



Siliguri Institute of Technology

Civil Engineering Department

Laboratory Work Book for Solid Mechanics Lab (CE(ES)492)

NAME:

ROLL NO.:

REGISTRATION NO.:

GROUP NO:



Siliguri Institute Of Technology
Department of Civil Engineering

Laboratory workbook for SM Lab(CE(ES)492)

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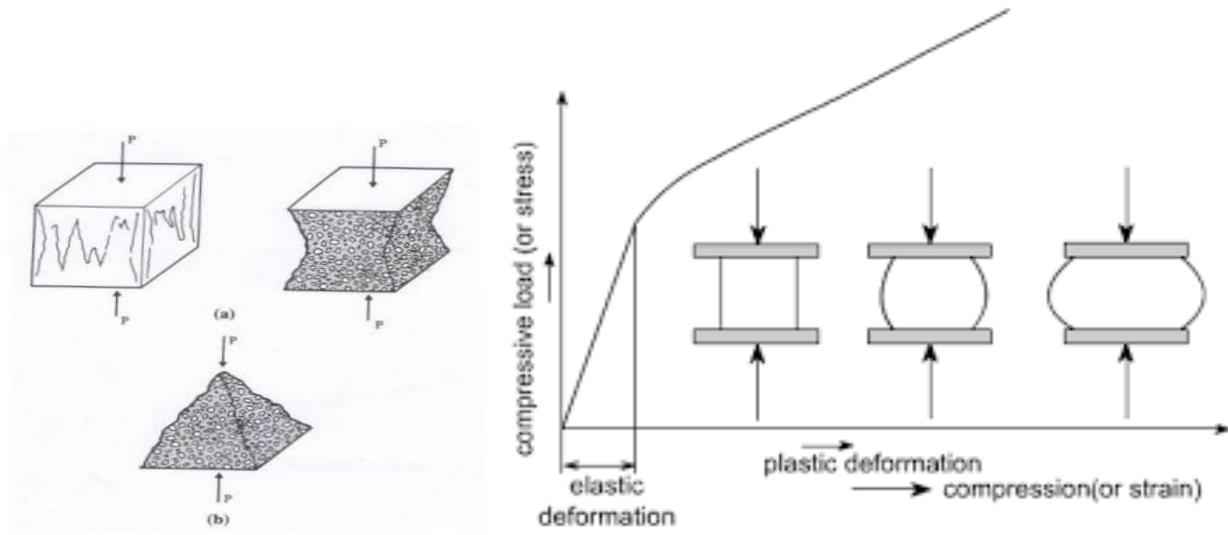
EXPERIMENT NO. CE 492/1

NAME: Determine compressive strength of brick & concrete cube.

APPARATUS:

Bricks, Measuring tape & UTM.

DIAGRAM:

***THEORY :***

Bricks are used in construction of either load bearing walls or in portion walls incase of frame structure. In bad bearing walls total weight from slab and upper floor comes directly through brick and then it is transverse to the foundation. In case the bricks are loaded with compressive nature of force on other hand in case of frame structure bricks are used only for construction of portion walls, layers comes directly on the lower layers or wall. In this case bricks are loaded with compressive nature of force. Hence for safely measures before using the bricks in actual practice they have to be tested in laboratory for their compressive strength.

EXPERIMENTAL PROCEDURE:

Before starting the experiment, please see that;

- 1) At first, on the main switch of the machine and on the switch of computer which is connected with the machine.
- 2) Take a brick specimen.
- 3) Measure the dimensions of the brick.
- 4) Then, put the brick on the operation table on the under the movable jaw.
- 5) Move up and down the middle cross head according to necessity.
- 6) Then, open the computer program.
- 7) Make a new file according to your experiment and put the all types of data about the specimen.
- 8) Take the program on 'comport' position by selecting the given option on the computer screen. But not click on the start button.

- 9) Close the relief valve on controlling unit.
- 10) Switch on the pump and watch the load changing on the controlling unit screen. When the load changing will stop then switch off the pump.
- 11) After that, click on **STOP, TARE, ENTER** and **START** button.
- 12) After clicking the **START** button on controlling unit, immediately click on the **START** button also on computer screen.
- 13) Switch on the pump.
- 14) Then watch the experiment on the machine and follow the graph on the computer screen.

OBSERVATION TABLE:

SL.NO.	L X B X H mm ³	Area L X B mm ³	Load (N) (P)	Compressive Strength P/A(N/mm ²)

CALCULATIONS:

$$\text{Compressive Strength} = \frac{\text{Max. Load at failure}}{\text{Loaded Area of brick}}$$

PRECAUTIONS:

- 1) Measure the dimensions of Brick accurately.
- 2) Specimen should be placed as for as possible in the lower plate.
- 3) The range of the gauge fitted on the machine should not be more than double the breaking load of specimen for reliable results.

CONCLUSION:

The average compressive strength of new brick sample is found to be (N/mm²)

EXPERIMENT NO. CE 492/2

NAME: Study the UTM and perform the tensile test on H.Y.S.D bar.

APPARATUS:

1. Universal Testing Machine,
2. Mild steel specimen,
3. Vernier caliper/micrometer,
4. Dial gauge.

THEORY :

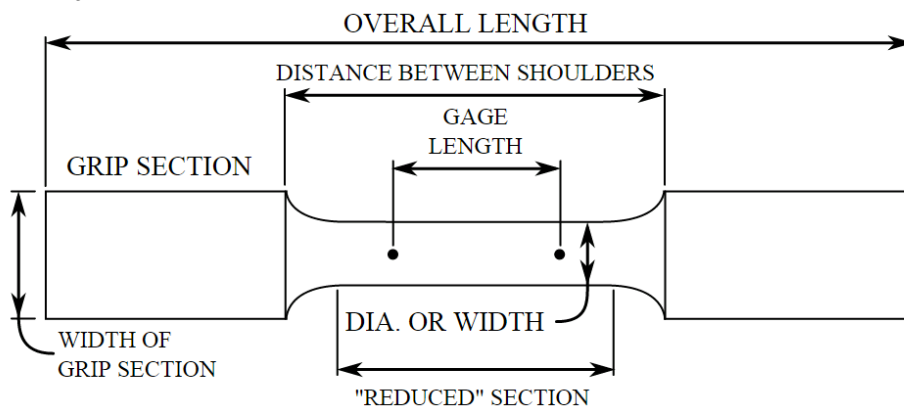
Various m/c and structure components are subjected to tensile loading in numerous application. For safe design of these components, their ultimate tensile strength and ductility one to be determine before actual use. Tensile test can be conducted on UTM.

