

## Strength Reduction in S690-QT Welded Sections under Various heat input energy

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### ABSTRACT:

In recent decades, a number of research studies were carried out to investigate weldability of S690-QT steel materials, and hence structural behaviour of these welded sections. It was found that S690-QT steel materials might suffer from a reduction in both yield strengths and tensile strengths after welding. In the current study, a series of standard tensile tests were conducted on S690-QT steel coupons to quantify strength reductions in welded sections. Both welding methods GMAW and SAW were employed to carry out perfectly-matched welding with various heat input energy.

It was shown that in most welded coupons, fracture occurred at heat affected zones (HAZs). It was proved that only coupons from welded sections with a heat energy not larger than 1.0 kJ/mm meet various ductility requirements stipulated in EN1993-1-12, i.e. i)  $f_u / f_y \geq 1.05$ , ii)  $\epsilon_{fu} \geq 15 f_y / E$  and iii)  $\epsilon_u \geq 10\%$  (CEN, 2007). By comparing with measured mechanical properties of corresponding steel plates, only welded sections with a heat energy of 1.0 kJ/mm exhibit equal strengths to those of steel plates, whilst reduction factors for yield strengths are found to be 0.90, 0.86 and 0.70 respectively for welded sections with heat energy of 1.5, 2.0 and 5.0 kJ/mm respectively.

**Keywords:** High Strength S690-QT, Welded Sections, Heat Input Energy, Strength Reduction.