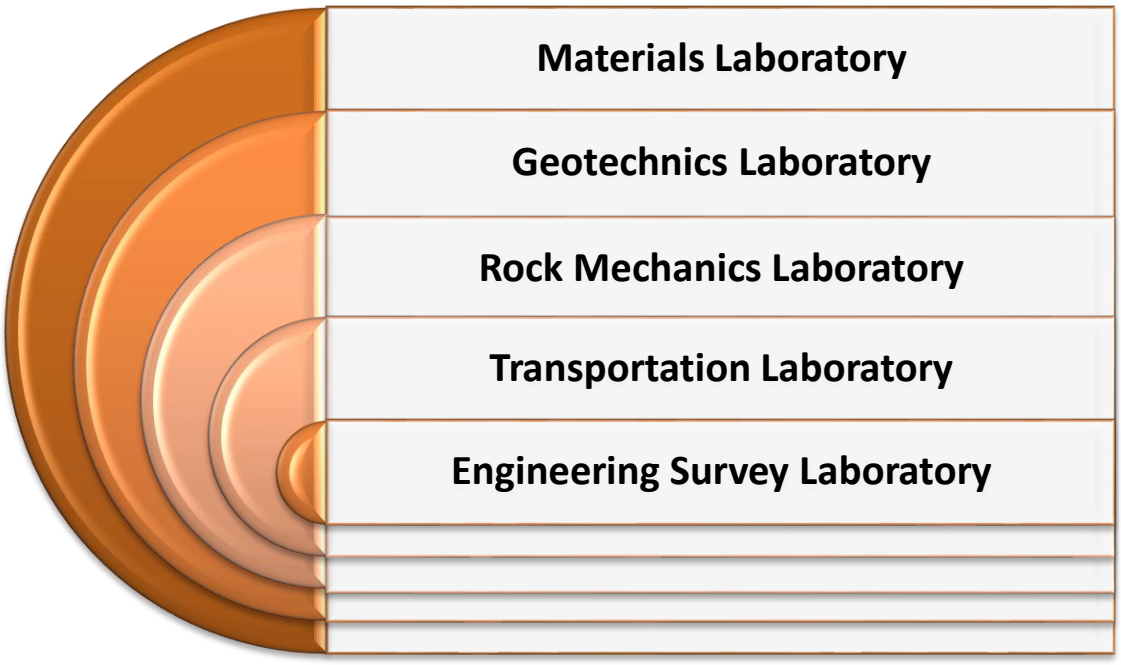
قسم الهندسة المدنية

Civil Engineering Department

A Guide of Civil Engineering Department Laboratories

Department Laboratories



Civil Engineering Laboratories

Seven laboratories are belonging to the civil engineering department. These laboratories have scientific and consultant activities. These laboratories include many devices, Maintenance is performed frequently to elongate the lifespan of the derives and maintains their good condition.

These laboratories help to produce high-quality research. Additionally, they contribute for performing many tests. The laboratory also contributes for providing consultations services.

Expert faculty members from the civil engineering department manage the laboratories. A good management is the reason of successfulness of these laboratories.

1. Construction Materials Laboratory

The Construction materials laboratory represents the most important and the biggest laboratory among civil engineering laboratories. The laboratory has been

established in 1967 and its area was 1260 m2. The laboratory was equipped with a high-quality device. The laboratory includes rooms for lecturers and graduate students. The laboratory was renovated in 2007. It was destroyed because of military activities in 2017. It was renovated again in 2019 by UNDP organization and under supervision of Directorate of Construction and Projects at the University of Mosul.

The laboratory includes many apparatuses and tools used for performing physical tests of structural materials. The devices and tools are used by graduate students and for consultations purposes.

Compression tests for concrete cubes, ceramic tests, cement test, steel test, steel mech test, concrete block test, steel sections test, breaks test, curbstone test, testing of all pipe types, sand and gravel tests, concrete mix design. Non-destructive test (core test, ultrasound test, load test)

Finally, the laboratory can voluntarily provide assistances for graduate students form other departments or colleges.

2. Geotechnical Laboratory

The geotechnical laboratory represents the stone-corner of the civil engineering laboratories because of it is importance for educating the undergraduate students the fundamental soil mechanics.

The laboratory was established by a group of experts at soil mechanics and foundation engineering fields in Iraq in 1963 which is the same date as the civil engineering has been established. The laboratory building is 300 m2. It includes a classroom, stages, and benches for performing tests, storage rooms, and lecturers' room,

The main purpose of the laboratory is for educating underground student of the physical soil properties such as specific gravity, Atterberg limits, grain size distribution, compaction test, hydraulic properties such as permeability test, and mechanical tests such as consolidation test, unconfined compression tests, direct shear tests, and triaxial tests. Additionally, chemical tests of soils can be performed in the laboratory. The laboratory also contributes for providing consultations services.

