

TRANSPORTATION ENGINEERING

LAB MANUAL

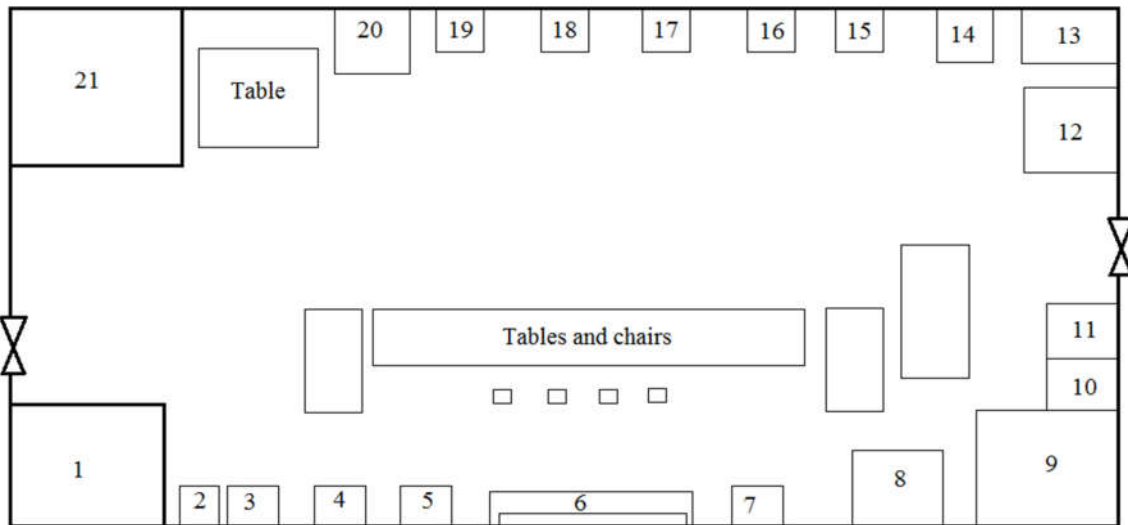
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Regd. No. 2014-CIV-136
Section: C
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List of Experiments

1. Determination of the flakiness and the elongation index for the given aggregate sample
2. Determination of angularity number for the given aggregate sample
3. Determination of Specific Gravity (Relative Density) and Water Absorption for aggregates
4. Los Angeles Abrasion Test on aggregates
5. Measuring surface frictional properties using British Pendulum Skid Resistance Tester
6. Flash and Fire point test for asphalt by Cleveland Open Cup
7. Marshall method of mix design or Marshall Stability method of mix design
8. Penetration test on bituminous material
9. Determination of specific gravity of bituminous material
10. Determination of Specific Viscosity of liquid asphalts using Engler Viscometer
11. To perform Ductility Test on asphalt
12. Determination of Softening Point of bitumen by using Ring and Ball Apparatus

Layout of Transportation Engineering laboratory (Ground floor):**Description of items/machinery:**

1. Covered area
2. Cleveland Open Cup Tester
3. Electric oven 200°C
4. Fine sieve shaker
5. Hot plate
6. Electric oven 1000°C
7. Fine sieve shaker
8. Asphalt mixer
9. LOS ANGELES abrasion machine
10. Coarse sieve shaker
11. Drum of LOS ANGELES abrasion machine
12. Cupboard
13. Fan circulating oven 250°C
14. Cupboard
15. Specific gravity apparatus
16. Portable skid resistance tester
17. Say-bolt viscometer
18. Ring and ball softening point apparatus
19. Penetrometer
20. Computer
21. Office

Use, specifications and photos of machines/items:

Cleveland Open Cup Tester:

Its primary use is for viscous materials having flash point of 79°C and above. It is also used to determine fire point, which is a temperature above the flash point, at which the test specimen will support combustion for a minimum of 5s.

Manufacturer/ Model no:

FREESIA MACROSS/TA-301B

Instructional capabilities:

For determination of flash and fire point of bituminous materials.



Electric oven:

Electrically operated oven used for drying of the sample. Its capacity is 200°C.



Fine sieve shaker:

It is a shaker used for sieving of the sample. As the name suggests it is used for the sieving of the fine aggregate.



Hot plate:

A hot plate is flat surfaced device used for controlling the heat directly or to create a heat bath. In the lab, a hot plate can be more useful than a Bunsen burner because the hot plate has the option of heating the substance slow as opposed to a rapid open flame heat source. The slow heating is important to finding the melting or boiling point of a substance accurately.



Electric oven:

It is an electrically operated oven which has more space for huge samples. Its maximum heating capacity is 1000°C.



Fine sieve shaker:

It is also a fine sieve shaker. In this sieve shaker, aggressive circular actions enhanced by the repetitive two-way tapping of the sieve stack are done to reorient particles and to promote passage of near-size particles and to prevent blinding for accurate results.



Asphalt mixer:

The design and testing of bituminous mixtures includes various laboratory tests as, for example, the MARSHALL stability. To produce the samples to perform this test, the preparation of a bituminous mixture is essential, at a reference temperature within a time that is limited in order to reduce mechanical degradation of the aggregates.

Manufacturer/ Model no:

FREESIA MACROSS/TA-381

Instructional capabilities:

For mixing of asphalt. Maximum capacity of mixing is 20 liters.



