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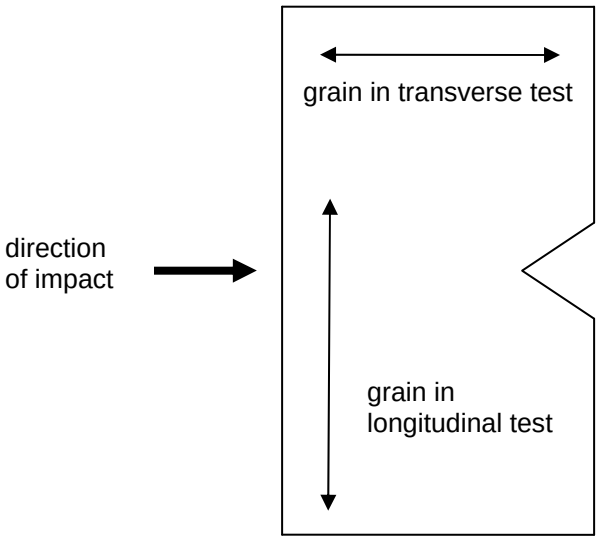
UNDERSTANDING IMPACTS

In an impact test, the test specimen is shaped like a rectangle. The term “longitudinal” or “transverse” refers to whether the grain of the steel in the test specimen runs the length of the rectangle (“longitudinal”) or the width of the rectangle (“transverse”). The “notch” goes in the middle of the length of the rectangle on one side. The hit from the pendulum strikes the side of the specimen (against the long side of the rectangle) in the middle of the notch. So in a longitudinal specimen the directional force of the impact from the hit goes across the grain of the specimen. In a transverse specimen the directional force of the impact from the hit goes parallel to the grain of the specimen (or effectively, between the strands of the grain).



When the directional force of the hit goes across the grain (as it does in a “longitudinal” test), it is harder to fracture the specimen than if the force goes parallel to the grain. It takes more energy to break the steel across the grain. That is why a longitudinal specimen has higher notch toughness than a transverse specimen. In other words, it will take more foot pounds (or joules) of absorbed energy to break a longitudinal specimen.

When a steel mill is required to produce 20 ft lbs longitudinally, the transverse impact will be less (say 12 ft lbs). It is easier for a steel mill to produce impact (or “notch”) toughness longitudinally because the grain direction of the steel provides a natural resistance to fracture. If you ask the same mill to produce 20 ft lbs transversely instead of longitudinally, it will be more difficult for the mill to do, because the grain of the steel will not be a factor in resisting the fracture.