



Technical Guidance



Stress Corrosion Cracking

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Stress corrosion cracking (SCC) is a term used to describe service failures in engineering materials (brass and steels) that occur by slow, environmentally induced crack propagation. The observed crack propagation is the result of the combined interaction of corrosion and mechanical stress to produce a failure by cracking.

This propagation may be formed both internally and externally depending upon the nature of the corrosive attack and the stress points.

SCC occurs occasionally within brass and stainless steel products and produces a marked loss of mechanical strength with little or no metal loss that is not obvious to casual inspection.

General View of Cracked Area



General View - highlighted by fluorescent penetrant

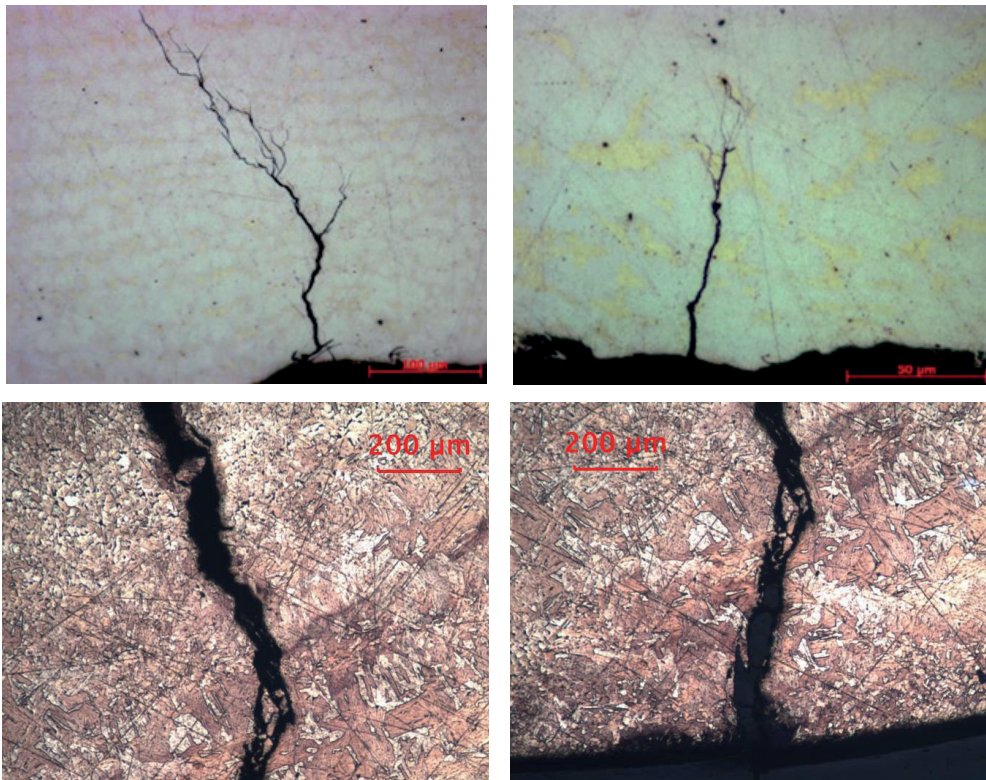


Specific conditions are required for this to occur.

1. A susceptible material, in this case brass / stainless steel.
2. A degree of internal stress in the material originating either from the manufacturing process or introduced during installation.
3. An environment that causes SCC for that material

(usually, ammonia or ammoniacal compounds for brasses and chlorine and chlorides for stainless steel. Other contaminants such as sulphur dioxide and some less frequently encountered substances, eg mercury, Silver Peroxide (compound of Silver Nitrate & Hydrogen Peroxide)

Material Microsection for 'typical' crack paths



Raw Material

The manufacturing processes will inevitably introduce a level of stress into the finished product, these low stress levels will not normally be a problem.

Products made by hot stamping processes or as castings are usually less susceptible to inherent harmful stresses by virtue of the high temperatures involved in manufacture, which result in naturally lower stress levels following forging.

Installation

Where failures occur as a result of SCC, the stresses involved will almost always have been introduced during installation as a result of the additional induced stresses applied during the movement of material (cold working) that occurs whilst making a joint.

