



Technology Committee Bulletin

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Multiple Failures of High-Pressure CNG Hoses with Stainless Steel Wire Braid and Teflon Linings

This bulletin provides information about at least seven failures of hoses on light duty CNG vans and pickups. All failures occurred in hoses located under the vehicle and in operating locales with severe exposure to deicing salts. The probable cause of the wire failures is chloride stress corrosion cracking, a well-documented failure mode for austenitic stainless steels.

Failures: All of the failures of this type to date have resulted in a loud report and leakage of CNG but no injury or property damage has been reported. All but one of the failures has been in the line from the fill receptacle to the CNG containers and this line experiences the greatest range of both temperature and pressure. The failures were in the main body of the hose and not near an end so the crimp and end fittings apparently do not contribute. The time in salt exposure service has varied from about three years to more than ten before failure.

Detection: At this time we do not have a means to detect accumulating damage before failure occurs. All of the reported failures involved hoses with rubber covers over the braid and in-service inspection does not seem feasible. Some wire braid hoses are installed without rubber covers and it might be possible to detect damage by visual inspection. Stress corrosion cracking is a failure mode that can progress rapidly from a detectable stage to ultimate failure and inspection will be of limited value.

Prevention: The CVEF Technical Report, *Factors Aggravating Chloride Stress Corrosion Cracking of Austenitic Stainless Steels*, identifies many unfavorable conditions that exist on CNG vehicles but some preventive measures are:

Minimize the use of hose by substituting rigid tubing wherever feasible.

Eliminate the use of a rubber cover that can collect and maintain a continuous wet saline solution in contact with the braid.

Specify a wire braid made from 316 stainless steel rather than 304. The increased chromium content of 316 imparts improved resistance to SCC.

Locate the hose where it will not be exposed to a severe road salt environment under the vehicle.

Locate the hose where it will not be exposed to high temperatures of 140F or greater since high temperature increases the potential for SCC.

Locate the hose where it will not be exposed to rust residue from other parts of the vehicle.

Vehicle Location:

At this time it appears that all failures have occurred in locales with high usage of deicing salts. Vehicles operating in warmer and drier areas away from the coast may not experience failures.

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