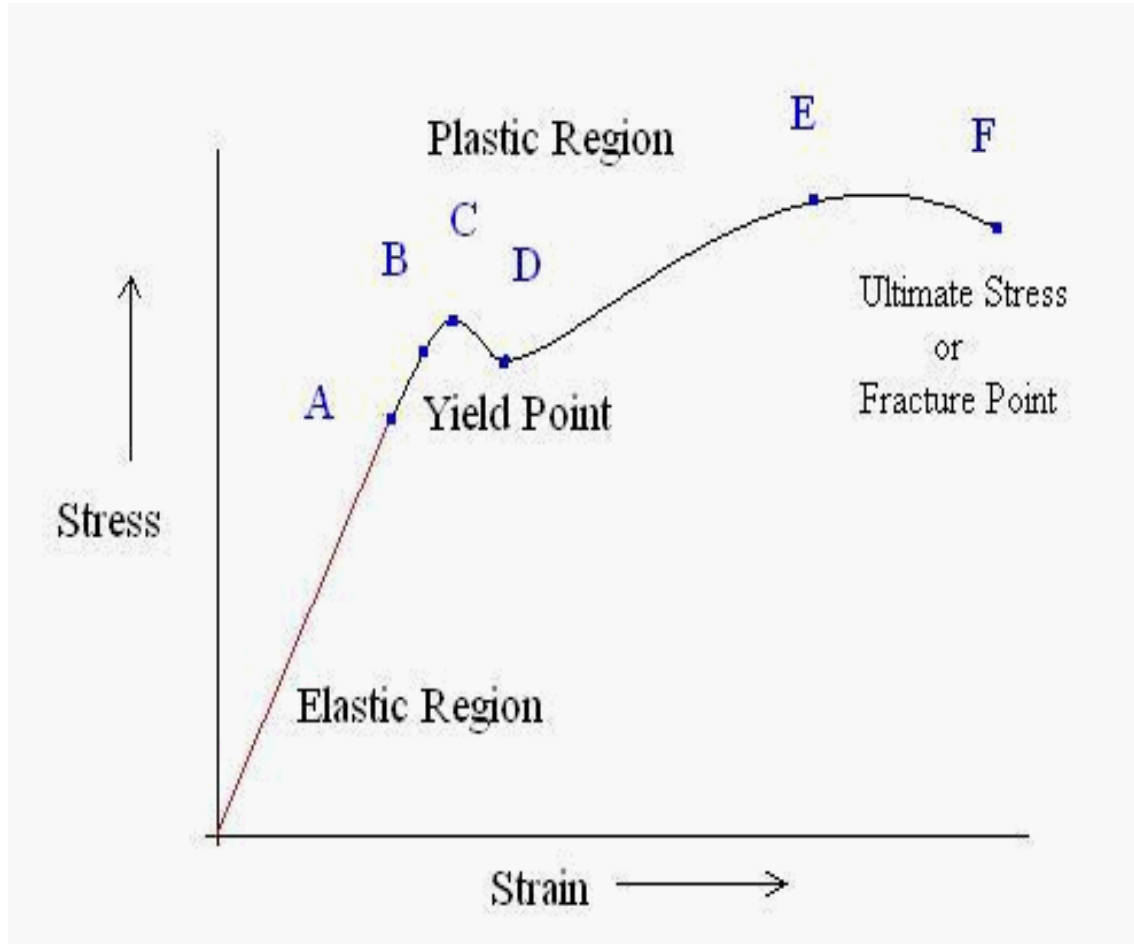
A material when subjected to a tensile load resists the applied load by developing internal resisting force. These resistances come due to atomic bonding between atoms of the material. The resisting force for unit normal cross-section area is known as stress.

The value of stress in material goes on increasing with an increase in applied tensile load, but it has a certain maximum (finite) limit too. The minimum stress, at which a material fails, is called ultimate tensile strength. The end of elastic limit is indicated by the yield point (load). This can be seen during experiment as explained later in procedure with increase in loading beyond elastic limit original cross-section area (A_0) goes on decreasing and finally reduces to its minimum value when the specimen breaks.

ABOUT OF UTM & ITS SPECIFICATIONS:

The tensile test is conducted on UTM. It is hydraulically operates a pump, oil in oil sump, load dial indicator and central buttons. The left has upper, middle and lower cross heads i.e; specimen grips (or jaws). Idle cross head can be moved up and down for adjustment.





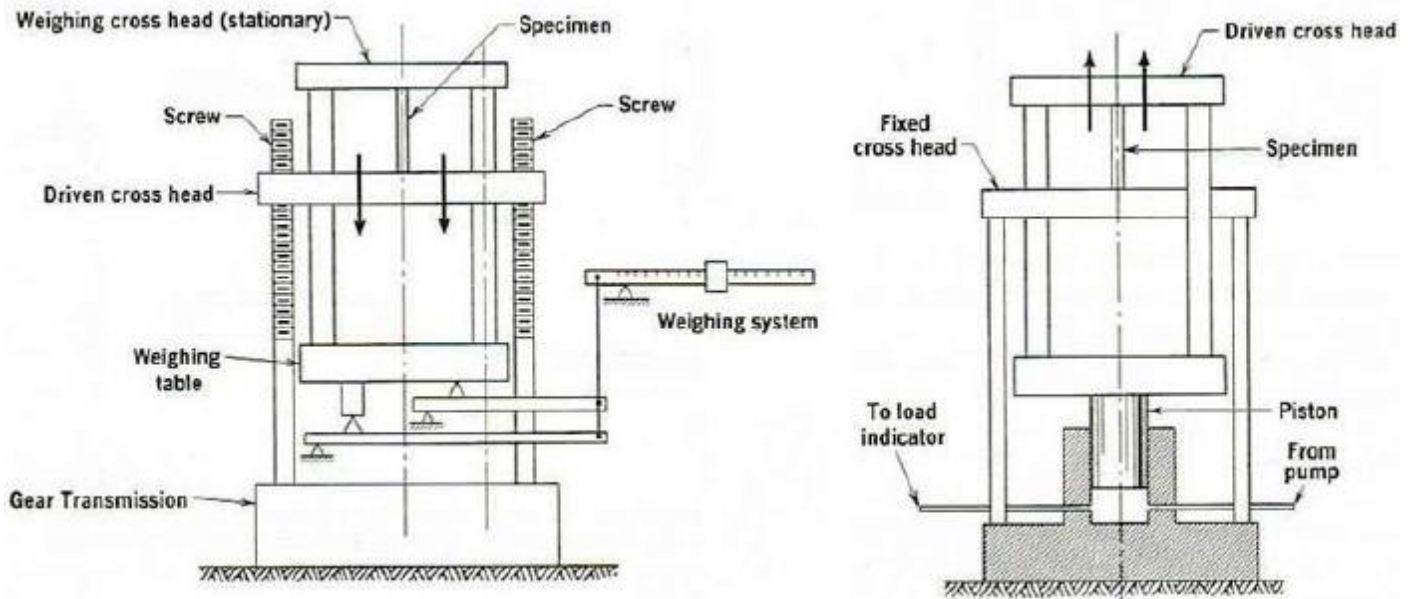
A typical stress-strain curve of HYSD bar

