DEPARTMENT OF CIVIL ENGINEERING

MATERIAL TESTING / CONCRETE TECHNOLOGY LABORATORY

Material Testing / Concrete Technology Laboratory is fully organized in a covered area of 230 m^2. It is well equipped with many machines and instruments in order to perform quality testing. Thrust area of this lab are to investigate different material properties used in concrete as an alternative material and as a partial replacement of conventional materials. Here is the list of few tests that are performed:

a) Fineness of cement by Blaine's Air Permeability Apparatus.
b) Soundness of Cement by Autoclave Method.
c) Consistency Test, Initial and Final Setting Time of cement.
d) Compressive Strength of Cement.
e) Workability Test using Slump, Compaction Factor Test, Vee-Bee Test, L-Box Test, J Ring Test and V Funnel Test.
f) Sieve Analysis of Coarse and Fine Aggregate.
g) Specific Gravity and Water Absorption test of Coarse and Fine Aggregate.
h) Mix Design
i) Bulking of Sand.
j) Silt Content.
k) Water Absorption of Brick.
l) Efflorescence Test of Bricks.
m) Compressive Strength of Bricks.
n) Torsion Test of Steel
o) Surface Hardness Test
p) Fatigue Test of Steel

The descriptions of the equipment are listed below.

i) Universal Testing Machine

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

Capacity: 1000kN

Universal Testing Machine (UTM) is designed to test rebars, plates and metals under tension, compression and bending both in the form of test pieces and as finished product. It is also designed for testing the compressive and flexural strength of several construction material and members. The load is applied by a hydrostatically lubricatedram.All the tests are performed under the guidance of experienced instructor.

Universal Testing Machine of 1000kN Capacity

ii) Compression Testing Machine

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

Capacity:2000kN

The Compressive Testing Machine (CTM) is used to test compressive strength of concrete cubes, cement cubes, bricks, tiles, concrete cylinder of length 300 mm. It can also be used to test the strength till M70 grade concrete. split tensile strength of concrete can also be determined by using this machine.

Compression Testing Machine of 2000kN Capacity

iii) Pendulum Impact Testing Machine

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

Capacity: 30 kg-m.

A Pendulum Impact Testing Machine is used to determine the impact strength or toughness of a material under impact loading by measuring the amount of energy the material is able to absorb. By this machine one can perform the Charpy as well as Izod impact test.

Izod Impact Testing Machine

iv) Rockwell Cum Brinell Hardness Tester

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

Capacity: 250 kg-f.

Rockwell cum Brinell hardness tester is used for checking hardness of metals and alloys of all kinds.

Rockwell Cum Brinell Hardness Tester

v) Compaction Factor Test Apparatus.

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

Compaction factor test is developed by Road Research Laboratory in United Kingdom and is used to determine the workability of concrete. The compaction factor is the ratio of weights of partially compacted to fully compacted concrete. The compaction factor test is used for concrete which have low workability for which slump test is not suitable.

Compaction Factor Test Apparatus

vi) Vee-Bee Consistometer

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

The Vee-Bee test gives an indication about the mobility and the compatibility aspect of the freshly mixed concrete. Vee-bee test carries out the relative effort measurement to change the mass of the concrete from the conical shape to the cylindrical shape by undergoing vibration process. The method can be also applied for dry concrete.

Vee-Bee Consistometer

vii) Torsion Testing Machine

Manufacturer: Enkay Ltd. (An ISO 9001: 2000 certified company)

A torsion testing machine is a device that uses a torsion beam to apply a twist to a specimen and measure the torque necessary to induce failure.' Torsion testing machine is helpful in research, development, in production engineering to determine the ultimate tensile strength (UTS) or elastic modulus of materials.

Torsion Testing Machine

viii) Hot Air Oven

Hot air oven is an electrical device that uses dry heat. A thermostat is used to control the temperature. Their double-walled insulation keeps the heat in and conserves energy, the inner layer being a poor conductor and the outer layer being metallic. There is also an air-filled space in between to aid insulation. An air circulating fan helps in the uniform distribution of the heat.

Hot Air Oven

ix) Accelerated Curing Tank

Manufacturer: Labtest.

