A STUDY ON THE RELATIONSHIP BETWEEN THE QUENCHED CASE THICKNESS AND THE PERCENTAGE ELONGATION OF THE TMT REINFORCING BARS

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The conventional steel reinforcements are manufactured by twisting the hot rolled bar at cold stage thus usually referred as Cold Twisted Deformed (CTD). TMT (Thermo Mechanically Treated) bars manufacturing involves with quenching of the hot rolled bar with pressurized water-air mixture and allowing to be cooled to room temperature. The sudden cooling imparts a case-core structure to the bar while subsequent cooling tempers this structure. The case becomes harder as quenched while the core remains softer. The aim of this research is to study on the relationship between the ultimate elongation of the TMT bars with the thickness of the case achieved. Samples of 12 mm nominal diameter were selected for this purpose. Each sample was tested for tensile loading and for measurement of the case thickness. The percentage elongation at break of each sample was found after carrying out tensile testing. The distances of the predetermined markings on the bars before and after the test were used for the calculation of the percentage elongation. The case thickness was measured with the basis of the difference of the hardness readings along a radius of the cross-section. The hard case and the soft core resulted with hardness values with significant contrast. Vickers Hardness measurements were taken along the radii of samples with predefined intervals and graphed to calculate the thickness of the case. A micro hardness tester was used for this purpose. According to the described method, a clear measurement of the thicknesses quenched case was made and these are related with the percentage elongation at the fracture. Elongation decreases with the increasing quenched case thickness. This research supports the steel rebar manufacturers to know the range of the quenched case depth to maintain the required amount of elongation specified by the standards.

Keywords: Percentage elongation, Quenched case thickness, TMT