Soil Mechanics and Foundation Engineering Laboratory for Research

In 2002, the civil engineering department reserved a section for soil mechanic's research. The research laboratory section area is around 150 m2. The establishment of this laboratory was an important step for the ability of performing a high-quality research by a faculty and graduate students.

3. Rock Mechanics Laboratory

The Rock mechanics laboratory was established on1986 as a part of Soil Mechanics Laboratory. In 2007, a new building was constructed specifically for Rock mechanics laboratory and since then it becomes a stand-alone laboratory. The area of the new building is 250 m2.

The rock mechanics laboratory includes many apparatuses and tools. These apparatuses and tools are useful for performing physical and mechanical rock tests. They can be use for research by graduate students and for the purpose of engineering consultations by the engineering consultation bureau workers.

4. Surveying Engineering laboratory

Surveying Engineering Laboratory was established in 1964 and was equipped with German and Chinese devices. One of the modern devices in the laboratory is the electronic theodolite device. In 2008, a new building was allocated to this laboratory. The tests conducted in the laboratory are measuring areas, quantities and volumes, creating adjustment numbers and points of triangulation, drawing longitudinal and cross-sections, and measuring distances.

This laboratory includes many devices, used to train students in all measurement operations, and everything that a survey engineer needs in his work. These devices can be classified as follows:

Set One: It includes modern electronic devices for measuring distances, directional measuring devices such as gyroothiodelites, special devices for receiving

and recording time such as chronometers, short-wave receiving devices, and a small-scale planetarium.

Set Two: It includes various devices for measuring angles such as Theodolite, and the accuracy of measurement in these devices ranges from one minute to one second, and there are a number of tachometer devices and leveling devices of various kinds and accuracy.

Set Three: It includes traditional surveying devices such as flat panels. The laboratory contains antenna tapes that are used to measure baselines, and the horizontal rulers and a number of Substance bars.

5- Highway materials Laboratory

The Highway materials laboratory was established in 1967 to examine the engineering properties of asphalt materials, dirt, and dyes used in road construction and civil engineering works. It is one of the laboratory of the Ministry of High Education and Scientific Research \ University of Mosul \ College of Engineering \ Department of Civil Engineering.

Lab Activities:

The activities of the laboratory, which it carries out with high efficiency, include the following:

1. Conducting checks for asphalt materials, dirt, and dyes used in road construction and civil engineering works and determining their conformity with the approved standard specifications, (see the list of tests carried out in the laboratory based on the national and international standard), for the governmental and private sectors through the advisory office and the mechanism of cooperation. The test results are issued in all impartiality and transparency by an experienced and highly qualified engineering staff
2. Providing training services on tests and laboratory devices for new workers in the Civil Engineering Department as well as engineers working in the government institutions.

3. Performing its activities according to the international standard ISO / IEC 17025 / 2005.

   Other requirements specified by the national and international accreditation body in addition to the customer's requirements.

   1. To participate in the follow-up and supervision of the maintenance and repair of devices.
   2. Providing engineering consultancy for researchers (teachers and postgraduate students) and for the private and government sectors.

Apparatuses Description of Materials Laboratory

no.	Device Name	Device Description	Device Picture
1.	**General Compressive Test Device**	Examines concrete blocks for concrete pouring works in all engineering works. In addition, determines the suitability of the implemented concrete to the necessary requirements for each engineering work. Approved Specifications: Iraqi Specifications	

2.	**General Tensile Test Device**	Examines reinforcing steel used in engineering works of various sizes, as well as examines various steel sections used in engineering works. Approved Specifications: American ASTM A 615 British BS 4449	
3.	**General Tensile Test Device**	Examines the tiles used in the finishing processes of floors, as well as the tiles used for the surfacing of concrete ceilings	
4.	**General Tensile Test Device**	Examines the types of ceramics used in the packaging of structural members (such as internal and external walls). As well as the ceramics used for cladding floors. Approved Specifications : Iraqi Specifications: (BCG 1392, BCG 1704, BCG 1627	

