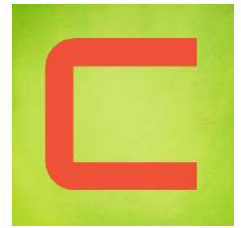




User Manual

CIVILAB 2023
BEARING CAPACITY

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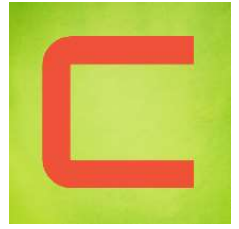
How to use CiviLab to calculate the bearing capacity from results of laboratory tests?

I- NF P 94 261 (Eurocode 7)

I-1- Test Data:

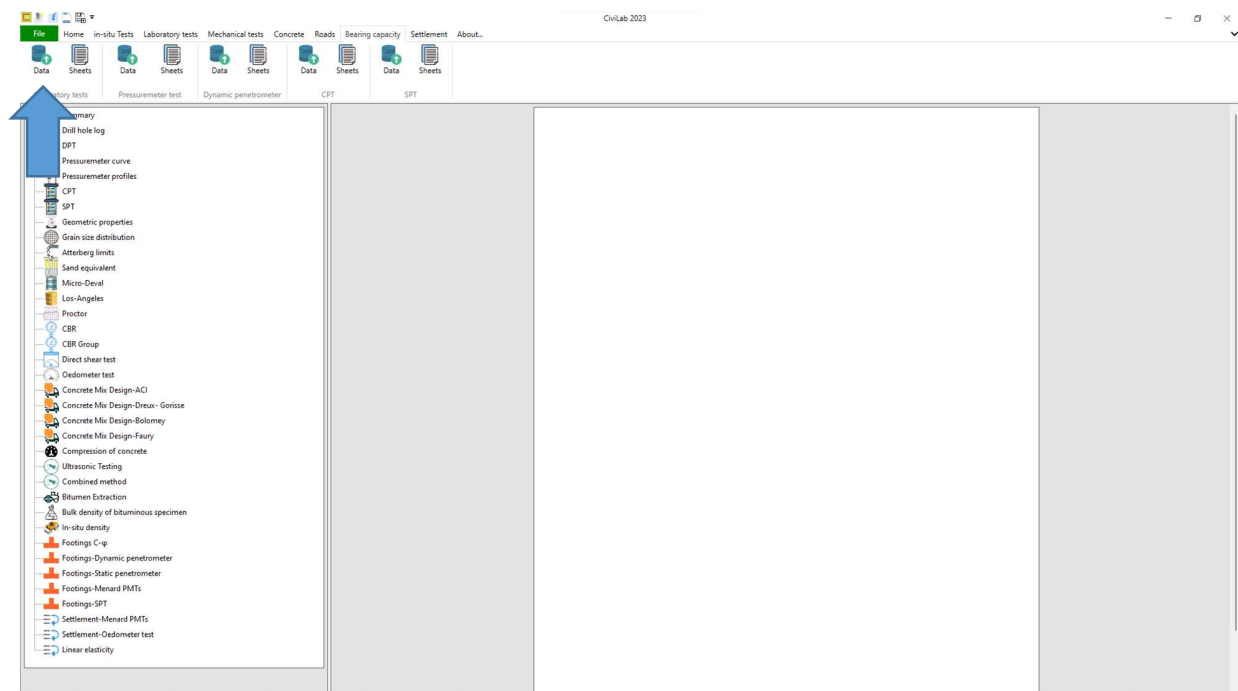
Click on the "Data" button in the "Laboratory Tests" panel, then input:

