
Mechanical properties of YSt-355 fire-resistant steel tubular sections micro-alloyed with molybdenum (0.1%)

Mohd. Dilawar Bhat*

Department of Civil Engineering,
Indian Institute of Technology Roorkee,
Uttarakhand, India

and

Department of Civil Engineering,
Islamic University of Science and Technology,
Kashmir, India

Email: mohd_b@ce.iitr.ac.in

*Corresponding author

Umesh Kumar Sharma

Department of Civil Engineering,
IIT Roorkee,
Uttarakhand, India

Email: umesh.sharma@ce.iitr.ac.in

P.C. Ashwin Kumar

Department of Earthquake Engineering,
IIT Roorkee,
Uttarakhand, India

Email: ashwin.pc@eq.iitr.ac.in

Abstract: A new category of low cost fire-resistant (FR) structural YSt-355FR steel cold-formed tubular sections micro alloyed with 0.1% molybdenum has been developed by Tata Steel, India. To investigate the degradation of mechanical properties at elevated temperatures, a series of steady-state tensile tests were performed within the temperature range of 24°C to 800°C. This research work presents the detailed results and discussion on strength, stiffness, and deformations of steel at ambient temperature (AT) and elevated temperature (ET). The stress-strain curve for mechanical properties and the reduction factors of yield strength, elastic modulus and ultimate strength were plotted and compared with current design standards and to those reported in the literature. The results led to conclusion that the codal design factors are either too conservative or unsafe. Consequently, new equations were proposed for the reduction factors at an elevated temperature suggesting its potential use in steel constructions subjected to fire conditions.

Keywords: fire-resistant steel; FRS; elevated temperature; ET; reduction factor; steel tubular sections.