Accelerating curing tank is used to determine the strength of concrete in 28 ±0.3 hrs. Normally, the strength of concrete is found out after 7 days and 28 days. For some construction activities, it may be too late and need to know the strength earlier.

Accelerated Curing Tank

x) Rebound Hammer

A rebound hammer test on concrete is an appropriate strategy to specify concrete's compressive potency. It is commonly beneficial to test concrete beams and cores, which are also used to assess the quality of concrete. The test is carried out by striking the concrete with a hammer and measuring the hammer's rebound using a calibrated spring.

Rebound Hammer

xi) Vicat's Apparatus

Vicat's apparatus is used to determine the standard consistency, initial and final setting time of cement.

Vicat's Apparatus

xii) Specific Gravity of Coarse Aggregate Apparatus

This apparatus is used to determine the specific gravity and water absorption of coarse aggregate (larger than 10mm).

Specific Gravity of Coarse Aggregate Apparatus

xiii) Concrete Air Entrainment Meter Apparatus

Capacity: 5 litres.

This apparatus is used to get the air content of a sample of freshly mixed concrete using a pressure meter.

Concrete Air Entrainment Meter Apparatus

xiv) Concrete Vibrating Tables

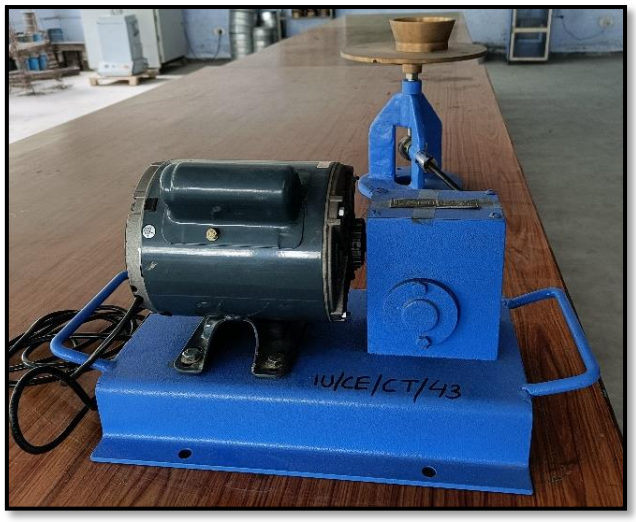
There are two vibrating table in this lab. One is small that is used for compacting concrete cubes and other one is big that is used for compacting larger specimens such as beams. These are used for proper compaction of concrete specimens. Proper compaction of cement concrete while casting specimens for testing is essential to achieve higher strength.

Small Vibrating Table

Big Vibrating Table

xv) Mortar Flow Table Apparatus

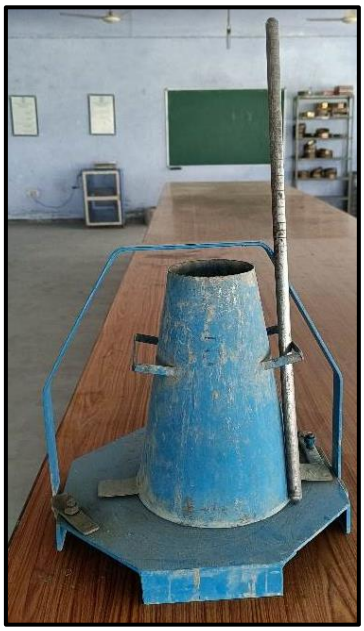
The mortar flow table of this lab is motorized one. This apparatus is used to determine consistency of cement mortar and building lime.



Mortar Flow Table Apparatus

xvi) Slump Test Apparatus

A slump test is a method used to determine the consistency/workability of concrete**.** The consistency, or stiffness, indicates how much water has been used in the mix. The stiffness of the concrete mix should be matched to the requirements for the finished product quality. Workabilityindicates the ease with which concrete flows. It can also be used as an indicator of an improperly mixed batch.



