

High tensile steels and alloys under high stress are more susceptible to chemical attack by the chloride ion and the hydrogen ion than normal steels. Product failures have been recorded in many types of high tensile steels including stainless steels due to stress corrosion cracking.

Stress corrosion cracking (SCC) is the unexpected sudden failure of normally ductile metals subjected to a tensile stress in a corrosive environment, especially at elevated temperature in the case of metals. SCC is highly chemically specific in that certain alloys are likely to undergo SCC only when exposed to a small number of chemical environments. The chemical environment that causes SCC for a given alloy is often one which is only mildly corrosive to the metal otherwise. Hence, metal parts with severe SCC can appear bright and shiny, while being filled with microscopic cracks. This factor makes it common for SCC to go undetected prior to failure. SCC often progresses rapidly, and is more common among alloys than pure metals. The specific environment is of crucial importance, and only very small concentrations of certain highly active chemicals are needed to produce catastrophic cracking, often leading to devastating and unexpected failure.

Products which in normal use give satisfactory service, but can be affected by this phenomenon, are high tensile bolts, rivets, hollow rivets, anchor bolts, couplers and other fittings which have locked in stresses from the manufacturing process. The stresses can be the result of the crevice loads due to stress concentration, or can be caused by the type of assembly or residual stresses from fabrication (e.g. cold working); the residual stresses can be relieved by annealing.

In such hostile environments any components susceptible to stress corrosion should be additionally protected by in situ painting and re-painting. If the structure is to stand for several months metallurgical advice should be sought and the recorded behaviour of similar metals on the same site taken into account.

When aluminium or zinc coated products are likely to be exposed to any aggressive chemical, specialist advice should be taken.

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