

CIVL 283

MATERIAL SCIENCE

LABORATORY DATA SHEET AND HANDOUT

CIVIL DEPARTMENT

FACULTY OF ENGINEERING

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HARDNESS TEST

1. OBJECTIVE

Our primary aim is to measure the Rockwell Hardness values of materials and estimate ultimate tensile strengths by the aid of conversion tables.

2. HARDNESS TESTING THEORY

Hardness is usually defined as the resistance of a material to plastic penetration of its surface. There are three main types of tests used to determine hardness:

• Scratch tests are the simplest form of hardness tests. In this test, various materials are rated on their ability to scratch one another. Mohs hardness test is of this type. This test is used mainly in mineralogy.

• In Dynamic Hardness tests, an object of standard mass and dimensions is bounced

back from a surface after falling by its own weight. The height of the rebound is indicated.

Shore hardness is measured by this method.

• Static Indentation tests are based on the relation of indentation of the specimen by a penetrator under a given load. The relationship of total test force to the area or depth of indentation provides a measure of hardness. The Rockwell, Brinell, Knoop, Vickers, and ultrasonic hardness tests are of this type.

For engineering purposes, mostly the static indentation tests are used.

**BRINELL HARDNESS TEST:**

This test consists of applying a constant load, usually between 500 and 3000 kgf for a specified time (10 to 30 s) using a 5 or 10-mm diameter hardened steel or tungsten carbide ball on the flat surface of a workpiece.



Hardness is determined by taking the mean diameter of the indentation and calculating the Brinell hardness number (BHM or HB) by dividing the applied load by the surface area of the indentation according to following formula:



where P is load in kg;

D ball diameter in mm;

and d is the diameter of the indentation in mm.

Calculations have already been made and are available in tabular form for various combinations of diameters of impressions and load. The Brinell hardness number followed by the symbol HB without any suffix numbers denotes standard test conditions using a ball of 10 mm diameter and a load of 3,000 kg applied for 10 to 15 s. For other conditions, the hardness number and symbol HB are supplemented by numbers indicating the test conditions in the following order: diameter of ball, load, and duration of loading.

For example, 75 HB 10/500/30 indicates a Brinell hardness of 75 measured with a ball of 10 mm diameter and a load of 500 kg applied for 30s.

**Lab Report:**

**Objective:**

This annex contains testing requirements for Round Wire Products that are specific to the product. The requirements contained in this annex are supplementary to those found in the general section of this specification.



**Preliminary Remarks:**

**Apparatus:**

* Brinell hardness tester
* Ball indenter.
* Gripping Devices
* Pointed Micrometer

**Test specimen**

Test specimens having the full cross-sectional area of the wire they represent shall be used. The standard gauge length of the specimens shall be 2.5 mm. The total length of the specimens shall be at least equal to the gauge length plus twice the length of wire required for the full use of the grip employed.

**Procedure**

The hardness measurements for all three samples should be taken prior to the tensile tests. Since the tensile strength of the specimens will be measured, all hardness readings should be made at the ends of the specimens.

**Calculation**





**Result and Discussion of Results**

The hardness measurements for all samples should be taken prior to the tensile tests. Since the tensile strength of the specimens will be measured, all hardness readings should be made at the ends of the specimens.

**Conclusion**

As a conclusion, this experiment had some datas and range of brinell hardness calculated according to these datas. Then, the table was filled according to datas and result of calculations.