

Explosions Caused by Leaks in Flexible Gas Connectors

By

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When analyzing the cause of a fuel gas related fire or explosion, examination of flexible gas connections in the building is advisable. Leaks in the flexible gas connector can be caused by improper installation, excessive bending from movement of the appliance, defective design or manufacture and environmentally assisted cracking. Improper installation such as cross threading of connectors and insufficient torquing of the connection can cause leakage. Inexperienced installers are likely to be at the root of poor installations. Excessive bending of the gas line can occur by forcing the appliance against an immobile object, such as a wall, causing crimping of the tube. It does not take too many cycles of excessive bending to cause partial or total failure of the tube. Older homes and installations are candidates for this type of failure since remodeling and other rearrangements of appliances over the years have taken their toll.

A typical manufacturing or design defect is insufficient soldering of the tube assembly to the end ferrule. Explosions have occurred from leaks caused when the solder connection failed allowing a large crack near the end of the connector. Utility companies often compile lists of flexible connectors with poor performance histories.



Figure 1

Environmentally assisted cracking (stress corrosion cracking) occurs in certain types of brass used in flexible connectors. Figure 1 is a view of a typical flexible gas connector. Figure 2 is a view of a crack in a flexible



Figure 2

connector caused by environmentally assisted cracking. The crack is in a stressed section of the tube. Chemical analysis of the brass showed it to be Cartridge Brass (nominally 70% copper and 30% zinc). Brasses containing more than 20% zinc are highly susceptible to stress corrosion cracking. Figure 3 is a photomicrograph of a cross-section of the tube showing the grain structure of the brass and severe intergranular corrosion in the tube, characteristic of stress corrosion cracking. The corrosion is aggravated by household cleaning chemicals such as ammonia. The cracking can occur with very little movement of the tube and is often a subtle failure.

These are a few examples of deficiencies that can occur in flexible brass connector installations which can result in substantial

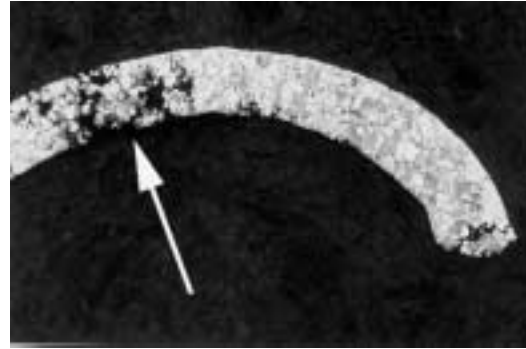


Figure 3

property or casualty loss. Clues to causation of the loss may lie in the detailed examination of flexible brass connectors attached to gas appliances.

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