In the case of compression fittings, tightening the nut will introduce a hoop stress, which, if of a sufficiently high magnitude, can trigger SCC. It is very important therefore that joints are assembled exactly in accordance with the published instructions and that over tightening is avoided. The use of correctly fitting spanners is vital. Loose fitting tools can cause nuts to be damaged and introduce a locally highly stressed region of the nut at which cracks can propagate.

With large size fittings, a drop or two of light oil on the threads can significantly reduce the effort required to assemble the joint and thereby reduce the overall stress level in the component.

Similarly the application of jointing compound to the threads of nuts should be avoided, as this



tends to pack in the gap and increase the stress levels in the nut.

Joints made between taper male and female threads will always result in a stressed region at the mouth of the female end of the adaptor. Avoid tightening to such an extent that the female end becomes permanently deformed and use sealing materials that do not over pack the threads. Preferred materials are PTFE thread tape or a suitable liquid/paste sealant. Do not use hemp. Even in the absence of a corrodent, severe over tightening can result in service failure and must be avoided at all times.

Contaminants

As indicated above, the usual corrodent involved in SCC is ammonia or ammoniacal compounds. These can be derived from a number of sources including:

1. Cleaning fluids
2. Refrigeration gases
3. Micro-biological growth within water systems
4. Sewage waste products, from human or animal sources
5. Building materials
6. Insulating materials especially foams
7. Flame and smoke retarding treatments.

Water Treatment

The use of chemicals for system dosing and the application methods employed must be determined by the user and their selected water treatment provider.

Consideration must be given to all aspects of the system variables (raw water, biocides, inhibitors etc) and any microbiological processes existing within the system as these may be the source of 'corrosive media' and can promote SCC within products.

The water treatment provider must be aware materials that form that system in order to accurately determine compatibility of the compounds / chemicals to be used.

Condensation

An essential ingredient in the SCC process is moisture. Without this, SCC is unlikely to occur. Moisture on the fitting or pipework allows the corrodent to collect and become more concentrated.

Particular problem areas are in chilled water installations. In these cases, the pipework is usually covered with insulating material, which allows the condensed moisture to be retained and kept in close contact with the fitting. The contaminants will collect in the condensation and promote SCC.

Some insulating materials are known to release ammoniacal or similar compounds and being in close proximity to the brass component can readily cause rapid failure in service.

Avoidance of SCC



1. Do not over tighten brass or stainless steel components during installation.
2. Installation joints must be made in accordance with our installation instructions. Correctly fitting tools such as flat faced spanners must be used so as not to cause any damage or localised stressing to the component. 'Stilson' type wrenches must not be used.
3. For brass products, install products manufactured in DZR (less susceptible) or Bronze (immune) material.
4. Where possible, the use of compression ended components is not recommended.
5. System water quality, raw water and the correct selection and handling of the introduction of chemicals into the system (and maintenance).
6. The wrapping of susceptible fittings in a suitable vapour barrier (Denso Wrap) or the application of impermeable paints can be helpful in preventing contact with the corrosive. (*BS 5970:2012 – Thermal Insulation of Pipework*).
7. Nickel plating of product does not provide protection against SCC.



About Albion Valves (UK) Ltd

Albion has been supplying valves and fittings to the building services and industrial markets for the past 40 years.

Albion was created with the sole purpose of providing quality products at an affordable price. With a growing reputation for quality and reliability, Albion is now an established brand providing the industry with a trusted alternative to premium-priced products.

Our commitment to setting the highest standards in all areas of our business means, if you're looking for quality, service, delivery and choice — you'll find it's all at Albion.

Quality

Whatever you need, you can rest assured that if it comes from Albion it has been designed and manufactured to deliver optimum performance and is accredited with the necessary approvals. Our in-house quality department are always on hand too!

Service

We pride ourselves on our customer service – we have even won awards for it! Our cradle to grave approach means you will never be on your own!

Delivery

We know that time is money, and when a priority project depends on a part you can trust Albion to deliver – next day for all orders placed before 4:00PM.

Choice

We may have started out with a single brass ball valve, but our range has grown substantially since and we now consider ourselves to be a 'One Stop Shop' with our comprehensive range. It is becoming more and more apparent to the industry, that it really is all at Albion.