Los Angeles abrasion machine:

It consists of a hollow steel cylinder closed at both ends, having inside diameter of 28" and inside length of 20". The cylinder is mounted on stub shafts in such a way that it rotates about horizontal axis at 30-33 rpm.

Instructional capabilities:

Used for Los Angeles abrasion test on aggregate.



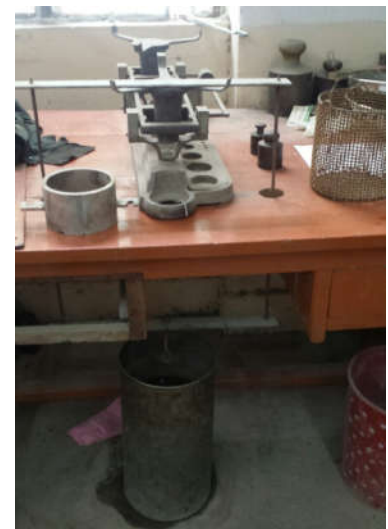
Coarse sieve shaker:

It is used to sieve the coarse aggregates. It has 3", 1.5", 1", ¾", ½", 3/8", 4.75mm sieve sizes.



Specific gravity apparatus:

It is an apparatus used to determine the specific gravity of coarse aggregates.



Portable skid resistance tester:

The British pendulum skid resistance tester is an impact type pendulum used to measure the energy loss when a rubber slider edge is propelled over a test surface. The values measured represent the frictional properties and are expressed as BPN (British pendulum number).



Manufacturer/ Model no:

Stanley London

Instructional capabilities:

For the determination of BPN of a surface.

Saybolt viscometer

This is used to measure the viscosity of a fluid. The Saybolt viscometer controls the heat of the fluid and the viscosity is the time it takes the fluid to fill a 60ml container.

Manufacturer/ Model no:

FREESIA MACROSS/TA-376

Instructional capabilities:

For the determination of Saybolt furoil viscosities of petroleum products at specified temperature.



Ring and ball softening point apparatus:

This is used to determine the softening point of bituminous materials by ring and ball method. The softening point is defined as the mean of temperatures at which the bitumen disk softens and sags downward a distance of 25mm under the weight of a steel ball.

Manufacturer/ Model no:

FREESIA MACROSS/TA-365

Instructional capabilities:

For determining of softening point of bituminous materials.



Penetrometer

The penetrometer is used as a measure of consistency. The penetrometer is used for determination of penetration of semi solid and solid bituminous materials. It gives penetration as a distance of tenths of a mm that a standard needle vertically penetrates a sample of a material under known conditions of loading, time and temperature.

Manufacturer/ Model no:

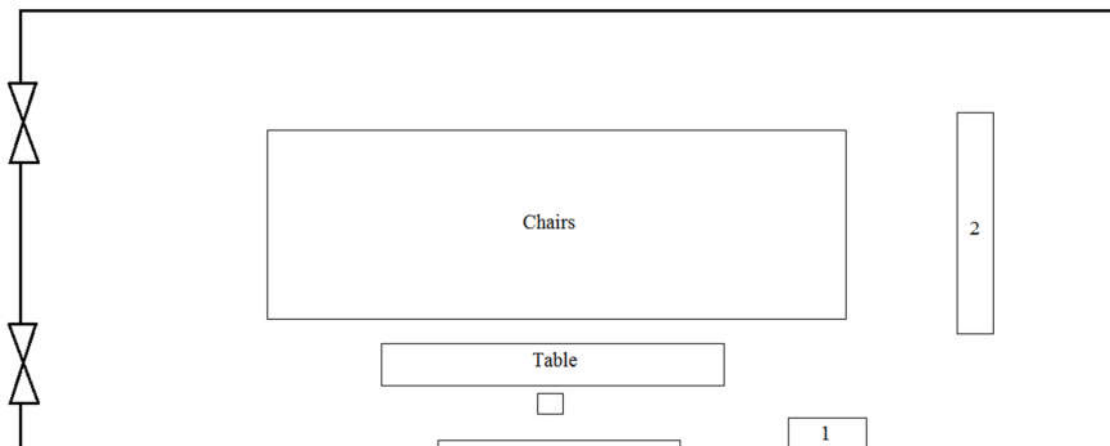
FREESIA MACROSS/TA-375

Instructional capabilities:

For the determination of penetration grade of bituminous materials.



Layout of Highway lab II (First floor):



Description of items/machinery:

1. Marshall stability test apparatus:
2. Ductilometer

Use, specifications and photos of machines/items:

Marshall stability apparatus:

Marshall stability and flow are asphalt mixture characteristics determined from tests of compacted specimens of a specified geometry. The Marshall stability apparatus is used for the measurement of resistance to plastic flow of 4in cylindrical specimens of asphalt paving mixture loaded in a direction perpendicular to the cylindrical axis.

Manufacturer/ Model no:

FREESIA MACROSS/TA-311

Instructional capabilities:

For measuring stability and flow value of compacted asphalt specimens



Ductilometer:

The Ductilometer is an instrument to measure the bituminous ductility. Some ductility is necessary in a bitumen as in practice, bituminous roads are subjected to both temperature change and traffic induced movement.

