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Abstract

The HAZ toughness of the fire and seismic resistant (FSR) steel (0.089C, 0.131Mo, 0.018 Ti, 0.029Nb, 0.0021B) were systematically investigated. The gleeble thermomechanical simulations were used to characterize the microstructure and mechanical properties. It has been seen that toughness of the inter-critically reheated coarse-grained heat affected zone (ICCGHAZ) are lower than the coarse grain heat affected zone (CGHAZ) and its base material. The electron microscopic fractographic analysis shows that the fracture was initiated on some brittle microstructures which are depicted as the M-A. Microstructure characterization reveals that there exists a large percentage of M-A constituent in the ICCGHAZ. Due to the difference in hardness stress concentration can easily occur in the M-A matrix interface or inside the M-A constituents, which indeed lead to the crack initiation. Eventhough high prior austenitic grain size is detrimental for the toughness of CGHAZ, the presence of tough microstructures such as acicular ferrite, bainitic ferrite was made the CGHAZ more tougher. Hence it can be concluded that, for a particular heat input of 2.19 kJ/mm for FSR steel, the toughness properties detrimental only for the ICCGHAZ due to the brittle M-A constituent.