Rajshahi University of Engineering & Technology

Experiment No: 05

Determination of Impact Test of Mild Steel

Course No: 2114

Course Title: Mechanics of Materials Sessional – II

Introduction:

Impact: a high force on shock over a short time. In mechanics, an impact is a high force on shock applied over a short time when two or more bodies collide.

Impact Test:

Impact testing, ASTM E23, and ISIBS Standard; The impact test is a method for evaluating the toughness and notch sensitivity of engineering materials. It is usually used to test the toughness of materials.

Charpy Impact Test: A test specimen 'B' machined to a 10mm x 10mm cross-section, with either a 'V' or 'U' notch. Subsize specimens are used where the material thickness is restricted. The specimen can be tested down the cryogenic temperature.

Principle: The Charpy impact test is a dynamic test piece U-notched or V-notched in the middle and supported at each end, is broken by a single blow of a freely swinging pendulum.

Then the energy is measured by the impact strength of materials.

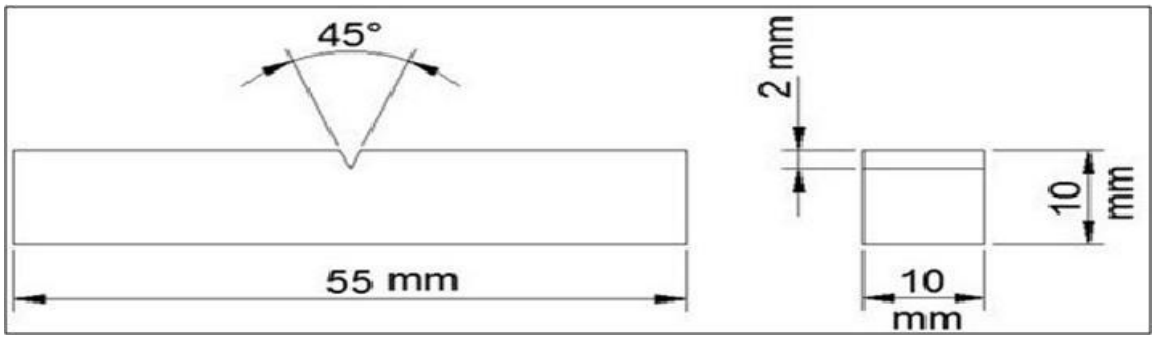

Figure 1: Charpy Test Specimen

Figure 2: Charpy Impact Test machine

The impact test helps to measure the energy absorbed.

Izod Impact Test: The test specimen is machined to a square or round section, with either one, two, or three notches. The specimen is clamped vertically on the anvil with the notch facing the hammer.

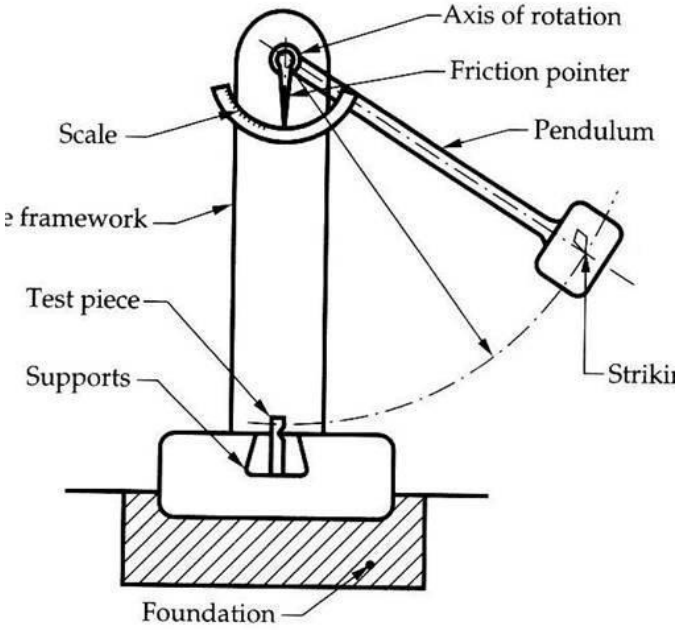

Figure 3: **Izod Impact Test.**

Principle: The Izod in which a test piece V-notched test piece gripped vertically, is broken by a single blow of freely swinging pendulum. The blow B struck on the same face as the notch and at the fixed height above it. The energy absorbed is measured. The absorbed energy is a measure of the impact strength of the material.

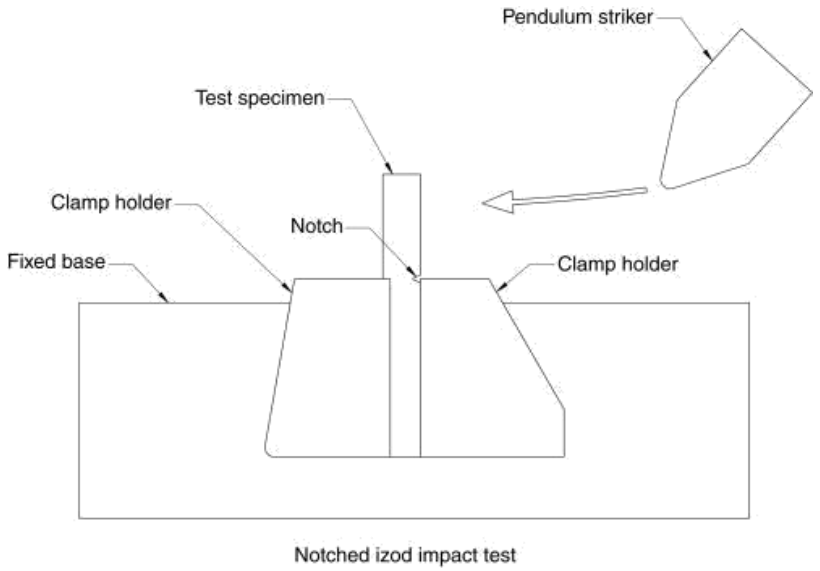

Figure 4: Izod Impact Test Specimen.

