

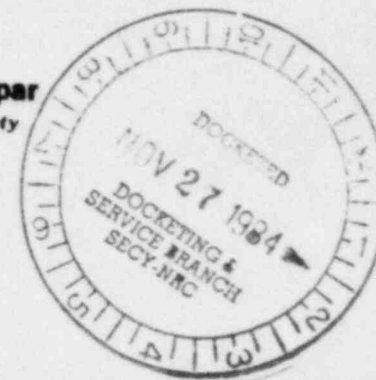


Iron Castings Handbook

*Covering data on Gray,
Malleable, Ductile, White, Alloy
and Compacted Graphite Irons*

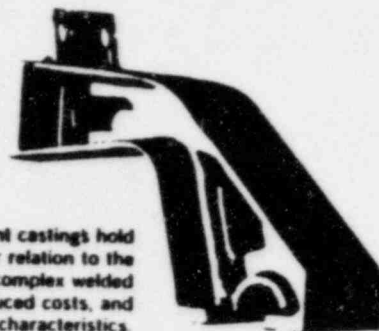
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Two of these ductile iron truck mount castings hold the cab-over-engine cab in proper relation to the truck frame. This redesign from a complex welded steel fabrication resulted in reduced costs, and improved strength and fatigue characteristics.

mental to fatigue life but the speed of the loading cycle and the occurrence of rest periods are not significant.

As the maximum stress is reduced, the number of cycles necessary to produce a failure becomes much larger. The highest stress at which the number of cycles for failure approaches infinity (generally in excess of ten million cycles) is called the *endurance limit*. The *endurance ratio* is the relation between the endurance limit and the tensile strength. Most of the data on fatigue strength have been obtained with the rotating beam type test where the maximum stress alternates between tension and compression. A typical S-N curve on which the stress is plotted against the number of cycles to failure¹⁶ is shown in Fig. 13. From these results, the unnotched endurance limit is indicated to be 28,000 psi (193 MPa). This is the maximum stress at which a failure should not occur under similar conditions in any number of cycles. Since this particular ductile iron has a tensile strength of 68,500 psi (472 MPa), its endurance ratio is 0.41.

The effect of stress raisers on the endurance limit has been evaluated by the use of notched test bars. For this purpose, a notch is usually turned into the circumference of an oversize bar so that the base of the notch leaves a cross-section equal to the regular unnotched bars to which the notched bars are compared. The ratio of the unnotched to the notched endurance limit is termed the notch sensitivity factor or the dynamic stress concentration factor. Several investigations have obtained endurance ratios of from .33 to .52 for the different types of ductile iron. The endurance limit increases with tensile strength, but as with other ferrous metals, the increase is less than proportional. The relation between tensile strength and the endurance ratio is different for the annealed, ferritic irons than for the irons with a matrix of pearlite or tempered martensite^{17,18}, Fig. 14.

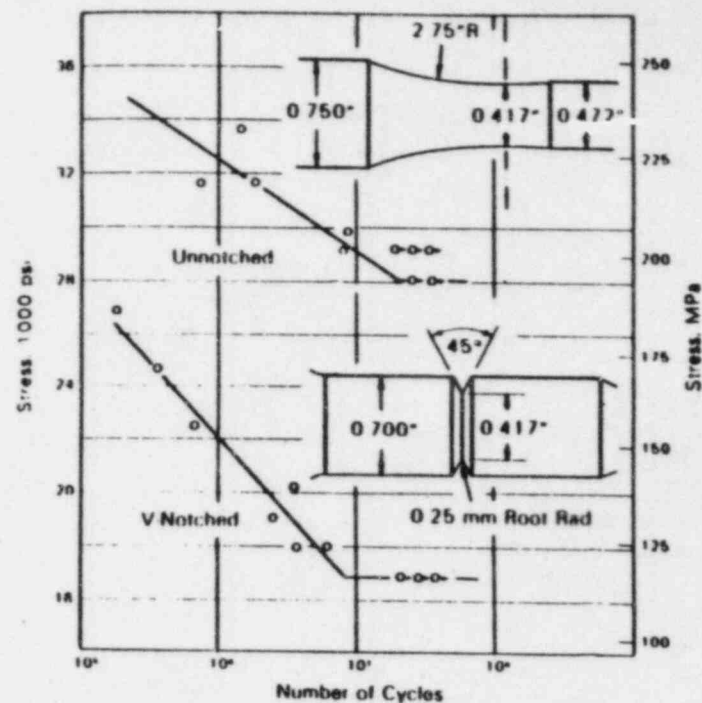


Fig. 13 The unnotched and notched fatigue properties of an annealed ductile iron¹⁶ with a tensile strength of 65,800 psi (454 MPa). The endurance ratio is .41 and the notch sensitivity ratio is 1.67.

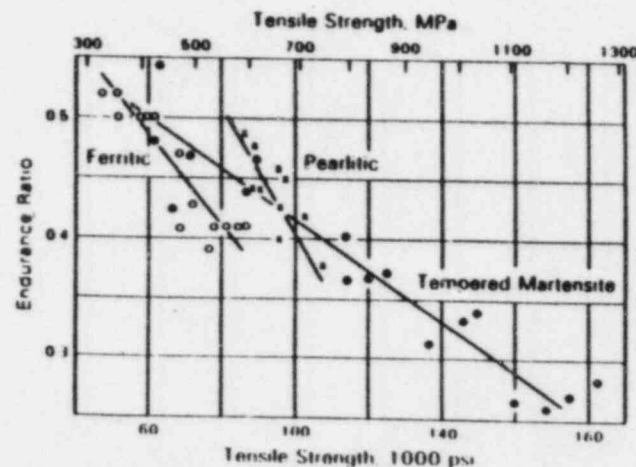


Fig. 14 The endurance ratios for ductile irons as influenced by tensile strength and matrix microstructure^{17,18}.