

Steel Grade Selection for Hull Structural Applications using the Master Curve Approach

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Abstract: The resistance to the brittle fracture of ship hull structures typically follows a letter grade designation associated with a minimum Charpy V Notch (CVN) absorbed energy requirement at a specified test temperature. While the selection of the steel letter grade is often prescribed by Ship Classification Societies depending on minimum operating temperature and plate thickness, it is impossible to estimate the safe operating limits of hull structure using the letter grade designation alone. The **Master Curve** approach together with CVN to reference temperature correlations which account for stress-intensity rates, provides a means to quantitatively predict the risk associated with different steel grades [1]. The ability of these expressions to predict the fracture response of hull structural steels under different environmental and loading rates is examined. These predictions draw upon a series of experimental data sets ranging from explosively loaded tests [2], dynamic fracture toughness, quasi-static fracture toughness and Charpy V notch configurations. Conclusions drawn from the analysis are related to the probability of ship survivability for the different loading scenarios.

References:

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- [2] J. P. W. Verdaasdonk, R. Spyker, and Z. Sterjovski. *The Use of Modern High Strength Steel Grades in the Australian Air Warfare Destroyer (AWD)*. in *Pacific 2012 International Maritime Conference*. Darling Harbour, Australia, (2012),