Difference Between the Charpy Impact Test & Izod Impact Test:

- In the Charpy impact test, the specimen was set to be simply supported, but in the Izod impact test, the specimen is set to be cantilever.
- In the Charpy impact test, both ‘V’ notch and ‘U’ notch is used, but in the Izod impact test, only ‘V’ notch is used.
- In the Charpy impact test, the length of the specimen is 55 mm and the notch is equidistance from both ends. But in the Izod impact test, the length of the specimen is 75mm and the notch is 47mm from one end and 28mm from the other end.
- In the Charpy impact test, V-notch or U-notch is set in position in the opposite direction of load, but in the Izod impact test, the v-notch is set in position, in the direction of load.

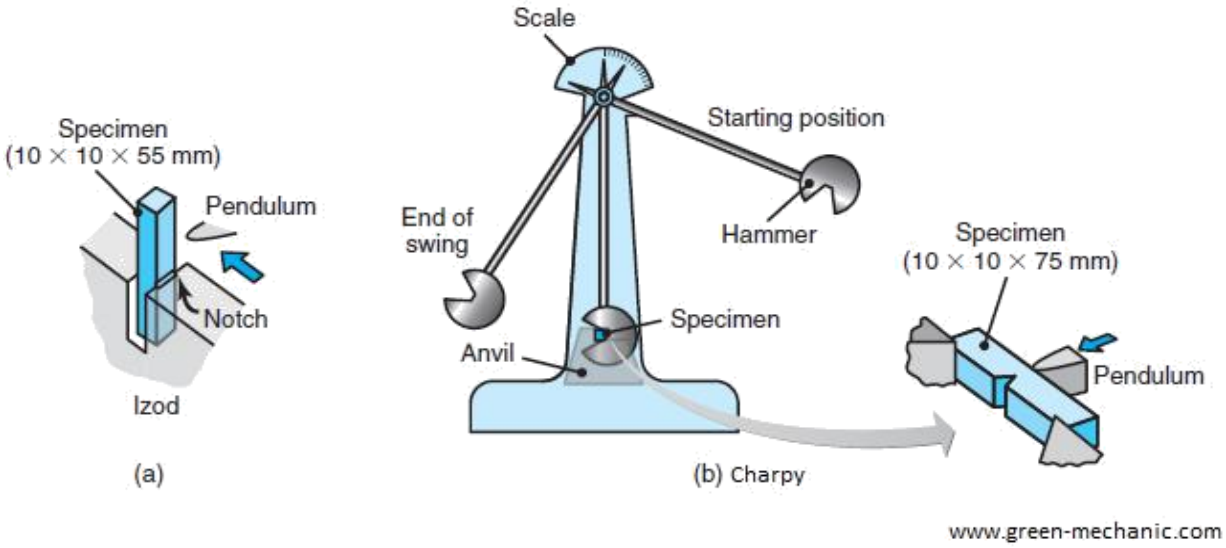

Figure 5: Difference Between the Charpy Impact Test & Izod Impact Test.

Objective:

- To determine the absorbed energy capacity of mild steel.

Apparatus:

- Specimen of steel
- Scale
- Slide calipers
- Shaper machine
- Izod impact test machine
- The Charpy impact test machine

Figure 6: Apparatus

Procedure:

For the Charpy impact test:

- The first sample of required dimensions was taken.
- A V-notch was made equidistance from both ends by using a shaper machine.
- Before setting the specimen to the Charpy impact test machine, the hammer was set to fall freely from the starting point and the maximum reading was taken.
- The difference between the starting point and maximum reading was calculated.
- The specimen was set and the hammer was again allowed to fall from the starting point and the reading of the needle of the machine was taken.
- Again, the difference between the maximum point and the starting point was calculated.
- The first difference was the initial reading, and the 2^{nd} difference was the final reading.
- The difference between the initial and final reading was calculated which was the energy absorption capacity of the specimen.

For the Izod impact test:

- At first, the specimen of required dimensions was taken.
- V-notch was made, as shown in the figure using a shaper machine.
- Before setting the specimen, the hammer of the Izod impact test specimen machine was allowed to fall freely from the starting point and the maximum deflection was taken. The difference between these two points was noted as initial reading.
- Then the specimen was set as discussed in the introduction and the hammer was allowed to fall from the starting point and the maximum deflection was noted. The difference between these two points was noted as the final reading.
- The difference between the initial and final reading was calculated which was the energy absorption capacity of the specimen.

Calculation:

For Charpy impact test:

Initial reading (without specimen)	= (220-0) lb-ft
	= 220 lb-ft
Final reading (with specimen)	= (220-180) lb-ft
	= 40 lb-ft
Energy absorption capacity of specimen	= (220-40) lb-ft
	= 180 lb-ft

For Izod impact test:

Initial reading (without specimen)	= (220-0) lb-ft
	= 220 lb-ft
Final reading (with specimen)	= (220-120) lb-ft
	= 100 lb-ft
Energy absorption capacity of specimen	= (220-100) lb-ft
	= 120 lb-ft

Result:

- Energy absorption (Charpy impact test) = 180 lb-ft
- Energy absorption (Izod impact test) = 120 lb-ft

Discussions:

- The face of the notch was the most important factor to be kept in right direction to break or to fail.
- The specimen supported for the two testing machines were also important. Because its absorption capacity would be changed for its supporting system.