SOLID MECHANICS LABORATORY

BRINNELL'S HARDNESS TEST

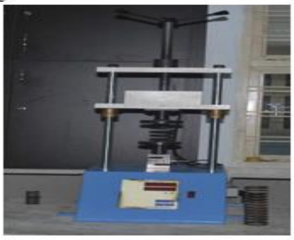
Hardness of a material is generally defined as Resistance toPermanent indentation under static or dynamic loads. However it also refers to stiffness or to resistance to scratching, abrasion or cutting. Indentation hardness maybe measured by various hardness tests, such as Rockwell, Vickers, Brinnells hardness etc. In brinnel's hardness test, a hard steel ball, under specified conditions of load and time, is forced into the surface of the material under test and the diameter of the impression is measured. Hardness number is defined as the load in kilograms per square millimeters of the surface area of indentation. This number depends on the magnitude of the load applied, material and geometry of the indentor.

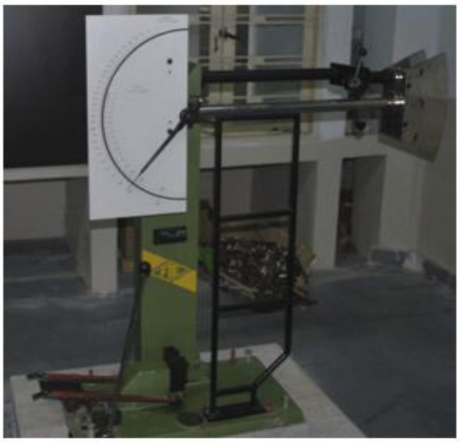
BRINNELL'S HARDNESS TESTING MACHINE

ROCKWELL'S HARDNESS TEST:

The Rockwell test is similar to Brinnel's test. In that the hardness number found is a function of degree of indentation of test piece and the action of an indenter under a given static load. Various loads and indentor are used depending on the condition of given static load. It differs from the Brinnel's test in that the loads are smaller and hence resulting indentation is smaller and shallower. It is applicable in testing of materials beyond the scope of Brinnel's test. It is widely used in industrial works. The test is conducted in a specially designed machine that applies load through a system of lever and weights. The indentor is a steel ball or a diamond with a somewhat rounded point. The hardness value as read from a specially graduated dial indentor, it is an arbitrary number that is related inversely to depth of indentation.

ROCKWELL'S HARDNESS TESTING MACHINE

COMPRESSION TEST ON SPRING When an axial compression load w is applied on spring, every section of the spring wire is subjected to twisting moment WR, where R is the mean radius of the coil. For a close called the helical spring	Spring Testing Machine 2 
TENSION TEST The machine frame consists of two cross heads and lower table. Centre crosshead is adjustable by means of geared motor. Compression test is carried out between centre and lower table and tension test is carried out between centre and upper crosshead. Sensing of load is by means of precision pressure transducer of strain gauge type. Hydraulic system consists of motor pump unit with cylinder and piston. Safety relief valve is provided for additional safety.	**TENSION TESTING MACHINE** 
TORSION TEST If a round shaft is subjected to axial twisting moment as shown, the relation between torque T and angle of twist ş is given by T/J = G ş /L	**TORSION TESTING MACHINE** 

COMPRESSION TEST Concrete Cube.Compression testing machine, C.T.M is a machine designed to test the specimen in compression. The machine is operated hydralically and its driving is performed by the electric motor .Load verification of the testing machine meets the requirement of BS: 1610-1964 and IS: 1828-2000 .The machine consists of loading unit and the control panel.	**COMPRESSION TEST** 
IMPACT TEST In impact test is specially prepared notched specimen is fractured by a single blow from a heavy hammer and energy required being a measure of resistance to impact.	IMPACT TESTING MACHINE 

DEFLECTION TEST ON CANTILEVER BEAM

For a cantilever beam with concentrated load at end-span the formulae of deflection are as follows.

Span deflection at point of deflection meter (δ_c) = ($WL^3/3EI$)

Where δ = Deflection

W = Load.

L = Span Length of Beam

E =Young's Modulus and

I = Moment of Inertia of the beam = (1/12)*(bd^3)

CANTILEVER BEAM SETUP:

DEFLECTION TEST ON SIMPLY SUPPORTED BEAM/

VERIFICATION OF MAXWELL'S RECIPROCAL THEOREM ON

BEAMS

For a simply supported beam, AB of span L carrying a load W at a distance "a" from A and "b" from B , so that L= a+b , then the deflection "ị" at a distance "x" from A is given above.

For a simply supported beam with concentrated load at mid-span the formulae for deflection are as follows:

Quarter -span deflection (ị) = (11/768)* (WL^3/EI) Half-span deflection (ị) = (1/48) * (WL^3/EI)

Where ị = Deflection

W= Load.

L= span

E= Young's Modulus

I = Moment of inertia

SIMPLY SUPPORTED BEAM SETUP

DEFLECTION TEST ON CONTINUOUS BEAM

continuous beam of Uniform flexural rigidity EI. It is loaded at half of each span from end supports and deflection is measured at 1/4th of span from right end support.

Deflection (į) at F= (43/6144)* (WL^3/EI)

Where į = Deflection

W= Load.

L= span

E= Young's Modulus

I = Moment of inertia of the beam = (1/12)*(bd^3)

CONTINUOUS BEAM SETUP

Commented [KRY1]: