



# Pegler Yorkshire

## Stress Corrosion Cracking

**Stress corrosion cracking (SCC) is a phenomenon that occurs occasionally with brass compression fittings. Specific conditions are required for this to occur.**

- 1.** A susceptible material, in this case brass.
- 2.** A degree of internal stress in the material originating either from the manufacturing process or introduced during installation.
- 3.** An environment containing, usually, ammonia or ammoniacal compounds. However, other contaminants such as sulphur dioxide can cause cracking.

Some less frequently encountered substances e.g. mercury from broken thermometers have been responsible for the cracking of stressed parts.

### Raw material

Brass compression fittings are manufactured from bar stock, from forged material or as castings. The manufacturing processes will inevitably introduce a level of stress into the finished product, but if the processes are carefully controlled, these low stress levels will not normally be a problem. All bar stock from reputable suppliers is tested for harmful stress levels after manufacture and where necessary suitable heat treatment is applied to the material after completion of the final drawing operation. Fittings made by hot stamping processes or as castings are usually free of any harmful stresses by virtue of the high temperatures involved in manufacture.

### Installation

Where failures occur as a result of SCC, the stresses involved will almost always have been introduced during installation. 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 our published instructions and that overtightening 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 corrodant, severe overtightening can result in service failure and must be avoided at all times.

### Contaminants

As indicated above, the usual corrodant 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.** Sewage waste products, from human or animal sources
- 4.** Building materials
- 5.** Insulating materials especially foams
- 6.** Flame and smoke retarding treatments.

### 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 corrodant 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 overtighten brass components during installation.
- 2.** Minimise the risk of contamination with a potential corrodant. Wrapping susceptible fittings in a vapour barrier or the application of impermeable paints can be helpful in preventing contact with the corrodant.
- 3.** Use parallel threaded adaptors to avoid stressing the female threaded ends.

For chilled water applications, Yorkshire Fittings Ltd does not recommend the use of brass components that are likely to be stressed during installation. For such applications use fittings made from SCC resistant or immune materials e.g. copper or gunmetal. Fittings from the XPress, Tectite, Yorkshire or Endex ranges are the preferred products for chilled water applications. If compression fittings are used then they should be assembled exactly in accordance with our published instructions and securely bound by a moisture barrier such as Densotape® or equivalent to prevent moisture build up on the fitting.

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