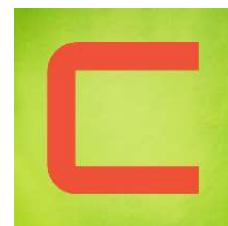
- The test name;
- Select the test date;
- Select the layer;
- The standard (NF P 94 261)
- For undrained conditions, check the corresponding box
- c' et ϕ' or c_u
- The density of the soil above and below the base of the footing (γ_1 , γ_2)
- Load value q
- The value of the partial factor allowing the calculation of the lift at ULS ($\gamma_{R; v(ULS)}$) (PS: the value proposed by CiviLab is that recommended by standard NF P 94 261).
- The value of the partial factor allowing the calculation of the lift at SLS ($\gamma_{R; v(SLS)}$) (PS: the value proposed by CiviLab is that recommended by standard NF P 94 261)
- The model coefficient associated with the calculation method used ($\gamma_{R; d; v}$) (PS: the value proposed by CiviLab is that recommended by standard NF P 94 261)
- Click on the "Geometric properties" button then:
 - Select the footing type
 - Enter the data of the geometric shape of the footing (B, L, D)
 - Enter the depth of the water table (if the water table is unknown enter the value 9999)
 - If the base of the footing is inclined, enter the angle value



- If the foundation is near an embankment, check the corresponding box and enter the values for:
 - The angle of inclination β
 - The distances: d and D_e
- If the load is inclined, check the corresponding box and enter the values for:
 - The angle of inclination θ
 - The value of the horizontal load H
 - The value of the vertical load V
- If the load is eccentric, check the corresponding box and enter the values of e_B and e_L (or e , depending on the footing shape)
- Click on the “validate” button, then CiviLab automatically calculates the corresponding factors.

Click on the "Add / Modify" button





Bearing capacity

Name: Footings-Lab N°=1

Layer: Graphs

Test date: mardi 29 juin 2021

Method: Eurocode 7 (NF P 94-261) ☐ Undrained behaviour

Data:

ϕ (°)	9,25	i_c	1	i_q	1	i_γ	1	N_c	8,04	i_β	1
C (kPa)	32,5	s_c	1,14172	s_q	1,08037	s_γ	0,85	N_q	2,31		
γ_1 (kN/m³)	18,2	b_c	1	b_q	1	b_γ	1	N_γ	0,43		
γ_2 (kN/m³)	17,9										

Geometric properties

Partial factors:

$\gamma_{R,v}$ (ELU)	1,4	$\gamma_{R,v}$ (ELS)	2,3	$\gamma_{R,d,v}$	2
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Loads:

q (kPa)	0
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Add/Modify
Remove

Geometric properties

Type: Isolated Footings-Rectangular

☐ Embankment
☐ Inclined load
☐ Eccentric load

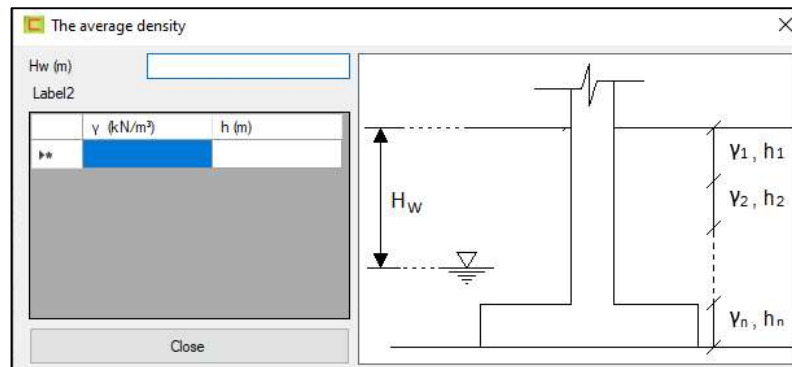
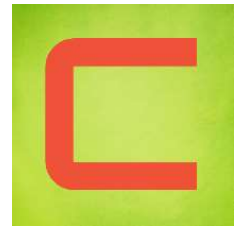
Parameters:

β (°)	0	H (kN)	0	e_B (m)	0
d (m)	0	V (kN)	0	e_L (m)	0
D_e (m)	0	θ (°)	0		

Data:

D (m)	5	Hw (m)	999
B (m)	3	α (°)	0
L (m)	6		

Validate Close

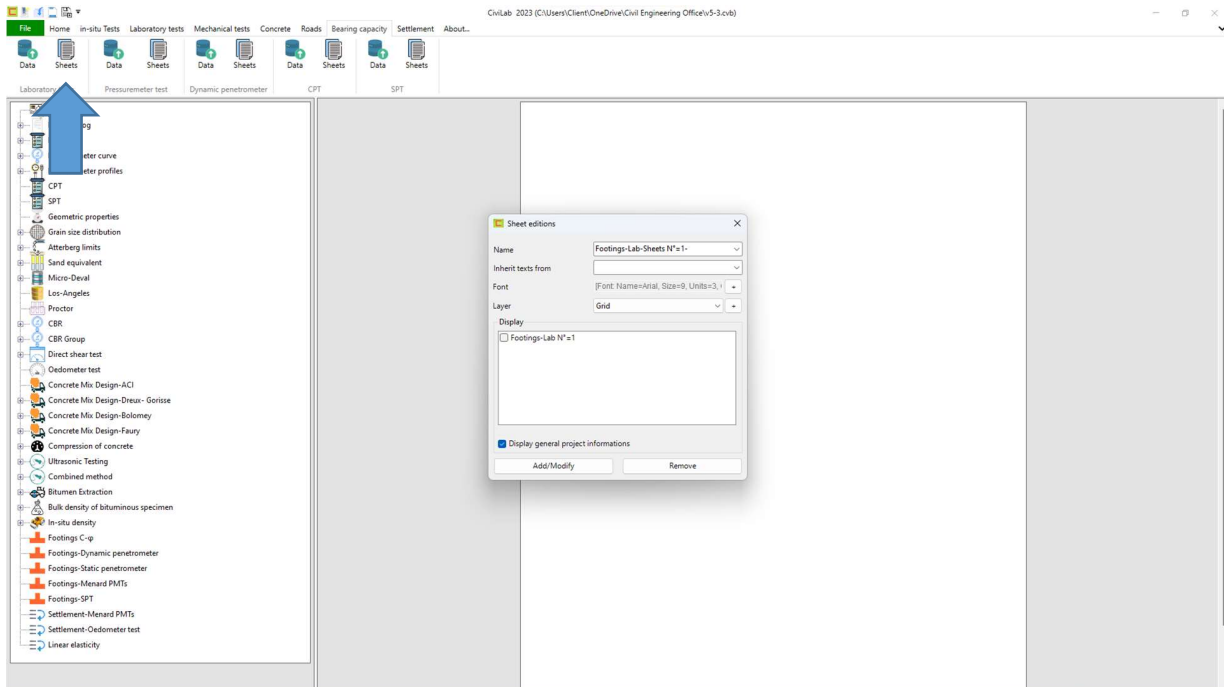
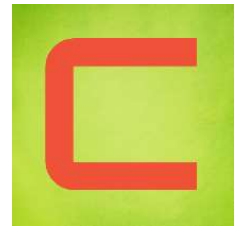


I-2- Add a sheet :

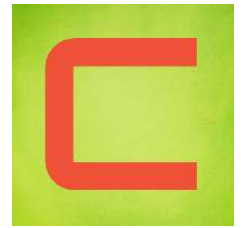
Click on the "Sheets" button in the "Laboratory Tests" panel and input:

- The sheet name;
- Select the font;
- Select the layer used in the background drawing;
- Select the tests;
- To display general project information's check the corresponding box;

Then click on "Add/Modify" button



- I-3- Display the report
- To display the report, click on the sheet name in the tree view



CivilLab 2023 [C:\Users\Client\OneDrive\Civil Engineering Office\3-civil]

File Home in-situ Tests Laboratory tests Mechanical tests Concrete Roads Bearing capacity Settlement About...

