MOHAMED KHIDER UNIVERSITY OF BISKRA

FACULTY OF ARCHITECTURE, CIVIL ENGINEERING, HYDRAULICS

DEPARTMENT OF CIVIL ENGINEERING AND HYDRAULICS

LAB REPORT N°3

Direct Shear Test

Authors:
Oussama ACHOURI
Djasser CHENAG
Abdelmounaim HAMLAOUI

Supervisor:
Dr.Brahmi N

A lab report for the practical work of soil mechanics 2
for the degree of 3 Licence in Civil Engineering

2024/2025

Contents

1 Direct Shear Test

1.1 Introduction

The direct shear test is a fundamental experiment in geotechnical engineering used to determine the shear strength of soil. Shear strength is critical for assessing the stability of slopes, retaining walls, and foundations. This test measures the shear stress required to cause failure under a given normal stress, providing essential data for the Mohr-Coulomb failure criterion.

1.2 Objective of the Test

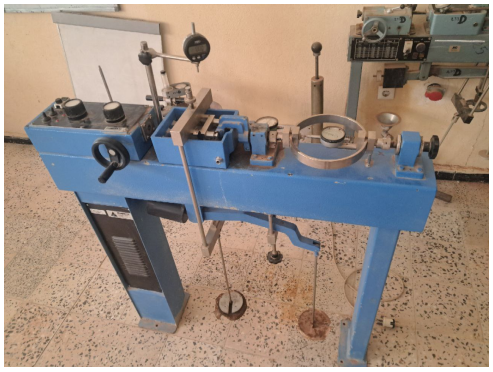
To determine the shear strength parameters of the soil sample: cohesion (c) and angle of internal friction (ϕ).

1.3 Use of the Test in Civil Engineering

The direct shear test is widely used in civil engineering to assess the stability of slopes, design retaining walls, and evaluate the bearing capacity of foundations.

1.4 Equipment used

- Direct shear test apparatus
- Soil sample
- Loading frame
- displacement sensors
- Weights for applying normal stress