NOTE: **Point A:** At origin, there is no initial stress or strain in the test piece. Up to point A Hooke's Law is obeyed according to which stress is directly proportional to strain. That's why the point A is also known as proportional limit. This straight line region is known as elastic region and the material can regain its original shape after removal of load. **Point B:** The portion of the curve between AB is not a straight line and strain increases faster than stress at all points on the curve beyond point A. Point B is the point after which any continuous stress results in permanent, or inelastic deformation. Thus, point B is known as the elastic limit or yield point. **Point C & D:** Beyond the point B, the material goes to the plastic stage till the point C is reached. At this point the cross-sectional area of the material starts decreasing and the stress decreases to point D. At point D the workpiece changes its length with a little or without any increase in stress up to point E. **Point E:** Point E indicates the location of the value of the ultimate stress. The portion DE is called the yielding of the material at constant stress. From point E onwards, the strength of the material increases and requires more stress for deformation, until point F is reached. **Point F:** A material is considered to have completely failed once it reaches the ultimate stress. The point of fracture, or the actual tearing of the material, does not occur until point F. The point F is also called ultimate point or fracture point.

SPECIFICATIONS :

1. Load capacity = 0-1000 KN.
2. Least count = 0.1KN.
3. Power supply = 440V

DIAGRAM:



EXPERIMENTAL PROCEDURE:

- 1) At first, on the main switch of the machine and on the switch of computer which is connected with the machine.
- 2) Take the specimen and mark the gripping area within 40-60mm.
- 3) Measure the diameter of the gripping area on three different points.
- 4) Take the average diameter and calculate the experiment length on the specimen and then put a mark on it.
- 5) after that, again mark the gripping area within 40-60mm on bottom of the experimental length of the specimen.
- 6) Then, grip the specimen on the upper cross head in the jaws by rotating the lever over there.
- 7) Move up and down the middle cross head according to necessity to grip the specimen from bottom side.
- 8) Then, open the computer program.
- 9) Make a new file according to your experiment and put the all types of data about the specimen.
- 10) Take the program on 'comport' position by selecting the given option on the computer screen. But not click on the start button.
- 11) Close the relief valve on controlling unit.
- 12) Switch on the pump and watch the load changing on the controlling unit screen. When the load changing will stop then switch off the pump.
- 13) Then grip the specimen on the middle crosshead by the jaws.
- 14) After that, click on **STOP, TARE, ENTER** and **START** button.
- 15) After clicking the **START** button on controlling unit, immediately click on the **START** button also on computer screen.
- 16) Switch on the pump.
- 17) Then watch the experiment on the machine and follow the graph on the computer screen.

OBSERVATION:

A) Original dimensions

Length = -----

Diameter = -----

Area = -----

B) Final dimensions:

Length = -----

Diameter = -----

Area = -----

OBSERVATION TABLE:

SL.NO.	LOAD (N)	ORIGINAL GAUGE LENGTH	EXTENTION (MM)	STRESS = $\frac{\text{LOAD}}{\text{AREA}}$ N/mm ²	STRAIN = $\frac{\text{INCREASE IN LENGTH}}{\text{ORIGINAL LENGTH}}$
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

To plot the stress strain curve and determine the following:

(i) **Limit of proportion** = $\frac{\text{Load at limit of proportionality}}{\text{Original area of cross-section}}$

(ii) **Elastic limit** = $\frac{\text{Load at elastic limit}}{\text{Original area of c/s}}$

(iii) **Yield strength** = $\frac{\text{Yield load}}{\text{Original area of cross-section}}$

(iv) **Ultimate strength** = $\frac{\text{Maximum tensile load}}{\text{Original area of cross-section}}$

(v) **Young's modulus, E** = $\frac{\text{Stress below proportionality limit}}{\text{Corresponding strain}}$

(vi) **Percentage elongation** = $\frac{\text{Final length (at fracture) - original length}}{\text{Original length}}$

(vii) **Percentage reduction in area** = $\frac{\text{Original area - area at fracture}}{\text{Original area}}$

PRECAUTIONS:

1. The specimen should be prepared in proper dimensions.
2. The specimen should be properly to get between the jaws.
3. Take reading carefully.
4. After breaking specimen stop to m/c

. CONCLUSION:

The modulus of elasticity of mild steel is -----

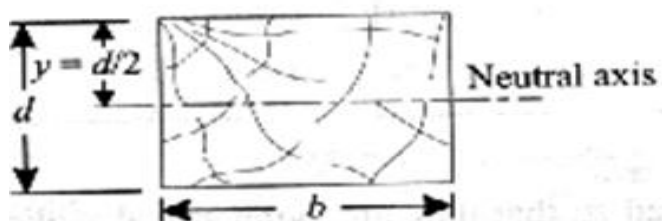
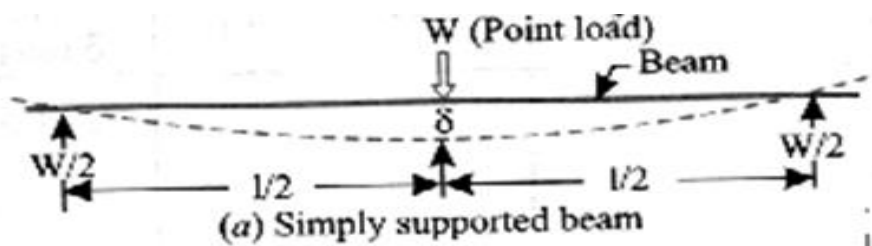
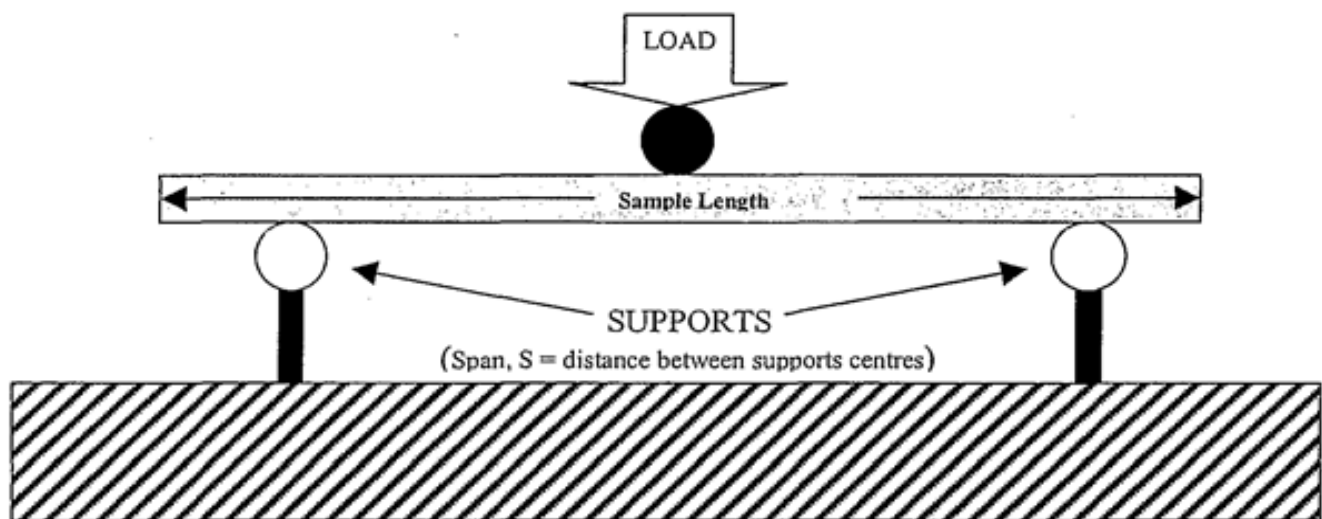
EXPERIMENT NO. CE 492/3