New Open Save Save as... Header Zoom Text Arial 14 0.0 1 pt Layer Nourin API Summary Export Print

Summary
 Drill hole log
 DPT
 Pressuremeter curve
 Pressuremeter profiles
 CPT
 SPT
 Geometric properties
 Grain size distribution
 Atterberg limits
 Sand equivalent
 Micro-Deval
 Los Angeles
 Proctor
 CBR
 CSR Group
 Direct shear test
 Oedometer test
 Concrete Mix Design-ACI
 Concrete Mix Design-Dreux- Gorisse
 Concrete Mix Design-Bolomey
 Concrete Mix Design-Faury
 Compression of concrete
 Ultrasonic Testing
 Combined method
 Bitumen Extraction
 Bulk density of bituminous specimen
 In-situ density
 Footings C-φ
 Footings-Lab-Sheets N°1-1
 Footings-Dynamic penetrometer
 Footings-Static penetrometer
 Footings-Ménard PMTs
 Footings-SPT
 Settlement-Ménard PMTs
 Settlement-Oedometer test
 Linear elasticity

BAKHTI Software Ltd
 Civil engineering software development
 Website: <https://www.bakhtisoftware.com>
 Email: bakhti@bakhtisoftware.com / support@bakhtisoftware.com

Project: Suivi RN 18 Project No.: Ref 006/2020
 Client: DTP
 Location: Medea
 Date: 2024-04-24

Bearing capacity: Method C-φ
 Standard: Eurocode 7 (NFP P 84-261)

For drained conditions, the general bearing capacity equation recommended by Eurocode 7:

$$q_{net} = c' N_c b_s s_i i_e + q_0' N_q b_s s_i i_e + q N_{\gamma} b_s s_i i_e + 0.5 \gamma' B N_{\gamma} b_s s_i i_e - q_0'$$

With:

- c' : The undrained cohesion of the subgrade of the foundation;
- N_c, N_q of N_{γ} : Bearing capacity factors;
- γ' : The effective density of the soil under the base of the foundation;
- q and q_0' are the overburden stress and the effective stress at the foundation base
- b_s, b_q at by: Base inclination correction factors;
- s_i, i_q at by: Shape correction factor;
- i_e, i_{γ} at by: Loads inclination correction factors.

Results

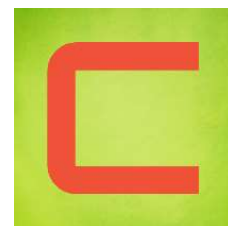
$$\sigma_{vd} \leq \frac{q_{net}}{\gamma_{Rd} \gamma_{Rd, \gamma}} + q_0$$

ELU: $\sigma_{vd} \leq 305.97 \text{ kPa}$; ELS: $\sigma_{vd} \leq 201.17 \text{ kPa}$
 $q_{net} = 757.04 \text{ kPa}$; $q_0 = 36.60 \text{ kPa}$; $q_1 = 130.00 \text{ kPa}$
 $\gamma_{Rd} = 2$; ELS: $\gamma_{Rd} = 2.3$; ELU: $\gamma_{Rd} = 1.4$
 $A = 12.60 \text{ m}^2$; $A_s = 12.00 \text{ m}^2$; $B = 3.00 \text{ m}$; $L = 4.00 \text{ m}$
 $N_c = 8.040$; $N_q = 2.310$; $N_{\gamma} = 0.430$
 $s_i = 1.213$; $s_q = 1.121$; $s_{\gamma} = 0.775$

Isolated Footings-Rectangular: $B = 3 \text{ m}$; $L = 4 \text{ m}$; $D = 2 \text{ m}$
 $q_1 = 120 \text{ kPa}$; $N_c = 8.040$; $N_q = 2.310$; $N_{\gamma} = 0.430$
 $s_i = 1.213$; $s_q = 1.121$; $s_{\gamma} = 0.775$

To export or print the report, click on "Home" tab, then click the appropriate button in the outputs panel (Print or Export button)