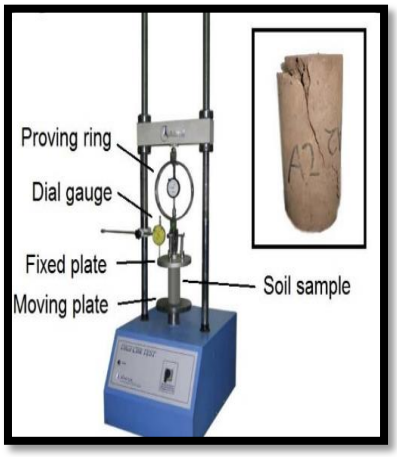
5.	**General Tensile Test Device**	Examines drinking water and waste water pipes Approved specification: M. S. P 1491	
6.	**General Compressive Test Device**	Examines the building blocks used in construction work of all kinds (solid and hollow) for loaded and non-loaded walls (partitions). In addition, knowing its suitability for engineering work. Approved Specifications: Iraqi Specifications (M. Q. cl 1077, M. Q. p. 1129)	
7.	**General Compressive Test Device**	Examines various types of bricks, which are used in engineering works. Approved Specification: M. S. P 25	

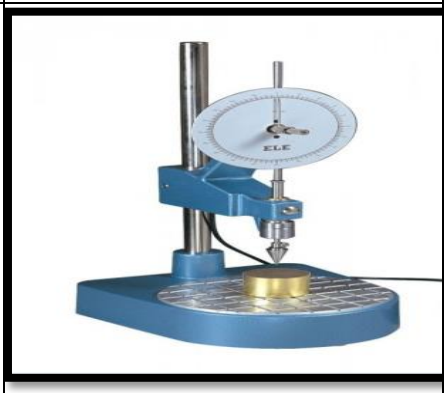
8.	**Utrasonic Test**	This test is achieving by passing a pulse of ultrasonic waves through the concrete parts. The time of passing of these ultrasonic waves is measured. The velocities of passing of these ultrasonic waves give us an indication about the density and other properties of the tested materials. This test is conducting in accordance with ASTM C597.	
9.	**Hammer Test**	This test is conducting by using the hammer device as shown in the picture on the right. The device includes a metal hammer which is connected to a spring. The test measures the rebound of a steel hammer affected on the concrete by a spring. The test gives an approximate indication about the compressive strength of concrete. This test is conducting in accordance with ASTM C805.	
10.	**Core test**	This test, which is considered a semi-destructive test, is using to assess the compressive strength of concrete. This test gives a real indication about the compressive strength of concrete in structural members such as, slab, beam, column, and foundation. This test is conducting in accordance with the Iraqi Code and ASTM C42.	

11.	**Vicat-apparatus**	This apparatus is using to determine the normal consistency, and initial and final time of setting. This test is conducting in accordance with: ASTM C187-13 and ASTM C191-13	
12.	**Jotting Table**	This apparatus is utilizing to prepare samples of cement in accordance with European specifications.	
13.	**Steel frame for research and graduate studies**	This steel frame is using to study the behavior of structural members and measure their strength. Different tests can be conducted by this steel frame.	
14.	**Apparatus for research and graduate studies**	This apparatus is utilizing to study the behavior of structural members and measure their strength.	

15.	**Electrical Oven**	Electrical oven which is used to dry structural materials. The capacity of the oven is 20 ft^3 and its temperature reaches up to 600 °C.	
16.	**Electrical Oven**	Electrical oven which is used to dry structural materials. The temperature of the oven reaches up to 250 °C.	

Apparatuses Description of Geotechnical Laboratory

No.	Apparatus Type	Apparatus Description	Apparatus Photo
1	**Direct Shear Test**	To measure the shear strength parameters (Angle of internal friction and (ϕ)soil cohesion) (C	
2	**Vane Shear Test**	To measure soil undrained shear strength	
3	**Consolidation Test**	To determine soil volume change, consolidation parameters (Cc, and Cs), swell pressure and free swell	
4	**Unconfined Compression Test**	To determine the undrained shear strength of cohesive soils	

5	**Triaxial Test**	To measure the shear strength parameters (Angle of internal friction and (ϕ)soil cohesion) (C	
6	**Permeability Test**	To determine the coefficient of hydraulic conductivity	
7	**Liquid Limit**	To measure the soil liquid limits of clayey soils, then soil classify the soil according to the soil specification	
8	**Fall Cone Test**	To measure the soil liquid limits of clayey soils, then soil classify the soil according to the soil specification	

9	**Field density**	To determine the field density	
10	**Hydrometer Test**	To find the grain sizes of fine-grained soils	
11	**Sieves**	To find the grain sizes of coarse-grained soils	

			
16	**Distilled water device Mechanical Shaking Device**	Used to shake soil solution to increase its homogeneity purposes	
13	**Samples Divider Device**	Used to divide a soil sample quadratically to facilitate the sieve analysis process	
14	**Electrical Ovens**	Used to dry out soil samples.	
15	**Burner Oven**	Used for organic matter test	