NAME: Determined young's modulus of elasticity of material of beam simply supported at ends by Bending Test.

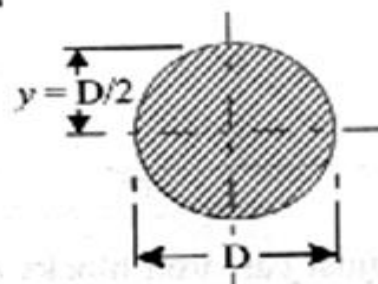
APPARATUS:

1. Universal testing machine.
2. H.Y.S.D bar.

DIAGRAM:-



(b) Wooden rectangular beam



(c) Steel round bar

SPECIFICATION:-

If a beam is simply supported at the ends and carries a concentrated load at its centre, the beam bends concave upwards. The distance between the original position of the beams and its position after bending at different points along the length of the beam, being maximum at the centre in this case. This difference is known as 'deflection' In this particular type of loading the maximum amount of deflection (δ) is given by the relation,

$$\delta = \frac{WL^3}{48EI} \dots\dots\dots (i)$$

$$E = \frac{WL^3}{48\delta I} \dots\dots\dots (ii)$$

W =Load acting at the center, N

L =Length of the beam between the supports mm

E =Young's modulus of material of the beam, N/mm²

I =Second moment of area of the cross- section (e.i., moment of Inertia) of the beam, about the neutral axis, mm.

BENDING STRESS:-

As per bending equation,

$$\frac{M}{I} = \frac{\sigma_b}{Y}$$

Where,

M = Bending moment, N-mm

I = Moment of inertia, mm⁴

σ_b = Bending stress, N/mm², and

Y = Distance of the top fiber of the beam from the neutral axis

EXPERIMENTAL PROCEDURE:

- 1) At first, on the main switch of the machine and on the switch of computer which is connected with the machine.
- 2) Take a H.Y.S.D specimen.
- 3) Measure the dimensions of the specimen.
- 4) Then, put the specimen on the operation table just like a simply supported beam.
- 5) Move up and down the middle cross head according to necessity.
- 6) Then, open the computer program.
- 7) Make a new file according to your experiment and put the all types of data about the specimen.
- 8) Take the program on 'comport' position by selecting the given option on the computer screen. But not click on the start button.
- 9) Close the relief valve on controlling unit.
- 10) Switch on the pump and watch the load changing on the controlling unit screen. When the load changing will stop then switch off the pump.
- 11) After that, click on **STOP, TARE, ENTER** and **START** button.
- 12) After clicking the **START** button on controlling unit, immediately click on the **START** button also on computer screen.
- 13) Switch on the pump.
- 14) Then watch the experiment on the machine and follow the graph on the computer screen.

OBSERVATION TABLE:

SL. NO.	Load W (N)	Bending Moment $M = \frac{Wl}{4}$ (Nmm)	Bending stress $\sigma_b = \frac{MY}{I}$ N/mm ²	Deflection, δ (mm)	Young's Modulus of elasticity, $E = \frac{Wl^3}{48\delta I}$

PRECAUTIONS:

- 1) Make sure that beam and load are placed a proper position.
- 2) The cross- section of the beam should be large.
- 3) Note down the readings of the vernier scale carefully.

CONCLUSION:

1. The young's modulus for steel beam is found to be----- N/mm².

EXPERIMENT NO. CE 492/4

NAME: Determine the impact strength of steel by Izod impact test

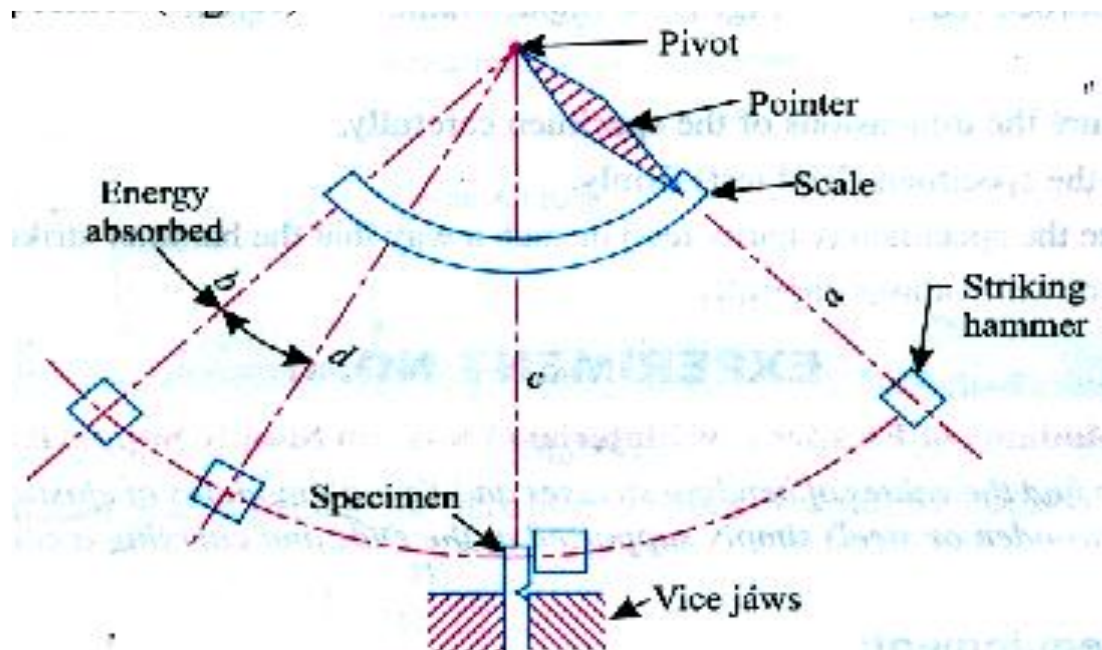
APPARATUS:

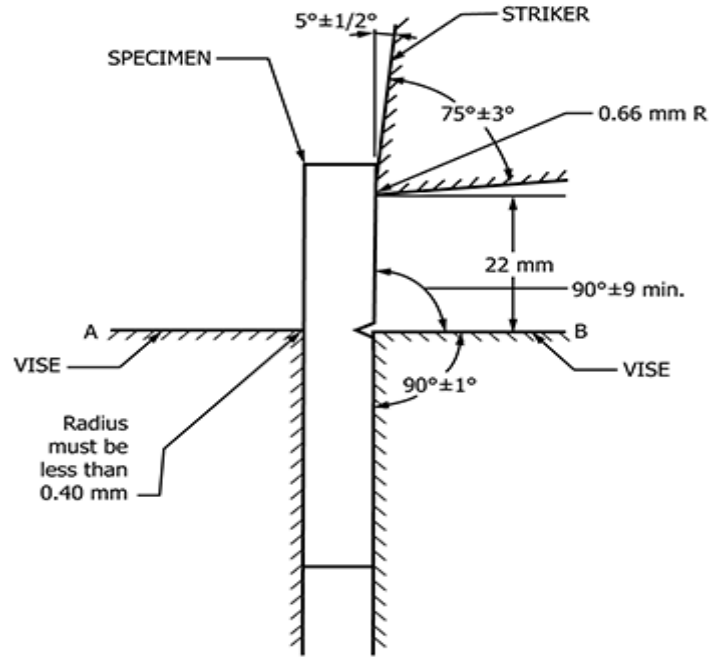
1. Impact testing m/c,
2. Izod test specimens of mild steel, 75 mm X 10mm X 10mm
3. Vernier caliper,
4. Specimen setting fixture.

SPECIFICATIONS:

An impact test signifies toughness of material that is ability of material to absorb energy during plastic deformation. Static tension tests of unnotched specimens do not always reveal the susceptibility of a metal to brittle fracture. This important factor is determined by impact test. Toughness takes into account both the strength and ductility of the material. Several engineering materials have to withstand impact or suddenly applied loads while in service. Impact strengths are generally lower as compared to strengths achieved under slowly applied loads. Of all types of impact tests, the notch bar tests are most extensively used. Therefore, the impact test measures the energy necessary to fracture a standard notch bar by applying an impulse load. The test measures the notch toughness of material under shock loading. Values obtained from these tests are not of much utility to design problems directly and are highly arbitrary. Still it is important to note that it provides a good way of comparing toughness of various materials or toughness of the same material under different condition. This test can also be used to assess the ductile brittle transition temperature of the material occurring due to lowering of temperature.

DIAGRAM:





EXPERIMENTAL PROCEDURE:

1. Raise the hammer and note down initial reading from the dial, which will be energy to be used to fracture the specimen. For the standard Izod test the energy stored should be 164j.
2. Place the specimen for test and see that it is placed center with respect to hammer. Check the position of notch.
3. Release the hammer. The hammer will break the piece and shoot up the other side of the specimen.
4. Note the residual energy indicated on the scale by the hammer.
5. Impact strength of the test specimen is the difference of the initial energy stored in hammer and the residual energy.

.OBSERVATION TABLE:

SL.No.	Initial Energy (E ₁) in joule	Residual Energy (E ₂) in Joule	Absorb Energy (E ₁ -E ₂)

CALCULATIONS:

- Modulus of rupture = Rupture / Effective volume of specimen
- Notch impact strength = Absorb energy / Effective cross section area

PRECAUTION:

1. The specimen should be prepared in proper dimensions.
2. Take reading more frequently.
3. Make the loose pointer in contact with the fixed pointer after setting the pendulum.
4. Do not stand in front of swinging hammer or releasing hammer.
5. Place the specimen proper position.

CONCLUSION:

The impact strength of given specimen = -----joule/mm²

EXPERIMENT NO. CE 492/5

NAME: To determine the impact strength of steel by (Charpy test)

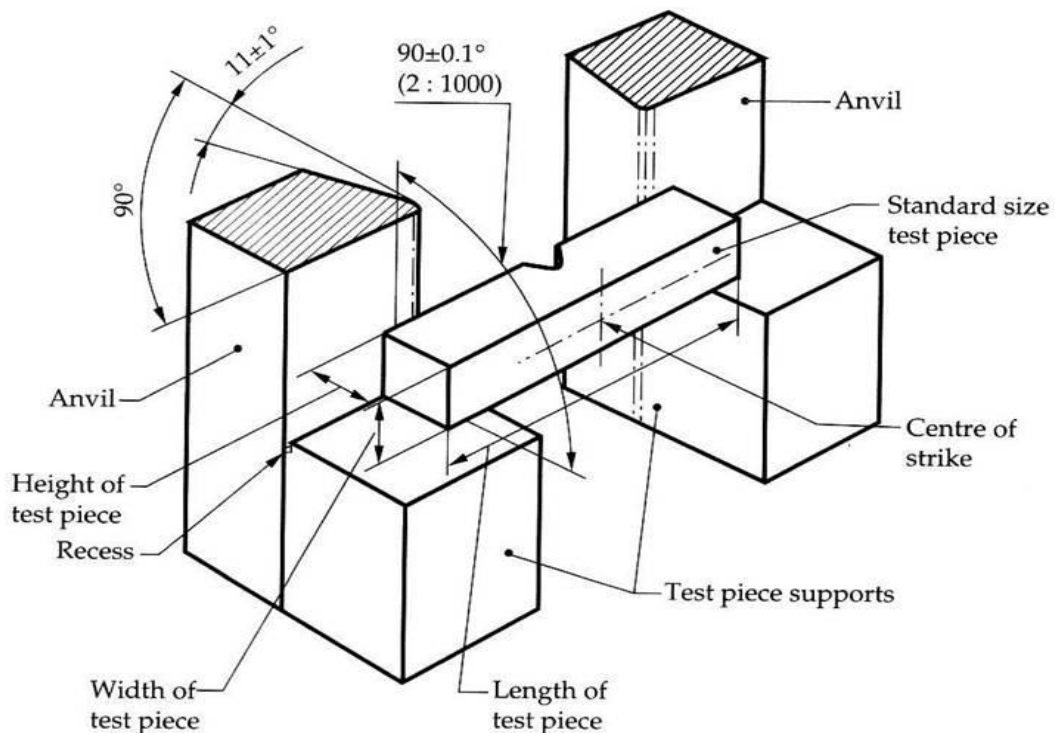
APPARATUS:

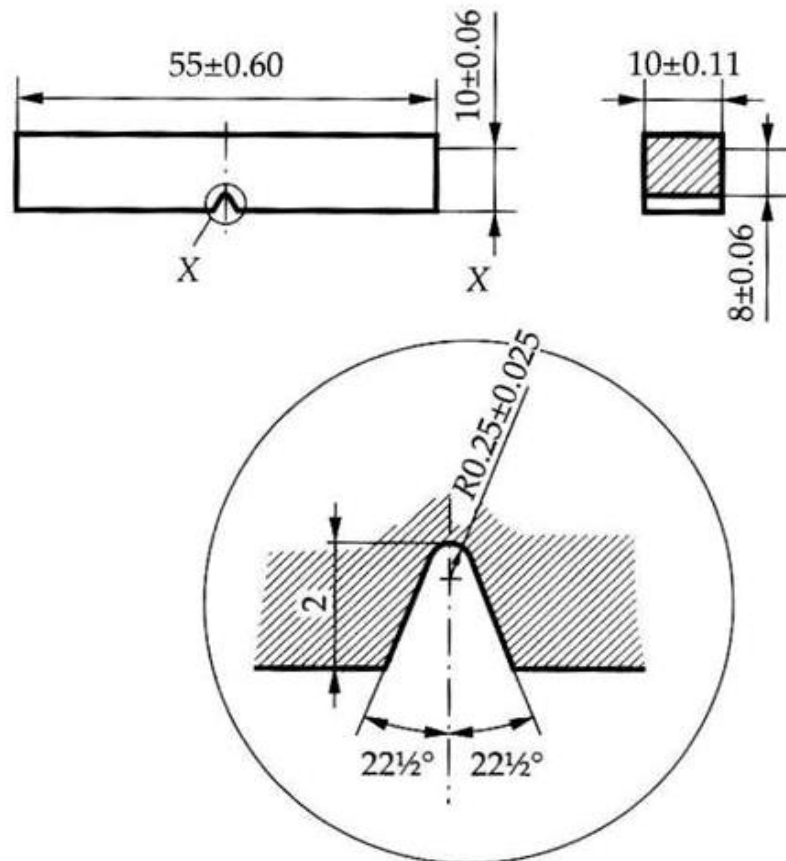
1. Impact testing m/c,
2. Charpy test specimens of mild steel, 10 mm x 10 mm X 55mm
3. Vernier caliper,
4. Specimen setting fixture.

SPECIFICATIONS:

- 1) Turbine power – 1 kw, rated speed 1250 rpm, no of guide vanes – 10, runner diameter – 160 mm.
- 2) Pump – 7.5 HP monoblock pump, head – 17 mtrs, discharge – 9.33 lps. Provided with D.O.L starter
- 3) Orifice meter with pressure gauges for discharge measurement.
- 4) Rope break pulley dia 0.185 m with spring balance & belt thickness 7 mm.
- 5) Pressure gauge to note down the pressure.
- 6) Butterfly valve to control pressure and flow.

DIAGRAM:





Charpy V-notch impact test piece

EXPERIMENTAL PROCEDURE:

1. Raise the hammer and note down initial reading from the dial, which will be energy to be used to fracture the specimen. For the standard Charpy test the energy stored should be 300j.
2. Place the specimen for test and see that it is placed center with respect to hammer. Check the position of notch.
3. Release the hammer. The hammer will break the piece and shoot up the other side of the specimen.
4. Note the residual energy indicated on the scale by the hammer.
5. Impact strength of the test specimen is the difference of the initial energy stored in hammer and the residual energy.

OBSERVATION TABLE:

SL.No.	Initial Energy (E_1) in joule	Residual Energy (E_2) in Joule	Absorb Energy ($E_1 - E_2$)

CALCULATIONS:

- Notch impact strength = Absorb energy / Effective cross section area

PRECAUTIONS:

1. The specimen should be prepared in proper dimensions.
2. Take reading more frequently.
3. Make the loose pointer in contact with the fixed pointer after setting the pendulum.
4. Do not stand in front of swinging hammer or releasing hammer.
5. Place the specimen proper position.

CONCLUSION:

The impact strength of given specimen = -----joule/mm²

EXPERIMENT NO. CE 492/6

NAME: Study the Brinell Hardness testing machine and the Brinell hardness test.

APPARATUS:

1. Brinell Hardness testing machine,
2. Specimen of mild steel / cast iron/ non ferrous metals
3. Brinell microscope.

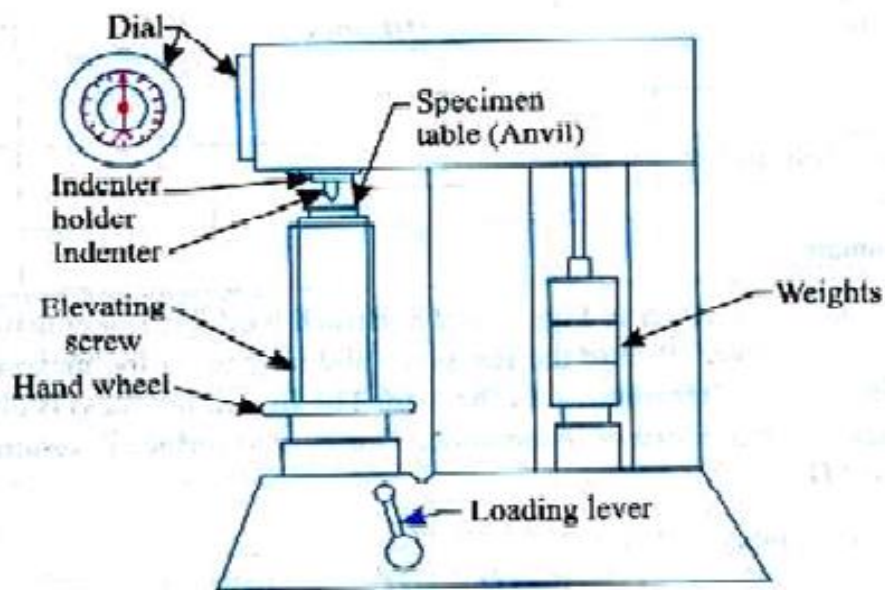
SPECIFICATION: -

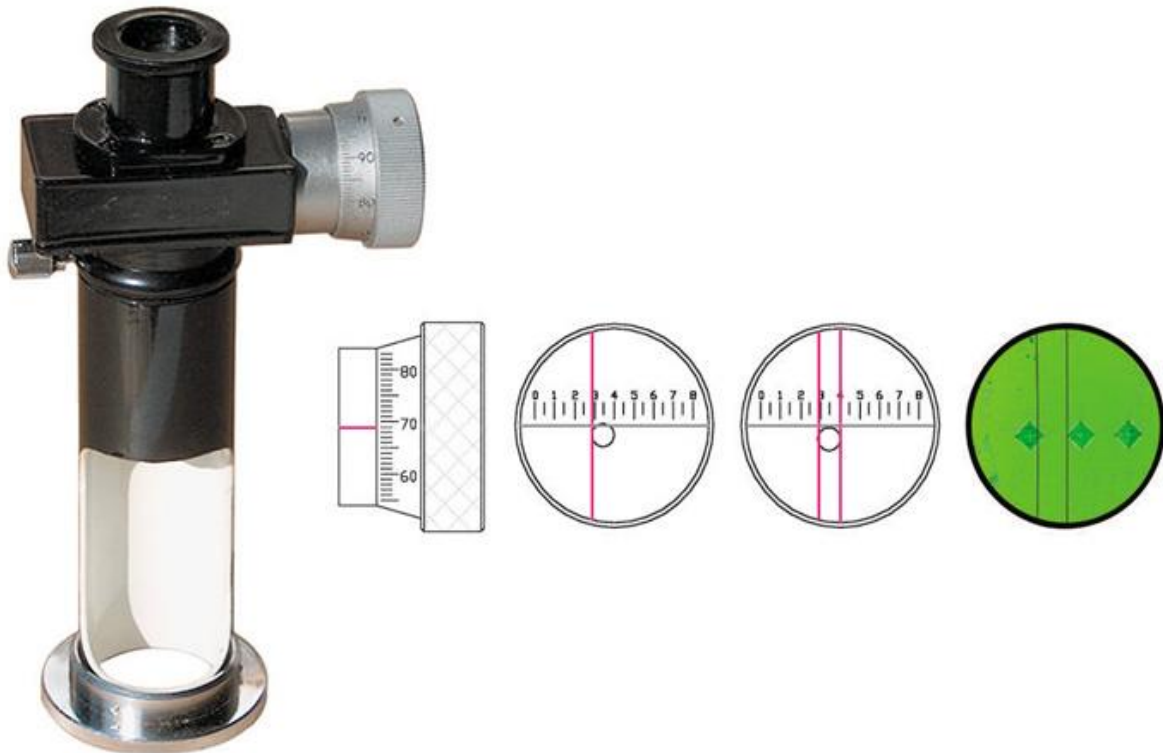
Hardness represents the resistance of material surface to abrasion, scratching and cutting, hardness after gives clear identification of strength. In all hardness testes, a define force is mechanically applied on the test piece for about 15 seconds. The indenter, which transmits the load to the test piece, varies in size and shape for different testes. Common indenters are made of hardened steel or diamond. In Brinell hardness testing, steel balls are used as indenter. Diameter of the indenter and the applied force depend upon the thickness of the test specimen, because for accurate results, depth of indentation should be less than 1/8th of the thickness of the test pieces. According to the thickness of the test piece increase, the diameter of the indenter and force are changed.

A hardness test can be conducted on Brinell testing m/c or Rockwell hardness m/c. the specimen may be a cylinder, cube, thick or thin metallic sheet. A Brinell- cum-Rockwell hardness testing m/c along with the specimen is shown in figure. Its specification are as follows:

1. Ability to determine hardness upto 500BHN.
2. Diameter of ball (as indenter) used $D = 2.5\text{mm}$
3. Maximum application load = 187.5 kgf.
4. Method of load application = Lever type

DIAGRAM:





EXPERIMENTAL PROCEDURE:

1. Insert ball of diameter 'D' in ball holder of the m/c.
2. Make the specimen surface clean by removing dust, dirt, oil and grease etc.
3. Make contact between the specimen surface and the ball by rotating the jack adjusting wheel.
4. Push the required button for loading.
5. Pull the load release level and wait for minimum 15 second. The load will automatically apply gradually.
6. Remove the specimen from support table and locate the indentation so made.
7. View the indentation through microscope and measure the diameter 'd' by micrometer fitted on microscope.
8. Repeat the entire operation, 3-time.

OBSERVATION TABLE:

SL. NO.	SPRING BALANCE DIFF. (kg)	PRESSURE GAUGE DIFF. (kg/cm ²)	TURBINE SPEED, N (rpm)
1.			
2.			
3.			

CALCULATIONS:

BHN = Load Applied (kgf.) / Spherical surface area indentation (in mm.)

$$\text{BHN} = \frac{P}{\pi r^2}$$

$$\frac{2P}{\pi D(D - \sqrt{D^2 - d^2})}$$

PRECAUTIONS:

1. The specimen should be clean properly.
2. Take reading more carefully and correct.
3. Place the specimen properly.
4. Jack adjusting wheel move slowly
5. After applying load remove the load.

CONCLUSION:

The Brinell hardness number of the specimen is -----

EXPERIMENT NO. CE 492/7

NAME: To study the Rockwell Hardness testing machine and perform the Rockwell hardness test.

APPARATUS:

1. Rockwell Hardness testing machine,
2. Specimen of mild steel or other material

SPECIFICATIONS:

Hardness represents the resistance of material surface to abrasion, scratching and cutting, hardness after gives clear indication of strength. In all hardness tests, a define force is mechanically applied on the piece, varies in size and shape for different tests. Common indentors are made of hardened steel or diamond. Rockwell hardness tester presents direct reading of hardness number on a dial provided with the m/c. principally this testing is similar to Brinell hardness testing.

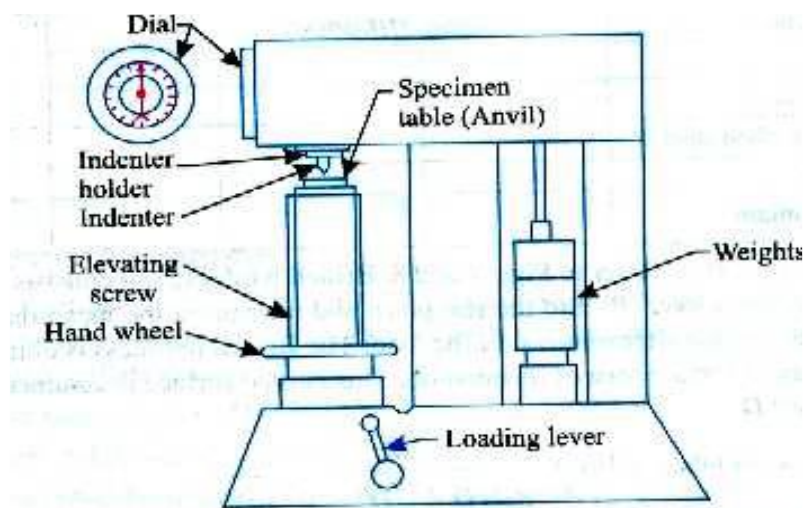
It differs only in diameter and material of the indenter and the applied force. Although there are many scales having different combinations of load and size of indenter but commonly 'C' scale is used and hardness is presented as HRC. Here the indenter has a diamond cone at the tip and applied force is of 150 kgf. Soft materials are often tested in 'B' scale with a 1.6mm dia. Steel indenter at 100kgf.

A hardness test can be conducted can be conducted on Brinell testing m/c, Rockwell hardness m/c. The specimen may be a cylinder, cube, thick or thin metallic sheet. A Brinell-cum-Rockwell hardness testing m/c is shown in figure below.