Test report:

	BAKHTI Software Ltd Civil engineering software development Website: https://www.bakhtisoftware.com Email: bakhti@bakhtisoftware.com / support@bakhtisoftware.com	a
Project: Suivi RN 18 Project No.: Ref 008/2020		b
Client: DTP Location: Medea Date: 2021-06-29 Tested by: BAKHTI	Checked by: LAIB	c

Bearing capacity: Method C-φ
 Standard: Eurocode 7 (NF P 94-261)

For drained conditions, the general bearing capacity equation recommended by Eurocode 7:

$$q_{net} = c' N_c b_c s_c i_c + q'_0 N_q b_q s_q i_q + q N_q b_q s_q i_q + 0,5 \gamma' B' N_\gamma b_\gamma s_\gamma i_\gamma - q'_0$$

With:

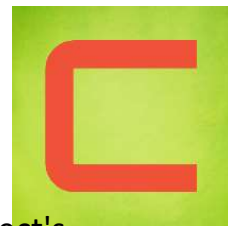
- c': The undrained cohesion of the subgrade of the foundation;
- N_c, N_q et N_γ: Bearing capacity factors;
- γ': The effective density of the soil under the base of the foundation;
- q and q'₀ are the overload stress and the effective stress at the foundation base
- b_c, b_q et b_γ: Base inclination correction factors;
- s_c, s_q et s_γ: Shape correction factor;
- i_c, i_q et i_γ: Loads inclination correction factors.

Results	
$\sigma_{V;d} \leq \frac{q_{net}}{\gamma_{R;d}} + q_0$ ELU: σ_{V;d} ≤ 282,16 kPa; ELS: σ_{V;d} ≤ 207,36 kPa q_{net}= 535,25 kPa; q₀= 91,00 kPa; q= 0,00 kPa γ_{R;d}= 2; ELS: γ_{R;d}= 2,3; ELU: γ_{R;d}= 1,4 A'= 18,00 m²; A= 18,00 m²; B'= 3,00 m; L'= 6,00 m N_c= 8,040; N_q= 2,310; N_γ= 0,430 s_c= 1,142; s_q= 1,080; s_γ= 0,850	Isolated Footings-Rectangular : B= 3 m; L= 6 m; q= 0 kPa D= 5 m; Hw= 999 m; α(Base angle)= 5° γ₁= 18,2 kN/m³; γ₂= 17,9 kN/m³; C= 32,5 kPa

Software: CivilLab 2022

a. Sheet Header Presentation: To import or modify the sheet header, go to the "Home" tab and select the "Header" button.





b. Project Name and Reference: These details can be entered from the project's general information found in the File menu.

c. Area for Displaying Test Information: Test information can be input within this area from the Test Information window (to show it click on the “+” button next to the name of the test on Data window) and project's general information window.

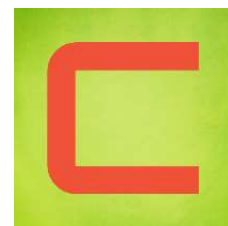
d. Area for results: this area is designated to visualize the test results.

II- DTR BC 2.331 et DTU 13.12

II-1- Test Data:

Click on the "Data" button in the “Laboratory Tests” panel, then input:

- The test name;
- Select the test date;
- Select the layer;
- The standard (DTR BC 2.331 or DTU 13.12)
- c et ϕ
- The density of the soil above and below the base of the footing (γ_1 , γ_2)
- Load value q
- The value of the safety factor F
- Click on the "Geometric properties" button then:
 - Select the footing type
 - Enter the data of the geometric shape of the footing (B , L , D)
 - Enter the depth of the water table (if the water table is unknown enter the value 9999)
 - If the base of the footing is inclined, enter the angle value
 - If the load is inclined, check the corresponding box and enter the values for:
 - The angle of inclination δ
 - If the load is eccentric, check the corresponding box and enter the values of e_B and e_L (or e , depending on the footing shape)
 - Click on the “validate” button, then CiviLab automatically calculates the corresponding factors.