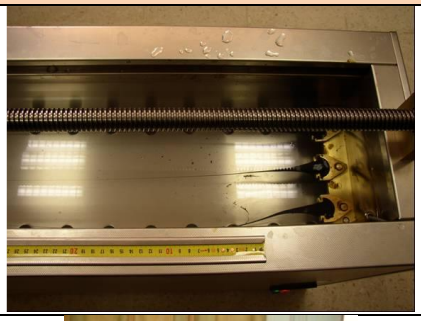
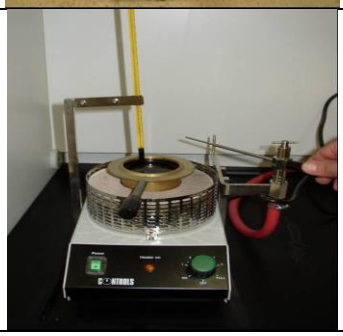
		Used to produce distilled water	
17	**Proving ring calibration device**	To calibrate proving rings	
18	**Hot Plate**	To boil soil solutions	

Rock Mechanics tests

No	Apparatus Type	Apparatus Description	Apparatus Photo
1	**Uniaxial Compression Test**	To determine stress-strain behavior and unconfined compressive strength of rocks	
2	**Triaxial Compression Test**	To determine stress-strain behavior, Shear strength, and shear strength parameters (cohesion and friction angle) of rocks	

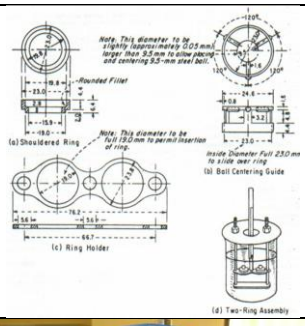
3	**Bending Test**	To determine the bending strength of rocks	
4	**Direct Shear Test**	To determine the shear force of rocks by applying vertical loads and to determine the angle internal friction.	
5	**Point Load Test**	To determine the index compressive strength of rocks. It has a relation with the compressive strength of the rocks.	
6	**Brazilian Test**	To determine the indirect tensile strength of rocks	
7	**Slaking and Durability Test**	To determine the amount of rock erosion and its durability in the presence of water	

Laboratory Devices

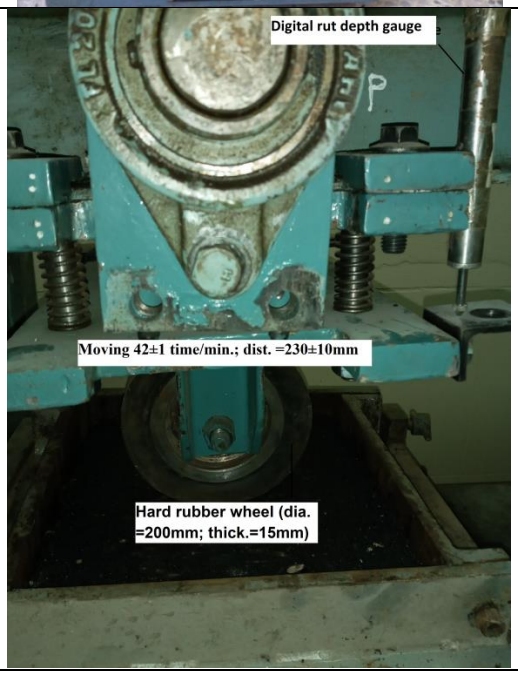
No.	Device Name	Description	Device Image
1	**Tensile and Ductility Properties Test Device for Bituminous**	Measuring the tensile properties and ductility of bituminous materials used in civil engineering works	
2	**A loss Test Machine for Volatile Substances of Bituminous**	Measuring the percentage of the loss of volatile materials for bituminous used in road cladding works	
3	**Friction Properties Test Device for Flexible Piling**	Measuring Friction characteristics (coefficient of friction) of a (flexible) asphalt paving with a dry or wet surface	
4	**Flash and Burn Point Test Device for Bituminous**	Determine the flash and burn point for bituminous (which are considered a safety factor in asphalt mix (production plants	
5	**Core Drilling Machine**	Obtaining cylindrical asphalt samples with different diameters based on a cylinder size	