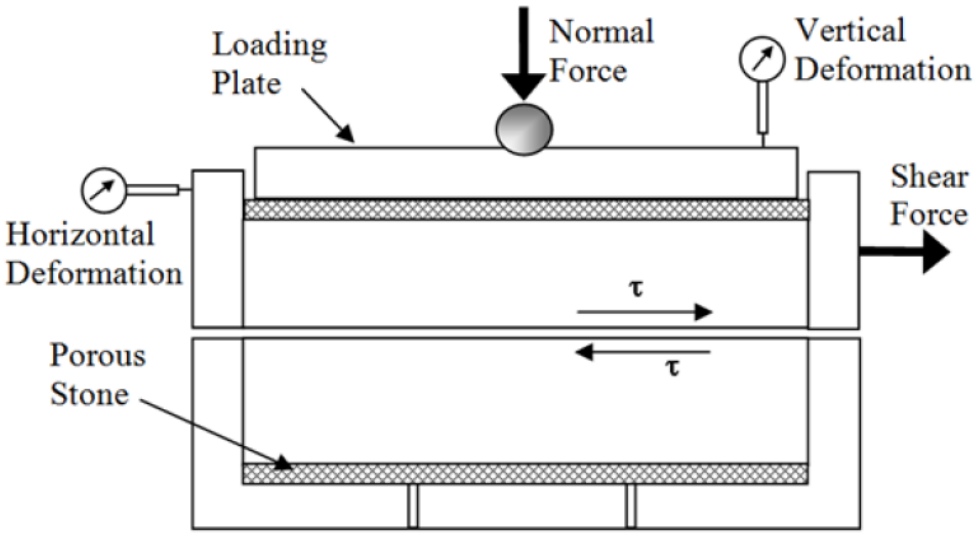


(A) Direct shear test apparatus

(B)
Weights

1.5 Operating Procedure

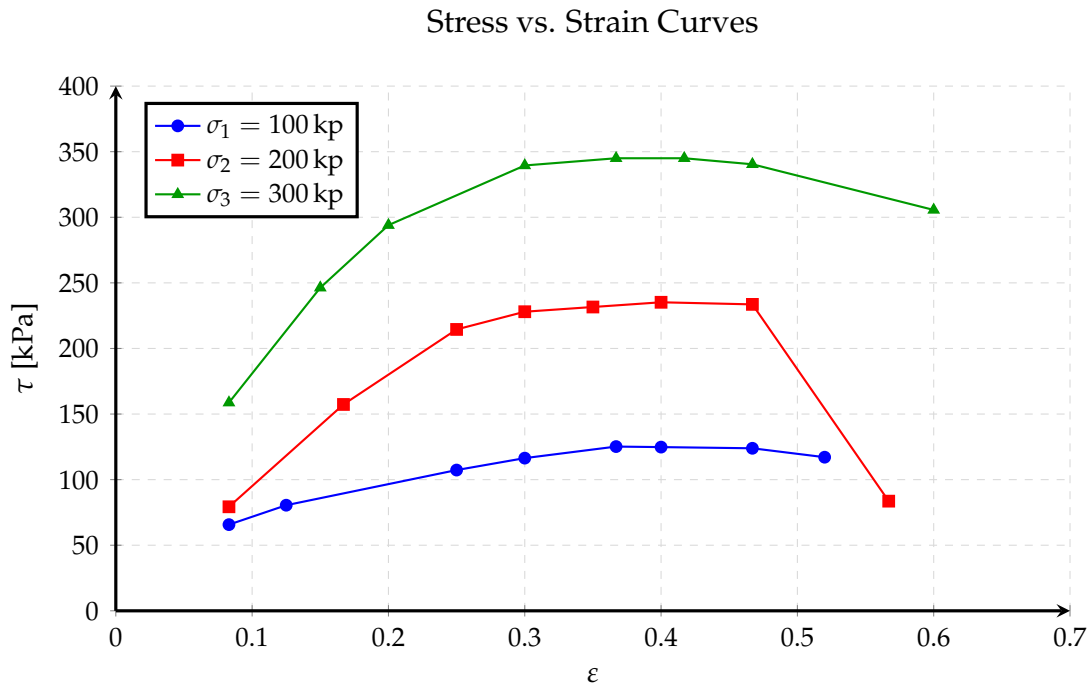
1. Loosen the screws of the dynamometric ring.
2. Assemble the two half-boxes, then place the base, a draining stone, and a grooved plate.
3. Collect a soil sample using a cutting tool and weigh it. This weighing can be used to calculate the soil's bulk density.
4. Place the sample in the box.
5. Lightly compact the sample with the tamper (this step is performed if the soil was sampled from depth).
6. Complete the assembly of the box with the upper grooved plate, the porous stone, and the lid.
7. Place the box in the frame, ensuring the upper half-box is connected to the dynamometric ring for measuring the shear force T.
8. Align the vertical loading system with the box, screwing the loading finger to ensure contact with the lid.
9. Place a load on the platform.
10. Lower the platform to release this load, initiating soil consolidation.
11. Tighten the screws of the dynamometric ring to eliminate any play.
12. Remove the assembly screws of the box.
13. Start the machine; the test begins. Typically, the reading on the dynamometric ring is recorded every 15 seconds.
14. The test may stop automatically.

