Hashemite University
Faculty of Engineering
Civil Engineering Department

Pavement Laboratory

List of Expirements

1. introduction to asphalt
2. Penetration of Bituminous Materials
3. Softening Point of Bituminous Materials
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7. Viscosity determination of unfilled asphalt
8. Aggregate Blending to Meet Specifications
9. Specific Gravity of Coarse and Fine Aggregate
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11. Asphalt Extraction

Pavement Lab

Device Name: Asphalt binder penetration apparatus
Used For: to determine the grading of asphalt by means of penetration
Experiment associated with it: penetration of asphalt
Courses associated with it: Pavement

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Machine Identification Card

Name	Manufacturer
Pentrometer apparatus	Matest-Italy
	Model No. B056

Machine Description

- It consists of a head support mounted on a vertical rod, which can be adjusted for height. A rack and pinion and pointer assembly provides fine adjustment of needle tip to sample and in corporate a slipping clutch mechanism which make reading of accurate operation. The dial graduate from 0-400 in one tenth millimeter sub division.

Safety Instructions

1. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Penetration of bituminous test.

The experiment summary

- **Measure the consistency of the tested bituminous material.**

PENETRATION PROCEDURE

1. Clean the needle and place it in its holder.
2. Place the correct weight in position above the needle.
3. Transfer the sample to be tested using the transfer dish and place it in position.
4. Lower the needle carefully until it touches the surface of the sample. You can watch the reflection of the needle at the surface of the sample. The needle should be at least 10 mm from the sides of the can.
5. Bring the pointer of the apparatus to zero position, or take the initial reading.
6. Release the needle holder quickly and simultaneously start the stopwatch.
7. Once the specified period of time is reached, record the reading of the distance the needle moved and report the value in tenths of millimeter.
8. Make at least three readings following steps 1 to 7. Make sure to satisfy the following:
    A. Each reading should be at least 10 mm far from the previous one.
    B. During cleaning of the needle, the sample must be kept in the water bath at the specified temperature.
    C. If penetration is > 200 mm, the needles should be left in the sample until all the three readings have been completed.
9. Report the average of at least three readings as the penetration of the tested bituminous material.

Pavement Lab

Device Name: Softening point apparatus
Used For: obtaining softening point of asphalt binders using ring and ball technique
Experiment associated with it: Softening point
Courses associated with it: Highway Engineering

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Machine Identification Card

Name	Manufacturer
SOFTENING POINT APPARATUS	Matest/Italy
	Model No. B071

Machine Description

- Apparatus includes two square-shouldered brass test rings, two 3/8in (9.5mm) steel balls, two brass ball-centering guide rings, an 800ml heat-resistant beaker (bath), and a brass ring holder suspension assembly with cover and shelf to fit the beaker.

Safety Instructions

2. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No Maintenance Required

The experiment conducted on this machine

- Softening point test.

The experiment summary

- **Classify bitumen's according to their suitability to use in hot or cold region.**

Softening Point of Bitumen Procedure

1. Select the suitable test condition from Table 6.1:

2. Assemble the apparatus into its position.

3. Fill the bath with the suitable liquid, as indicated in Table 6.1, making sure that the liquid depth is 105 ± 3 mm.

4. Start heating or cooling the sample carefully in order to arrive at the starting temperature. Maintain this temperature for 15 minutes with the apparatus in place.

5. Place the ball in the center of the sample using the ball-centering guide.

6. Start heating and observing temperature. Make sure that heating is at the rate of 5°C per minute.

7. Record the temperature at which the bitumen surrounds each ball touches the support plate (i.e. moved a distance of 25 mm).

8. Table 6.1. Recommended Softening Point test conditions

Test Condition	**1**	**2**	**3**
Expected Softening Point	30 °C to 80 °C	80 °C to 160 °C	30 °C to 110 °C
Recommended Liquid	Freshly boiled distilled water	USP glycerin	Ethylene glycol
Best Thermometer	ASTM 15C or 113C	ASTM 16C or 113C	ASTM 113C
Starting Temperature	5 ± 1°C	30 ± 1°C	5 ± 1°C

Pavement Lab

Device Name: ductiletometer apparatus
Used For: obtaining ductility of asphalt binders
Experiment associated with it: ductility
Courses associated with it: Pavement lab

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Machine Identification Card

Name	Manufacturer
Ductilometer apparatus	Italy
	Model No. B054-01

Machine Description

- The Ductilometer basically consists of a moving carriage travelling along guide ways. The carriage is driven by an electrical motor, inside a large tank is fitted with digital thermostat, immersion electric heater, cooling coil for cold water circulation and pump unit.
- The ductilometer can accept up to 2 specimens simultaneously.
- Supplied complete except for the briquette mold and base plate that must be ordered separately

Safety Instructions

3. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Ductility of bituminous test.

