

Experimental Study on Post-Fire Mechanical Properties of S235 Steel

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Abstract : In order to evaluate the residual strength of S235 (St37) steel structures after the fire, an experimental program was undertaken to investigate the post-fire mechanical properties. Tensile coupons taken from S235 sheets were exposed to varying temperatures as 200°C, 400°C, 600°C, and 800 °C. The samples were then allowed to cool down to ambient temperature before they were tested to failure. To obtain the mechanical properties of steels; tensile tests are performed, and the post-fire stress-strain curves are evaluated. The microstructures of the heat-treated specimens were examined by Scanning Electron Microscope (SEM). It is seen that morphology and size of the precipitates in the specimens change, as the heat increases. The modulus of elasticity decreases, and deformation increases with temperature. Energy dissipation decreases due to lower stress according to the stress-strain curves of the specimens. Especially, the mechanical properties were decreased compared with the pre-fire ones. As a result of the post-fire and pre-fire behavior of S235, a set of equations is evaluated to predict the mechanical properties after the fire. These types of equations may allow the structural and/or fire engineers to predict accurately the post-fire behavior of the buildings constructed with S235 type steel.

Keywords : post-fire behavior, stress-strain curves, experimental study, S235 steel

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