Various scales in Rockwell hardness test are given below:-

Scale	Type of indenter	Initial load	Major load	Pointer Position	Kind of material
A	Cone, 120o	10	50	0	Much harder material
B	Ball, 1.58mm	10	100	30	Soft steels, copper, aluminum
C	Cone, 120o	10	150	0	Hard steels, Ti, W, Va, etc

DIAGRAM:



PROCEDURE:

1. Insert cone or ball pointer according to load given.
2. Make the specimen surface clean by removing dust, dirt, oil and grease etc.
3. Make contact between the specimen surface and the ball by rotating the jack adjusting wheel.
4. Push the required button for loading.
5. Pull the load release lever wait for minimum 15 second. The load will automatically apply gradually.
6. Remove the specimen from support table and locate the indentation so made.
7. Repeat the entire operation, 3-times.

OBSERVATION TABLE:

Following observation are recorded are from a test on steel specimen using a hardened steel ball as indentor.

- Test piece material =-----

Sl.No.	Scale using	Readings		
		1 st	2 nd	3 rd
1.	A			
2.	B			
3.	C			

PRECAUTION:

- The specimen should be clean properly.
- Take reading more carefully.

CONCLUSION:

Rockwell hardness of given specimen is -----

EXPERIMENT NO. CE 492/8

NAME: Torsion test on mild steel rod.

APPARATUS:

1. A torsion testing machine.
2. Twist meter for measuring angles of twist
3. A steel rule and Vernier Caliper or micrometer.

SPECIFICATIONS:

A torsion test is quite instrumental in determining the value of modulus of rigidity of a metallic specimen. The value of modulus of rigidity can be found out through observations made during the experiment by using the torsion equation

$$\frac{T}{I_p} = \frac{C \theta}{L} = \frac{q}{r}$$

Where,

T = Torque applied,

I_p = Polar moment of inertia,

C = Modulus of rigidity,

θ = Angle of twist (radians), and

L = Length of the shaft

q = Shear stress

r = Distance of element from center of shaft

DIAGRAM:



PROCEDURE:

1. Before the test is started, ensure that the display shows 000.0 when there is no torque applied to the sample. If it not, press the zero button to set the load value to zero.
2. Consisting of approximate breaking torque of test piece to be tested.
3. The rod is fixing in to the grip of machine.
4. Set the pointer on the torque measuring scale.
4. Switch “ON” the main of the machine by rotating the main switch provided on the side of the measuring panel.
5. Once the machine is switched on, see that the indicator is also “ON”.
6. Start the geared mortar with the help of the starter switch.

OBSERVATION TABLE:

Gauge length of the specimen, $l = \dots\dots\dots$

Diameter of the specimen, $d = \dots\dots\dots$

Polar moment of inertia,

$$C = \frac{TL}{I_p}$$

$$I_p = \frac{\pi d^4}{32}$$

PRECAUTION:

1. The specimen should be prepared in proper dimensions.
2. The specimen should be properly to get between the jaws.
3. Take reading carefully.
4. After breaking specimen stop to m/c.

CONCLUSION:

Modulus of rigidity of mild steel rod is ----- N/mm²

EXPERIMENT NO. CE 492/9

NAME: To determine the modulus of rigidity and stiffness of the given compression spring specimen

APPARATUS:

1. Spring test machine.
2. Compression spring specimen.
3. Vanier calliper.

DIAGRAM:



PROCEDURE:

1. Measure the outer diameter (D) and diameter of the spring coil (d) for the given compression spring.
2. Count the number of turn i.e. coil (n) in the given compression specimen.
3. Place the compression spring at the centre of the bottom beam of the spring test machine.
4. Rise the bottom beam by rotating right side wheel till the spring top touches the middle cross beam.
5. Note down the initial reading from the scale in the machine.
6. Apply a load of 25 kg and note down the scale reading. Increase the load at the rate of 25 kg upto a maximum of 100kg and note down the corresponding scale readings.

7. Finding the actual deflection of the spring for each load by deducting the initial scale reading from the corresponding scale reading.
8. Calculate the modulus of rigidity for each load applied by using the following formula.
Modulus of rigidity, $N = 64PR^3nd^4\delta$

Where, P = Load in N

R = Mean radius of the spring in mm (D-d/2)

d = Diameter of the spring coil in mm

δ = Deflection of the spring in mm

D = Outer diameter of the spring in mm

9. Determine the stiffness for each load applied by using the following formula:

$$\text{Stiffness, } K = \frac{P}{\delta}$$

10. Find the values of modulus of rigidity and spring constant of the given spring by taking average values.

OBSERVATION TABLE:

1. Material of the spring specimen =
2. Outer diameter of the spring, D = mm
3. Diameter of the spring coil, d = mm
4. Number of coil/turns ,n = Nos
5. Initial scale reading = Cm= mm

Sl. No.	Applied load in		Scale reading in		Actual deflection in mm	Modulus of rigidity in N/mm ²	Stiffness in N/mm
	kg	N	cm	mm			
Average							

PRECAUTION:

- The specimen should be clean properly.
- Take reading more carefully.

CONCLUSION:

The modulus of rigidity of the given spring = N/mm²

The stiffness of the given spring = N/mm²

Take out the specimen pulling out stud by removing it from the tap in specimen. Select the load required, depending upon the bending moment to be imposed, by moving the loading weight and selecting proper set of additional weights. Lock the loading weight by locking screw. Use the pin support while moving the loading weight, so that the lever is not moved. Remove the pin from support before starting the motor, otherwise the specimen will rotate without application of any bending moment. Check the direction of rotation. Reset the counter to show all 0's before running the specimen. In electronic counter there is a reset knob whereas in mechanical counter there is a reset key. Start the motor, thus starting the test. The motor will have recorded the number of revolutions completed by the specimen.

OBSERVATION TABLE:

The specimen loading arrangement results in a constant bending moment $PL/2$ over the test length of specimen.

Where: P = Load applied over the specimen kg.

L =Length of the specimen in cm.

Now, Bending moment (M_b) = $\frac{PL}{2}$ kgcm

Bending stress (f_b) = $\frac{M_b}{Z}$ kg/cm²

Where, Z = Section modulus = $\frac{\pi d^3}{32}$ for circular cross section

So, $f_b = \frac{M_b \times 32}{\pi d^3}$ kg/cm²

Note: The load P indicated on the scale includes the weight of swilling bodies, hanger etc.

Note 2: Final revolution count should be noted down for S-N diagram.

PRECAUTION:

- The specimen should be clean properly.
- Take reading more carefully.

CONCLUSION:

Bending Stress (f_b) = kg/cm²

ALLOCATION OF MARKS:

INTERNAL	EXTERNAL
40 MARKS	60 MARKS
Attendance (10)	Lab Examination (40)
Performance (20)	Viva voice (20)
Report submission (10)	
Grand total = 100	