The experiment summary

- **Used to determine the bituminous ductility**

Ductility of Bituminous Materials Procedure

1. Make sure that at least 10 liters of water are placed in the water bath and that the specimens are immersed for a distance of not less than 10 cm below the surface of water.

2. Remove the briquette from the plate.

3. Detach the sidepieces of the briquette and place them in the test position.

4. Attach the rings at each end of the clips to the pins in the testing machine. Make sure that the specimens are all covered with water.

5. Start pulling the specimens with constant speed until rupture happens. Make sure that during the test, the thread of the specimen is covered with water for a depth of not less than 2.5 cm above and below.

6. Record the length of the specimen at rupture.

Pavement Lab

Device Name: Flash and Fire pint apparatus
Used For: to determine Flash and Fire pint of asphalt binder
Experiment associated with it: Flash and Fire pint
Courses associated with it: Pavement lab

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Machine Identification Card

Name

Cleveland Open Cup apparatus

Manufacturer

CONTROL-Italy

Model No.

81-B0130/A

Machine Description

The test section consists of :

- Test Cup.
- Heating plate.
- Test flame.
- Thermometer.

Safety Instructions

4. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Flash and Fire Point test.

The experiment summary

- **To measure the tendency of the material to catch flames and obtain an idea about the presence of volatile material.**
- **Used to class flammable and combustible materials according to safety regulation .**

Flash and Fire Points of Bitumen Procedure

1. Let the apparatus stand on a leveled steady place. Protect from strong sunlight.
2. Wash the test cup carefully using some solvent in order to remove any traces of oils or residuals.
3. Support the thermometer in a vertical position at 6.4 mm from the bottom of the cup. Locate the thermometer halfway between the center and the side of the cup.
4. Fill the cup with the sample to the specified level. Take care not to overfill the cup. Air bubbles or foams should be carefully removed as mentioned earlier.
5. Light the test flame adjusting the flame to a diameter of 3 to 5 mm.
6. Start heating the sample with a relatively high speed (14ºC to 17ºC per minute). Continue until the temperature is about 60ºC below the probable flash point then decrease the heat so that the rate of heating is about 5ºC to 6ºC per minute.
7. When the temperature is about 30ºC below the probable flash point, apply the flame to the sample. The flame should be passed along the center of the sample and also about the circumference in a smooth way. The flame must be at a distance of not more than 2 mm above the plane of the edge of the can. Watch for possible ignition. The passing of the flame across the cup should be in about one second.
8. Repeat step 7 every increase of 2ºC.
9. Record the temperature at which flash ignition occurs. Record this value as the flash point.
10. Continue heating with the same rate (5ºC to 6ºC per minute) and repeat steps 7 and 8.
11. Record the temperature at which ignition occurs and burning continues for a minimum period of 5 seconds. Record this value as the fire point of the tested material.
12. Record the ambient barometric pressure.

Pavement Lab

Device Name: Pycnometer
Used For: obtaining Bitumen Specific Gravity
Experiment associated with it: Specific Gravity of Asphalt Cement
Courses associated with it: Pavement lab

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Machine Identification Card

Name	Manufacturer
Vacuum Pycnometer	Matest-Italy
	Model No. E067

Machine Description

- Pycnometer.

Safety Instructions

5. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Specific gravity of asphalt.

The experiment summary

- **Determine Specific Gravity of Asphalt Cement**

SPECIFIC GRAVITY OF ASPHALT CEMENT PROCEDURE

1. Heat the asphalt sample with care, stirring to prevent local overheating, until the sample has become sufficiently fluid to pour. In no case should the temperature be raised to more than 110°C above the expected softening point of the asphalt.

2. Pour enough sample into the clean, dry, and warmed pycnometer to fill it about three fourths of its capacity. Take precautions to keep the material from touching the sides of the pycnometer above the final level and prevent the inclusion of air bubbles.

