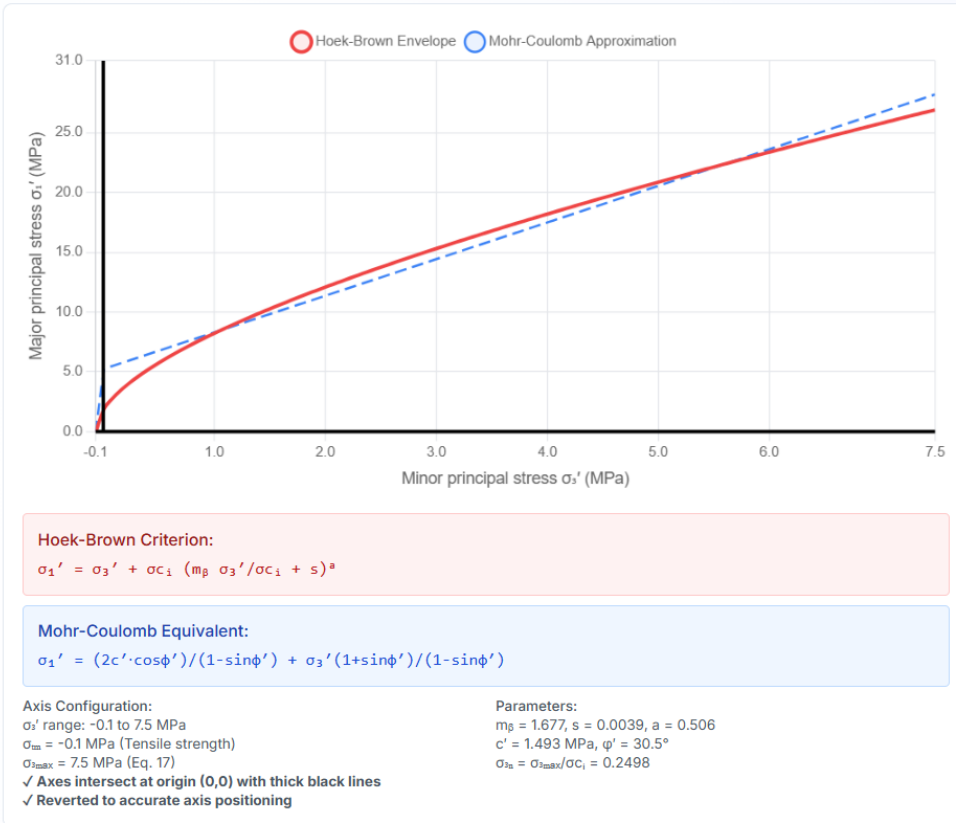
Parameter	Value	Unit
Hoek-Brown Parameters		
mb	1.677	-
s	0.0039	-
a	0.506	-
In-Situ Stresses		
Vertical Stress (σv)	8.560	MPa
Horizontal Stress (σh)	17.120	MPa
Rock Mass Strengths		
UCS of Rock Mass (σc)	1.807	MPa
Global Rock Mass Strength (σcm)	5.230	MPa
Tensile Strength (σtm)	0.069	MPa
Deformation Modulus (Erm)	3.686	GPa
Strain Analysis		
Strain (ε)	2.143	-
Tunnel Stress Analysis		
Max Stress at Crown (σmax)	42.800	MPa
Max Stress at Walls (σmax)	8.560	MPa
Equivalent Mohr-Coulomb Parameters		
Cohesion (c')	1.493	MPa
Friction Angle (φ')	30.522	°

Figure 3 - Rock Mass Properties Calculator Output Parameters

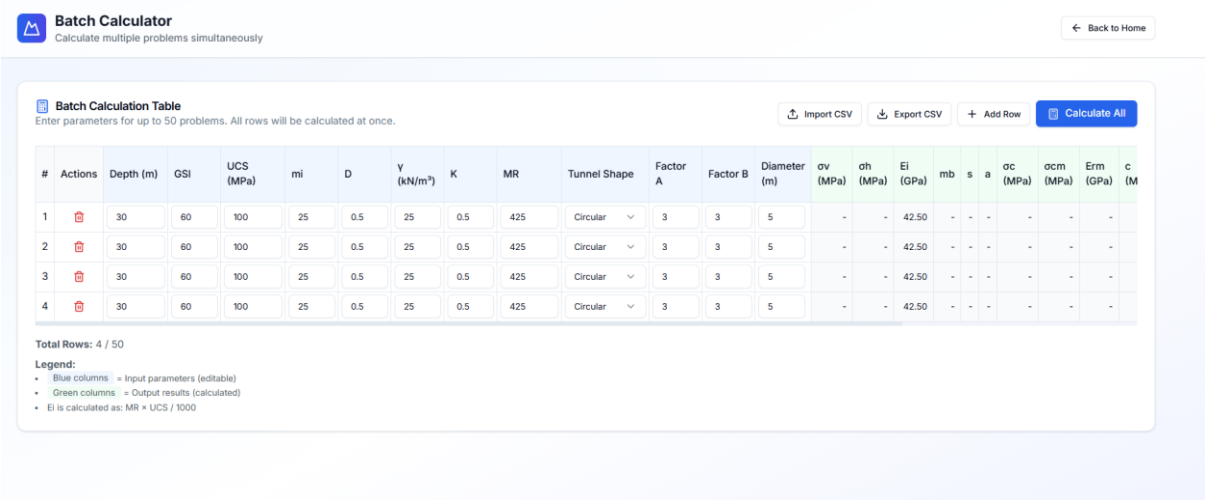
Display Capabilities: Instantaneous MC Sampler

