

**PHYSICAL  
METALLURGY  
PRINCIPLES**

Third Edition

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and directly behind, the notch. The effect of this mode of stressing is to place the metal at the base of the notch in a state of triaxial tension. The rate of loading in the impact test is much faster than in a normal tensile test, being of the order of 10 million times faster. This rate of straining results from the fact that the knife edge is mounted at the center of percussion of a heavy pendulum hammer, which is dropped from a fixed height. Because the hammer always falls the same distance, it contains a fixed amount of energy when it strikes the specimen, usually of the order of 200 ft-lb (271 J). Fracturing the specimen removes energy from the hammer, which is measured on the testing machine by the height to which the hammer rises after it has broken the specimen. The energy expended in fracturing the Charpy impact specimen is the quantity measured in the test. If the fracture is completely ductile, the energy expended will be high; when it is completely brittle, the energy expended will be low.

The impact test furnishes us with a simple method of following the change in

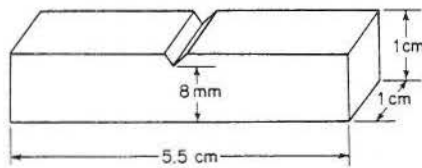


Fig. 22.50 V-notch Charpy impact test specimen.

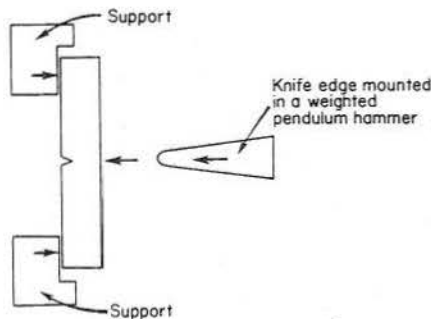


Fig. 22.51 Method of applying the impact load to a Charpy specimen.

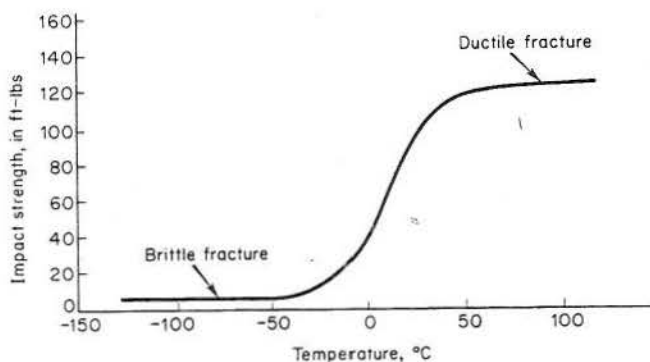
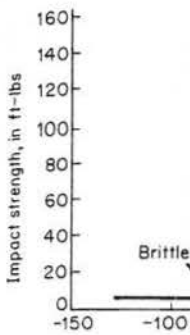


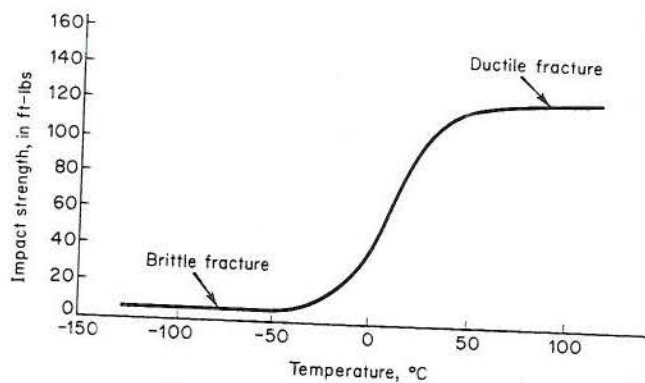
Fig. 22.52 Representative Charpy impact ductile to brittle fracture transition curve.



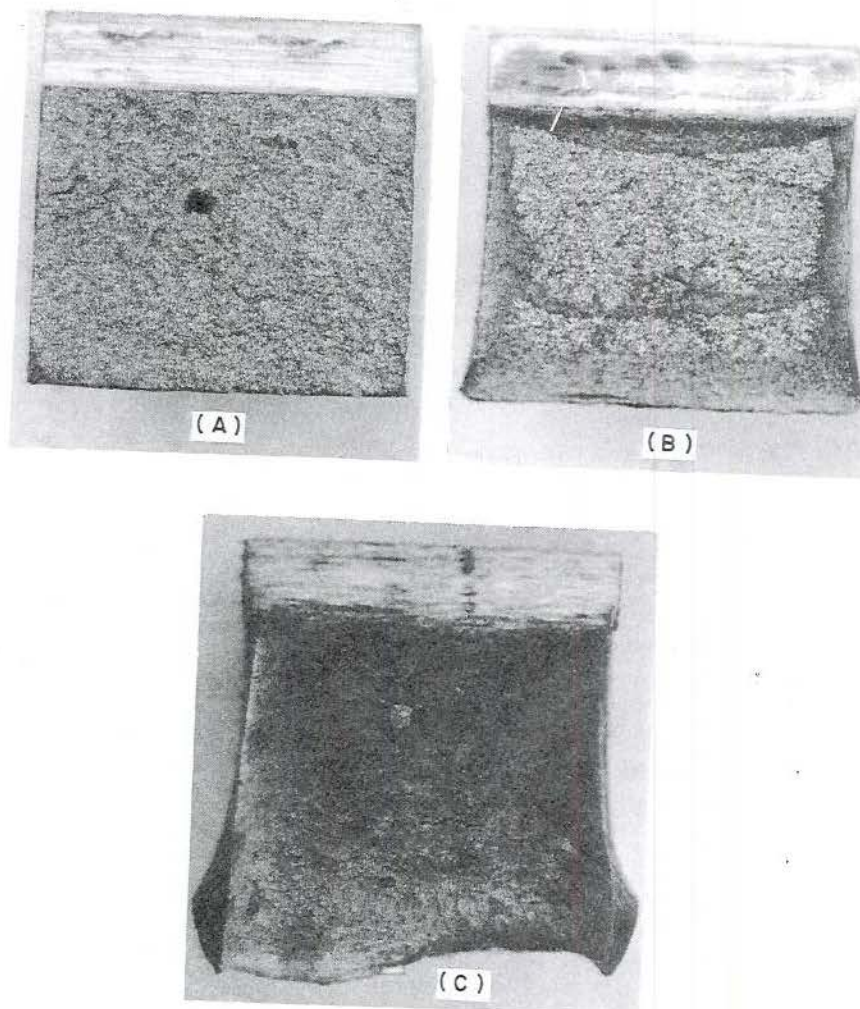


## 22.38 The Impact Test

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**Fig. 22.53** Representative Charpy impact ductile to brittle fracture transition curve.



**Fig. 22.54** Typical Charpy v-notch fracture surfaces: (A) completely brittle fracture; (B) part ductile, part brittle; (C) completely ductile.