3. Allow the pycnometer and its contents to cool to ambient temperature for a period of not less than 40 min.

4. Weight the partially filled pycnometer with the stopper to the nearest 1 mg. Record this weight as C.

5. Fill the pycnometer containing the asphalt with freshly boiled distilled water, placing the stopper loosely in the pycnometer.

6. Place the pycnometer in the beaker and press the stopper firmly in place. Return the beaker to the water bath.

7. Allow the pycnometer to remain in the water bath for a period of not less than 30 min. Remove the pycnometer from the bath and immediately dry it and weigh it. Record this weight as D.

Pavement Lab

Device Name: Electromagnetic sieve shaker
Used For: to obtain grain size distribution of aggregate
Experiment associated with it: Aggregate Blending to Meet Specifications
Courses associated with it: Pavement lab

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Machine Identification Card

Name

SIEVE SHAKER

Manufacturer

MATEST - ITALY

Machine Description

Model No.

A059-02

It accepts Sieves having dia. 200 - 250 - 300 - 315 mm, and 8" - 12."

This simple and low cost Sieve Shaker is activated by an electric motor and can hold up to 8 Sieves dia. 200 mm or 7 Sieves dia. 300 mm plus pan and lid.

Provided of timer 0 - 60 minutes, Power supply: 230V 1ph 50Hz 110W, and Dimensions: 350x400x950 mm

Safety Instruction

- This machine operates on electric current. Improper operation could result in electric shock, electrocution, or an explosion!
- Keep all parts of your body away from moving parts of the machine while it is operating.
- Be careful that any dangerous situations won't happen during the working; stop immediately the machine in the event that it will not work properly.
- Don't operate the machine without having all covers and case in place.
- Wear safety glasses when operating, maintaining, or repairing this machine.

Maintenance Record

No maintenance required

The experiments conducted on this machine

- Sieve Analysis of fine and coarse aggregates

The experiments summary

Sieve analysis helps to determine the particle size distribution of the coarse and fine aggregates. This is done by sieving the aggregates using sieves with suitable openings depending on the material to be tested, then pass aggregates through them and thus collect different sized particles left over different sieves.

AGGREGATE BLENDING TO MEET SPECIFICATIONS PROCEDURE

- **sieve analysis**

1. Weigh the pan and all of the sieves separately.
2. Pour the soil from above into the stack of sieves and place the cover on it.
3. Put the stack in the sieve shaker, affix the clamps, set a timer for 10 to 15 minutes, and start the shaker.
4. Stop the sieve shaker, measure the mass of each sieve, and retained soil.

- **Blending teqnique :**

1. Mathematical Method

Regardless of the number of aggregates or blending techniques selected, the basic formula expressing the combination is:

$$p = Aa + Bb + Cc + \ldots\ldots \quad (1)$$

where, p = the percent of material passing a given sieve for the combined aggregates A, B, C,.....
A, B, C,... = the percent of material passing a given sieve for each aggregate A, B, C,...
a, b, c,... = proportions (decimal fractions) of aggregates A, B, C,... to be used in the blend, a+ b + c... = 1.00

It is desirable, no matter which method is used, to first plot the gradations of the aggregates to be blended and the specification limits on a gradation chart before actual blending is attempted. From these plots, decisions can be made prior to any calculation depending on:

(a) whether a blend can be found using the available aggregates to meet the specification limits,
(b) where the critical sieve sizes are, and
(c) the approximate trial proportions to be selected.

These decisions can be made based on the following simple facts and the gradations shown in Figure 13-1:

1. The gradation curves for all possible combinations of aggregates A and B fall between curves A and B. It is impossible to blend aggregates C and B to meet the specification regardless of the method used.
2. If two curves cross at any point (B and D), the grading curves for all possible combinations pass through that point.
3. The curve for a blend containing more of aggregate A than B is closer to curve A than B and vice versa.

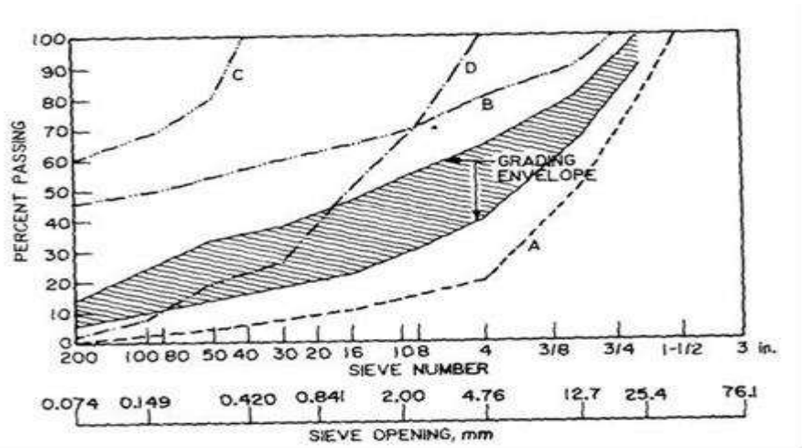

Figure 13.1. Example of blending different aggregates to meet gradation band.

2. The trial-and-error method

1. Selecting critical sieves for the aggregates in the blend;
2. Determining an initial set of proportions a, b, c, etc., which will meet the specification requirements for the critical sieves;
3. Checking the calculated blend using the proportions determined for all sieves in the specification requirements; and
4. Adjusting the proportions, as necessary, to ensure that the percentages for all sieves are within specification limits.

Pavement Lab

Device Name: Rotational Viscometer
Used For: obtaining rotational viscosity of asphalt cement binders
Experiment associated with it: viscosity of asphalt
Courses associated with it: Pvement lab

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Machine Identification Card

Name	Manufacturer
ROTATIONAL VISCOMETER	Brookfield/USA
Machine Description •	**Model No.** RDV1+Pro

Safety Instructions

6. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No Maintenance Required

The experiment conducted on this machine

- Viscosity of Asphalt

The experiment summary

- **Determine the viscosity of asphalt binders in the high temperature range of manufacturing and construction.**
- **This measurement is used in the Superpave PG asphalt binder specification.**
- **The RV test can be conducted at various temperatures, but since manufacturing and construction, temperatures are similar regardless of the environment, the test for Superpave PG asphalt binder specification is always conducted at 275°F (135°C).**

VISCOSITY DETERMINATIONS OF UNFILLED ASPHALTS USING THE BROOKFIELD THERMOSEL APPARATUS PROCEDURE

1. Read and understand the information in the instrument manufacturer is operating instructions before proceeding.
2. Turn on Thermosel power.
3. Set the proportional temperature controller to desired test temperature.
4. Refer to the operating instructions for calibration of the controller.
5. Wait 1.5 h (or until equilibrium temperature is obtained) with the selected spindle in the chamber (check control lamp).
6. Remove sample holder and add the volume of sample specified for the spindle to be used. Exercise caution to avoid sample overheating and to avoid ignition of sample with low flash point. Calculate the mass required from specific gravity or density data for the sample. Approximately 8 to 10 mL will be required.
7. Do not overfill the sample container. The sample volume is critical to meet the system calibration standard. Thoroughly stir filled asphalt coatings to obtain a representative sample.
8. The liquid level should intersect the spindle shaft at a point approximately 3.2 mm (1⁄8in.) above the upper “conical body”—“spindle shaft” interface.
9. Using the extracting tool put the loaded chamber back into the thermo container.
10. Lower the viscometer and align the thermo-container.
11. Insert the selected spindle into the liquid in the chamber, and couple it to the viscometer. Proper spindle selection may require testing with more than one spindle.
12. Allow the asphalt to come to the equilibrium temperature (about 15 min)
13. Start Brookfield models RV, HA, HB viscometer at 20 rpm, LV model at 12 rpm. Observe the meter reading. If it is between 2 and 98 units, proceed with the test.
14. Record three readings 60 s apart at each test temperature.
15. Follow the procedure for each test temperature required.
16. If readings are above 98 units at the lowest test temperature, decrease the spindle rpm setting and continue with the test.
17. If the reading is above 98, use the next smaller spindle and repeat the procedure using the sample volume specified.
18. Multiply the viscosity factor by the Brookfield reading to obtain viscosity in centipoise.
19. Do not change the speed (rpm setting) during a viscosity measurement, as this will change the shear rat

Pavement Lab

Device Name: Vacuum Pycnometer
Used For: obtaining maximum specific gravity of asphalt concrete mixes
Experiment associated with it: Marshall Mix Design
Courses associated with it: Pavement lab

Pavement Lab

Device Name: Marshall mixer and compactor
Used For: mixing and compaction of marshall sample
Experiment associated with it: asphalt mix design
Courses associated with it: Highway Engineering

Pavement Lab

Device Name: complete marshall stability mix design setup
Used For: design asphalt concrete mixes using marshal
Experiment associated with it: asphalt mix design
Courses associated with it: Highway Engineering

Pavement Lab

Device Name: compaction hammer
Used For: design asphalt concrete mixes using marshal
Experiment associated with it: asphalt mix design
Courses associated with it: Highway Engineering

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Machine Identification Card

Name

Vacuum Pycnometer

Manufacturer

Matest-Italy

Model No.