The Instantaneous Mohr–Coulomb Sampler feature enables users to visually extract cohesion and friction angle values at any point along the Hoek–Brown failure envelope.

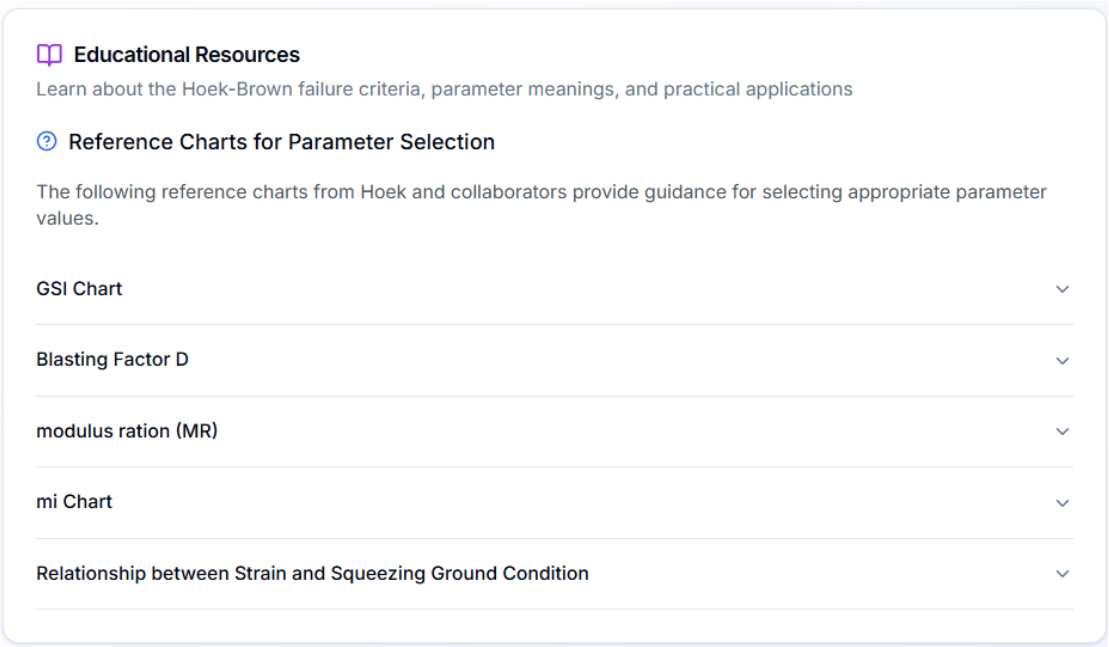


Batch Calculator

Batch Calculator works on the same principle as in the Single Calculator. Batch Calculator with includes many sections along the tunnel alignment. Right now, you can add up to 50 rows. If you need more rows, please let us know.



All Reference Charts You will get below Educational Resources.



Reference

1. Hoek-Brown failure criterion – 2002 Edition E. Hoek, C. Carranza-Torres and B. Corkum *Proc. NARMS-TAC Conference*, Toronto, 2002, 1, 267-273.
2. Hoek E. (2002). *Practical Rock Engineering*. London: Institution of Mining and Metallurgy. pp. 325.
3. Hoek E. and Brown E.T. (1980). "Empirical strength criterion for rock masses". *J. Geotechnical Engineering Division ASCE*: 1013–1025.
4. Hoek, E. and Brown (1988). "The Hoek-Brown failure criterion - a 1988 update". *Proc. 15th Canadian Rock Mech. Symp.*: 31-38. Hoek E, Carranza-Torres CT, Corkum B (2002). "Hoek-Brown failure criterion-2002 edition". *Proceedings of the fifth North American rock mechanics symposium* vol. 1: 267–273.