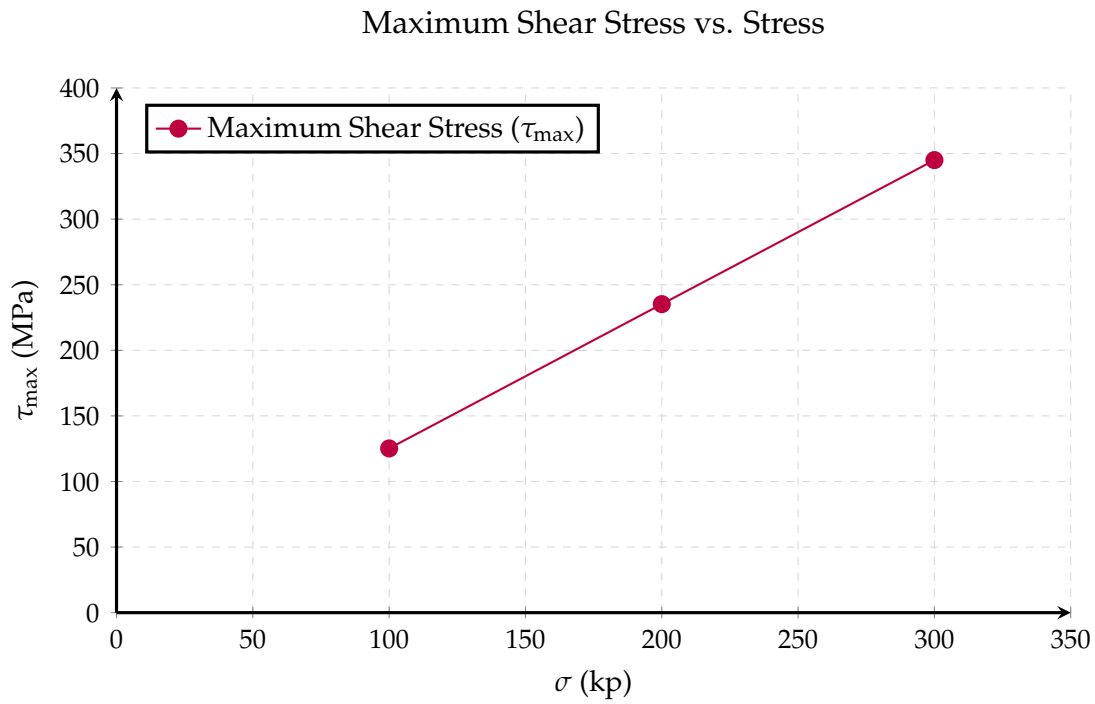


1.6 Expression of results

$\sigma_1 = 100\,\text{kp}$				$\sigma_2 = 200\,\text{kp}$				$\sigma_3 = 300\,\text{kp}$			
t	ΔL	ε	τ	**t**	ΔL	ε	τ	**t**	ΔL	ε	τ
[s]	[mm]		[kPa]	[s]	[mm]		[kPa]	[s]	[mm]		[kPa]
23.650	0.5	0.083	65.7	28.560	0.5	0.083	79.3	57.121	0.5	0.083	158.7
28.995	0.75	0.125	80.5	56.640	1.0	0.167	157.3	88.650	0.9	0.150	246.3
38.610	1.5	0.250	107.3	77.220	1.5	0.250	214.5	105.840	1.2	0.200	294.0
41.904	1.8	0.300	116.4	82.062	1.8	0.300	228.0	122.220	1.8	0.300	339.5
45.084	2.2	0.367	125.2	83.376	2.1	0.350	231.6	124.200	2.2	0.367	345.0
44.928	2.4	0.400	124.8	84.672	2.4	0.400	235.2	124.200	2.5	0.417	345.0
44.616	2.8	0.467	123.9	84.084	2.8	0.467	233.6	122.552	2.8	0.467	340.4
42.143	3.12	0.520	117.1	30.100	3.4	0.567	83.6	110.000	3.6	0.600	305.6

Ploting Data :





From the plot :

- Cohesion (c) = 12 kPa
- Angle of internal friction (ϕ) = 65°

1.7 Conclusion

The direct shear test successfully determined the shear strength parameters of the soil sample. The soil exhibited a cohesion (c) of 12 kPa and an angle of internal friction (ϕ) of 65°.