E067

Machine Description

- Pycnometer.
- Vacuum pump.
- Shaking table.

Safety Instructions

7. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Specific gravity of asphalt.

The experiment summary

- **Determine the theoretical maximum specific gravity and density of uncompact bituminous paving mixtures at 25°C [77°F].**

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Machine Identification Card

Name	Manufacturer
MARSHALL MIXER AND COMPACTOR	Matest/Italy
	Model No. E094& B033

Machine Description

- This ruggedly constructed machine has been designed to eliminate the laborious process of hand compaction. It automatically compacts the specimen and stops off the motor after the preset number of strokes has been completed on the automatic digital display counter. The trip mechanism is structured so that the hammer falls at the same height at every stroke. The unit incorporates a compaction wooden pedestal. The drive mechanism lifts the 4.53 kg. compaction hammer, plated against corrosion, to the height of 457 mm and allows free fall at 60 blows per minute
- This compactor is suitable only for Marshall molds diameter 4".

Safety Instructions

8. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

maintenance required

The experiment conducted on this machine

- Marshall Test.

The experiment summary

- **Determine the optimum asphalt content .**

MARSHALL MIX DESIGN PROCEDURE

A. Bulk Specific Gravity Determination:

This test is performed according to ASTM D 2726 test procedure as follows:

(a) Measure the height or thickness of the specimen and take its weight in air. Designate this as **A**.

(b) Immerse the specimen in a water bath at 25°C for 3 min to 5 min and then weigh in water. Designate this weight as **C**.

(c) Surface dry the specimen by blotting quickly with a towel and then weigh in air. Designate this weight as **B**.

(d) Record the weights A, B & C for each sample in Worksheet # 1. Calculate the Bulk specific gravity of the compacted specimens as follows:

$$\text{Bulk specific gravity} = A/(B - C) \qquad (1)$$

where, A = mass of the dry specimen in air, g,

B = mass of the saturated surface-dry specimen in air, g, and

C = mass of the specimen in water, g.

B. Stability & Flow Test:

(a) Immerse the specimen in the water bath at 60°C ± 1°C for 30-40 minutes before test.

(b) Thoroughly clean the inside surfaces of the testing ring. Ensure that the dial indicator in the proving ring is securely fixed and is zeroed for the no-load position.

(c) Remove the specimen from the water bath, dry the surfaces and place the sample in the lower half of the testing ring. Fit the upper testing head into position and center the complete assembly in the loading device.

(d) Place the flow meter over one of the guide rods and initialize it.

(e) Apply load to the specimen, at a constant rate of deformation, 1 in. per min, until failure occurs. The *maximum* load required to produce failure, in kN at 60°C is recorded as the Marshall Stability value.

(f) The reading on the flow meter at the point of maximum load is recorded as the flow value of the specimen, expressed in mm.

Note: The entire procedure from removal from the water bath to failure of the specimen should not take longer than 30 secs.

(g) Data obtained should be recorded in Worksheet # 1.

Pavement Lab

Device Name: Centrifuge Extraction
Used For: Determination of asphalt content in paving mixtures
Experiment associated with it: asphalt extraction
Courses associated with it: Pvement lab

Pavement Lab

Device Name: Asphalt Ignition Oven apparatus
Used For: Determination of asphalt content in paving mixtures
Experiment associated with it: asphalt extraction
Courses associated with it: Pvement lab

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Machine Identification Card

Name	Manufacturer
Asphalt Centrifuge Extraction apparatus	CONTROL-Italy
	Model No. 75-B0022/C

Machine Description

The test section consists of a removable, precision machined, aluminum rotor bowl, mounted on a vertical shaft.
A filter paper disc is pressed in between the rotor bowl and cover plate by tightening a knurled nut. The bowl assembly is enclosed in a housing mounted on a cast body. In the electrical operating model, the rotor bowl is coupled to a motor. The solvent may be introduced during test through a cup on the housing cover.