6	**Extraction Machine for Asphalt Mixtures**	Washing concrete asphalt samples and separating aggregate from asphalt	
7	**Cohesometer Test Machine for Bituminous Mixtures**	Measuring the cohesion of asphalt mixtures at a maximum temperature of 60 ºC	
8	**Tensile and Compression Strength Test Machine of asphalt Mixtures**	Measuring tensile and compressive strength properties of asphalt Mixtures	
9	**Aggregate Heating Furnace**	Heating aggregate and filler used in the production of asphalt mixtures to a temperature of 110 ± 5 ºC	
10	**Concrete Asphalt Mixer**	Mixing concrete asphalt samples	

11	**Asphalt Specific Gravity Scale**	Measuring the specific gravity of asphalt samples up to 2.5 kg with an accuracy of 0.01 g	
12	**Gyratory Compaction Machine**	Compacting of concrete asphalt samples with a diameter of 177.8 mm, and a height of 342.9 mm at a horizontal angle of 1.25º and under pressure of 600 KPa	
13	**Marshall hammer**	Compacting of concrete asphalt samples with a diameter of 101.6 mm and a height of 63.5 mm under (weight = 44.4 , vertical fall distance of 457.2 mm)	
14	**Wheel Tracking Compaction Machine**	Compacting square concrete asphalt samples with a length of 300 mm and a maximum thickness of 70 mm	
15	**California Bearing Ratio Test Machine**	Testing cylindrical samples of flexible paving layers (nature ground, foundation, and sub-foundation) with a diameter of 152 mm and a height of 178 mm	

16	**Softening Point Test Machine of Bituminous**	Measuring a ductility point of bituminous used in road cladding and surfacing works	
17	**Penetration Test of Bituminous Device**	Measuring the penetration of bituminous used in civil engineering work	
18	**Viscosity Test of Bituminous by Saybolt Device**	Measuring the viscosity of bituminous used in road cladding, liquids, and petroleum solvents, and oil	
19	**Marshall Test Machine**	Determining stability and Marshall creep of laboratory or field asphalt samples	
20	**Water Bath for Marshall Test**	Saving asphalt concrete samples with a diameter of 101.6 mm and a height of 63.5 mm for performing a Marshall stability test	

21	**Ignition Oven**	Burning asphalt materials containing organic solvents and the filler extracted by washing of asphalt mixtures at a temperature of 538 ºC	
22	**Aggregate Measurement**	Measuring gravel, sand, and soil samples up to 20 Kg with an accuracy of 1 g	
23	**Specific Gravity Measurement of Asphalt Mixtures**	Measuring cylindrical concrete asphalt samples with a diameter of 101.6 mm and a height of 63.5 mm	
24	**Oven for Flow Test of felt material**	Measuring the flow test for mastic (cold and hot type) used in filling joints of buildings, roads, and other civil engineering works. The oven is also used to calculate the percentage of asphalt material included in the composition of felt material	
25	**Mixer of Asphalt, Additives (Asphalt Emulsion and Diluents Asphalt)**	Mixing bitumen with additives (plastics in the form of granules or liquids…etc.) in addition to mixing asphalt emulsion or bitumen diluted with solvents in order to obtain the desired homogeneity	

26	**California Bearing Ratio Hammer**	Compacting of cylindrical concrete asphalt samples with a diameter of 152 mm and a height of 178 mm using a mechanical hummer (weight = 24.4 N, and a vertical fall distance of 305 mm	
27	**Flexural Strength Test**	Measuring flexural strength properties of asphalt mixtures	
28	**Ripples Resistance Test of Bituminous Mixtures**	Measuring ripples resistance of bituminous mixtures	

6- Computer Laboratory

The Department of Civil Engineering has four electronic computer laboratories that are used for preliminary studies lectures. They are equipped with the latest computers and are elegantly furnished.

The table below shows the contents of the laboratories:

Computer Lab -1
Description:
Lab 1 is for Grade-1 students in which practical programming is taught (IC3 Language), as well as AutoCAD and Microsoft Office .
Devices:
The laboratory includes 23 computers and a Data Show.
Computer Lab -2
Description:
Lab 2 is for Grade-2 students in which Visual Basic is taught.
Devices:
The laboratory includes 24 computers, a Data Show, and a scanner.

Computer Lab 2

Description:

It is a laboratory for second-year students, in which Visual Basic is taught

Devices:

The laboratory includes 24 computers in addition to a Data show and Scanner

Computer Lab 3

Description:

It is a laboratory for third-year students, where Matlab and premiere are taught.

Devices:

The laboratory includes 21 computers and a Data show

Computer Lab 4

Description:

It is a laboratory for grade 4 students, where Plaxis, Staadpro, Saab and Staad Foundation are taught.

Devices:

The laboratory includes 22 computers and a Data show