Click on the "Add / Modify" button

Bearing capacity

Name: Footings-Lab N°=2

Layer: Graphs

Test date: mardi 29 juin 2021

Method: DTR BC 2.331 ☐ Undrained behaviour

Data:

ϕ (°)	9,15	i_c	0,69444	i_q	0,69444	i_y	0,40876	N_c	8,077	i_β	1
C (kPa)	33,25	s_c	1,13333	s_q	1	s_y	0,86666	N_q	2,347		
γ_1 (kN/m³)	17,5	b_c	1	b_q	1	b_y	1	N_γ	0,432		
γ_2 (kN/m³)	18,6										

Geometric properties:

Partial factors:

F: 3 $\gamma_{R,v}$ (ELS): 2,3 $\gamma_{R,d,v}$: 2

Loads:

q (kPa): 0

Add/Modify

Remove

Geometric properties

Type: Isolated Footings-Rectangular

☐ Embankment

☒ Inclined load

☐ Eccentric load

β (°): 0

d (m): 0

De (m): 0

H (kN): 0

V (kN): 0

δ (°): 15

e (m): 0

eL (m): 0

Data:

D (m): 3

B (m): 2

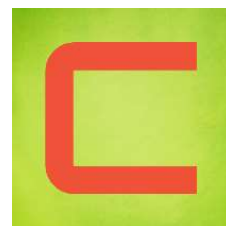
L (m): 3

Hw (m): 999

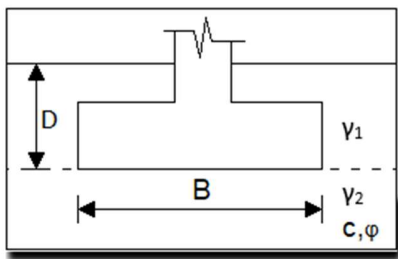
α (°): 0

Validate

Close



- II-2- Add sheet (same as section I-2)
- II-3- Display report (same as section I-3)
- II-4- Test report :

	BAKHTI Software Ltd Civil engineering software development Website: https://www.bakhtisoftware.com Email: bakhti@bakhtisoftware.com / support@bakhtisoftware.com
Project: Suivi RN 18	Project No.: Ref 008/2020
Client: DTP Location: Medea Date: 2021-06-29	
Bearing capacity: Method C-φ Standard: DTR BC 2.331	
The general bearing capacity equation is given by $q_u = s_q i_q \gamma_1 D N_q + \frac{1}{2} s_\gamma i_\gamma \gamma_2 B' N_\gamma + s_c i_c c' N_c$ With: - C: The cohesion of the subgrade of the foundation; - Nc, Nq et Ny: Bearing capacity factors; - γ1, γ2: The density of the soil above and below the base of the foundation - B': The effective width of the foundation - D: The embedding depth - sc, sq et sy: Shape correction factor; - ic, iq et iy: Loads inclination correction factors.	
Results $q_{adm} = \frac{q_u - \gamma_1 D}{F} + \gamma_1 D \quad F \geq 3$ qadm = 134,93 kPa qu= 299,78 kPa; qo= 52,50 kPa; q= 0,00 kPa F= 3 A'= 6,00 m²; A= 6,00 m²; B'= 2,00 m; L'= 3,00 m Nc= 8,077; Nq= 2,347; Ny= 0,432 sc= 1,133; sq= 1,000; sy= 0,867 ic= 0,694; iq= 0,694; iy= 0,409	 Isolated Footings-Rectangular : B= 2 m; L= 3 m; q= 0 kPa D= 3 m; Hw= 999 m δ(Loads angle)= 15° γ1= 17,5 kN/m³; γ2= 18,6 kN/m³; C= 33,25 kPa

Software: CivilLab 2022