Safety Instructions

9. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Asphalt extraction.

The experiment summary

- **Determination of asphalt content in paving mixtures.**

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Machine Identification Card

Name	Manufacturer
Asphalt Ignition Oven apparatus	Gilson/USA
	Model No. HM-378

Machine Description

The test section consists of a removable, precision machined, aluminum rotor bowl, mounted on a vertical shaft.
A filter paper disc is pressed in between the rotor bowl and cover plate by tightening a knurled nut. The bowl assembly is enclosed in a housing mounted on a cast body. In the electrical operating model, the rotor bowl is coupled to a motor. The solvent may be introduced during test through a cup on the housing cover.

Safety Instructions

10. Never operate this apparatus unless you have been fully trained and have received and understand all operating instructions

Maintenance Record

No maintenance required

The experiment conducted on this machine

- Asphalt extraction.

The experiment summary

- **Determination of asphalt content in paving mixtures.**

ASPHALT EXTRACTION PROCEDURE

The extraction test performed using centrifuge and NCAT extraction methods.

a) Centrifuge Extraction Procedure:

The recommended test procedure for the centrifuge extraction test is as follows:

1- If the mixture is not sufficiently soft to separate with a spatula or trowel, place it in a large, flat pan and warm to 110°C, only until it can be handled or mixed.

2- Dry the empty centrifuge bowl with the filter paper to a constant weight, and record this weight in the data sheet.

3- Dry the test sample at 110°C to remove the moisture from it.

4- Place a sample (650-2500 g) of the asphalt concrete mixture into the bowl of the centrifuge apparatus. Record this weight as *W1*.

5- Cover the test sample with trichloroethylene, trichloroethane, methylene chloride, or diesel and allow sufficient time for the solvent to disintegrate the test portion (not over 1 h).

6- Fit the filter paper on the bowl, clamp the cover on the bowl tightly and place a beaker under the drain to collect the extract.

7- Start the centrifuge revolving slowly and gradually increase the speed to a maximum of 3600 rpm or until solvent ceases to flow from the drainpipe.

8- Stop the machine, add 200 ml of the solvent, and repeat the centrifuge procedure.

9- Repeat Step # 8 sufficient times (not less than three) so that the extract has a light color.

10- Collect the extract and the washings in a suitable graduated cylinder.

11- Dry the bowl with the filter paper to a constant weight in an oven at 110 + 5°C.

12- Weight the dried aggregate and the filter paper. Designate the weight of the aggregate with the increase in the weight of the filter paper as *W2*.

13- Determine the amount of mineral matter in the extract using the following procedure:

   a. Record the volume of the total extract (from Step 8) in the graduated cylinder. Designate this volume as *V1*.

   b. Agitate the extract thoroughly and immediately take a representative sample (between 300-500ml) from the extract. Designate this volume as *V2*.

   c. Place the selected extract into a previously tared and calibrated flask.

   d. Place the flask in a controlled-temperature bath controlled to ±0.1°C, and allow to come to the temperature at which the flask was calibrated.

   e. Fill the flask with solvent, which has been kept at the same temperature. Bring the level of the liquid in the flask up to the neck, insert the stopper, making sure the liquid overflows

the capillary, and remove from the bath.

f. Wipe the flask dry, determine the mass to the nearest 0.1 g, and record this mass as the mass of flask plus extract.

b) NCAT Extraction Procedure:

1- If the mixture is not sufficiently soft to separate with a spatula or trowel, place it in a large, flat pan and warm to 110°C) only until it can be handled or mixed.

2- Split or quarter the material until the mass of material (around 3 kg) required for test is obtained.

3- Dry the test sample at 110°C to remove the moisture from it.

4- Weight the sample and record this weight as, *W4*.

5- Spread the sample on the ignition tray.

6- Leave the sample inside the oven for 30-40 min.

7- At the end of the ignition time, take the sample out of the oven and leave it to cool down.

8- Take the weight of the ignited sample and record it as *W5*.

9- Calculate the bitumen content as:

$$\text{Bitumen Content, AC\%} = \left(\frac{W4 - W5}{W5}\right) * 100 \qquad (4)$$

9- Sieve analysis can be performed on the obtained sample.