

Heating of Strengthened Alloys

Metal alloys are strengthened by cold work or by heat treatment depending on their composition. Designs that are based on the strengthened properties of the alloys must take into consideration those fabrication processes that may reduce their strength. These include such processes as welding, brazing and soldering or other heat-producing processes.

The most common mistake encountered is that of fusion welding alloys that are heat treated and then neglecting the loss of strength in the weld zone. As a consequence, the base metal in the heat-affected-zone (HAZ) may have a narrow band that has the annealed properties and, if yielding is called for during service, it will be concentrated in that narrow zone and result in overload rupture. If heat-treated alloys are to be welded after the strengthening heat treatment, then the design should provide for an increased section thickness in the region of the weld joint to provide more structural material of the reduced strength condition to prevent overload failure. If design changes cannot be made, due to dimensional or other constraints, a post-weld heat treatment should be considered to improve the strength of the weldments.