Slump Test Apparatus

xvii) Concrete Penetrometer Apparatus

Concrete Penetrometer is used to determine thesetting time of the mortar fraction in concrete mixes with slump greater than zero, by testing mortar sieved from the mix**.**

Concrete Penetrometer Apparatus

xviii) Concrete Mixer

Capacity: 100 Liters (mixed)

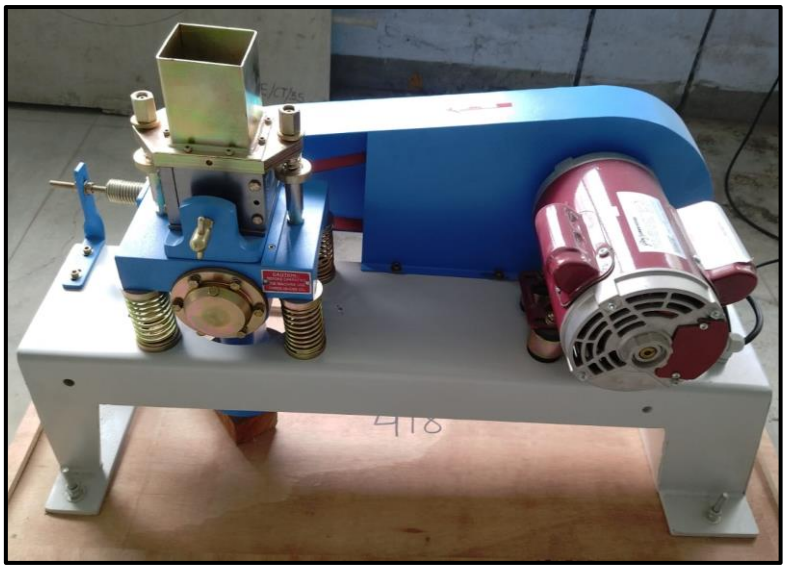
Drum Speed: 20 to 22 rpm.

Concrete Mixer is used for proper mixing of all the constituents of concrete.

Concrete Mixer

xix) Vibration Machine for Casting Standard Cement Mortar Cube

This machine is used for vibrating the mix in moulds at a frequency of 12,000 ± 400 cycles per minute, as per specification for optimum compaction of mix.



Vibration Machine for Casting Standard Cement Mortar Cube

xx) Blaine's Air Permeability Apparatus

This apparatus is used for determining the fineness of cement in terms of specific surface expressed as total surface area in square centimeters per gram of cement.

Blaine's Air Permeability Apparatus

xxi) J- Ring Apparatus

The J-ring test is used to assess passing ability of self-compacting concrete to flow through tight openings including spaces between reinforcing bars.

J- Ring Apparatus.

xxii) L-Box Apparatus

The L-Box Apparatus is used for self-compacting concrete. It is based on a Japanese design for underwater concrete. The test assesses the flow of the concrete and also the extent to which it is subjected to blocking by reinforcement.

L-Box Apparatus

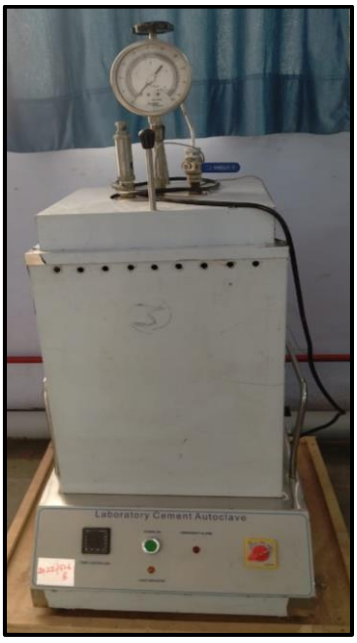
xxiii) V- Funnel Apparatus

The V-funnel test is used to assess the viscosity and filling ability of self-compacting concrete. This test is used when the maximum size of aggregate is not more than 20mm.

V- Funnel Apparatus

xxiv) Cement Autoclave

This apparatus is used to determine soundness of cement**.** The Cement Autoclave is suitable for conducting accelerated soundness tests on Cement or the Autoclave expansion test. The equipment consists of a Stainless-Steel Pressure Vessel with insulated outer shell, fabricated out of high-quality Stainless-Steel Sheet. The pressure inside the vessel is controlled through a micro- processor based PID controller.



Cement Autoclave

xxv) Pycnometer

The Pycnometer Bottle can be used to find specific gravity and water absorption of a wide range of materials from sand to gravel smaller than 10 mm.

Pycnometer