

TECH TIP # 46



One of a series of dealer contractor technical advisories prepared by HARDI wholesalers as a customer service.

TESTING FOR UNSAFE FURNACE HEAT EXCHANGERS

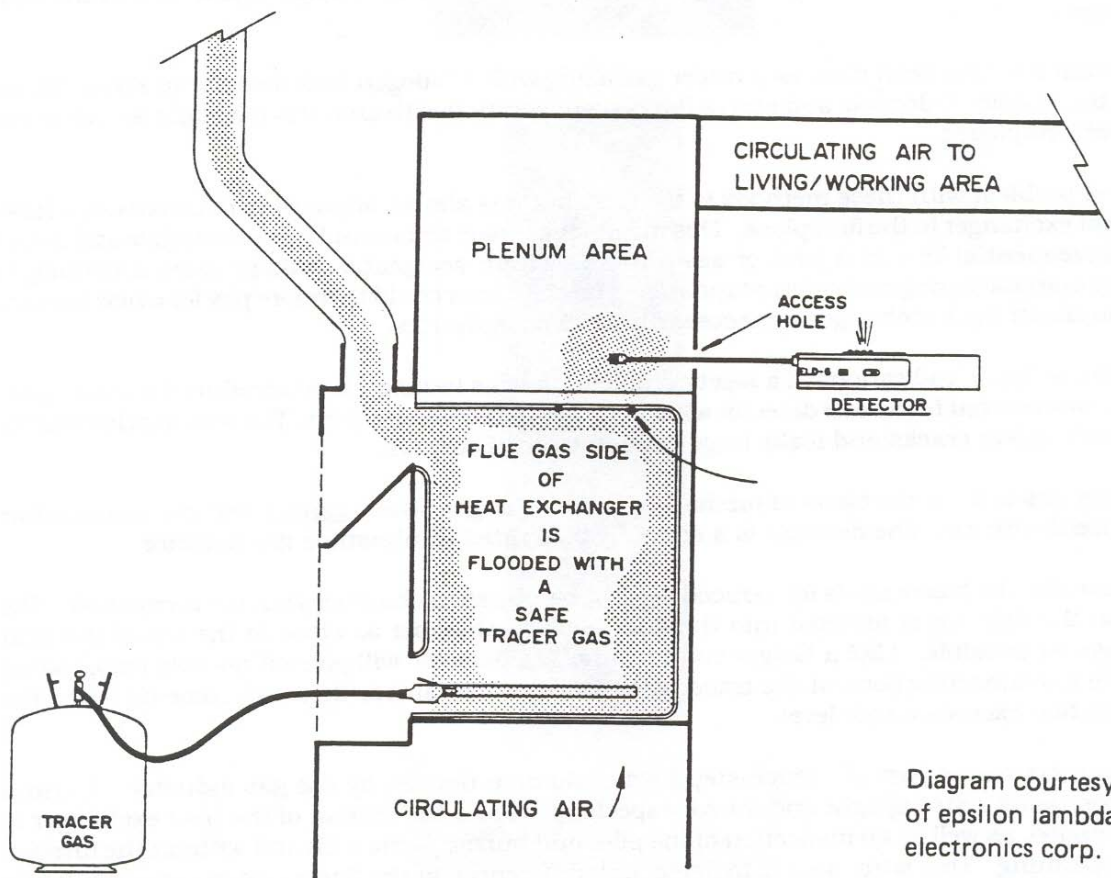


Diagram courtesy of epsilon lambda electronics corp.

Conventional furnace heat exchangers that leak excessive amounts of flue gases into the circulating air stream can pose a safety problem when coupled, in turn, with poor burner operation that results in a high concentration of deadly carbon monoxide in the flue gases.

Various methods are used in the field to detect cracked heat exchangers without resorting to a total furnace tear down. Two of the most popular methods are using smoke “bombs” and a salt spray.

Published by the Independent Study Institute, a division of the Heating, Airconditioning & Refrigeration Distributors International. The Institute offers accredited, industry training courses in HVAC/R technology. Direct inquiries to HARDI 3455 Mill Run Drive, Ste. 820, Columbus, OH 43026. Phone 888/253-2128 (toll free) · 614/345-4328 · Fax 614/345-9161

www.hardinet.org

Smoke --- With the flue outlet and burner access opening blocked, a smoke candle is ignited in the heat exchanger. A large quantity of dense smoke is produced and the air side of the furnace is visually checked for signs of smoke which would indicate a leaky heat exchanger.

Salt Spray --- The second method employs a sodium salt/water solution which is sprayed into the combustion heat exchanger and a propane torch is used as a detector on the air side. If the blue flame of the propane torch turns yellow, this would indicate the presence of sodium ions in the air stream and a leak in the heat exchanger.

Refrigerant has also been used as a tracer gas along with a halogen leak detector to sense the air side of the system. Odorants and even a fluorescent solution with an ultraviolet light as a detector have been employed.

A critical problem with these methods is the fact that it is almost impossible to construct a leak tight heat exchanger in the first place. This means that some tests could be too sensitive and detect an inconsequential leak in a joint or seam that is within acceptable leakage rates according to industry manufacturing and safety standards. The consumer could therefore pay for a new furnace or replacement heat exchanger unnecessarily in some instances.

To eliminate “false” indications of a safety problem, the gas industry has introduced a tracer gas/detector system that features a detector with a minimum threshold alarm. The test, in other words, would only detect cracks and leaks large enough to be of concern.

The tracer gas is a special blend of methane gas and nitrogen which cannot become combustible when mixed with air. The detector is a specially calibrated combustible gas detector.

Very basically, the tracer gas is introduced into the combustion chamber with the furnace off. The probe on the detector is inserted into the duct plenum chamber as close to the top of the heat exchanger as possible. Like a Geiger counter, the gas detector will give off audible clicks when detecting low concentrations of the tracer gas. However, an amber light will come on when the concentration exceeds a safe level.

The tracer gas test is part of a three-step field evaluation devised by the gas industry. A visual inspection using a strong light and mirror especially around the bottom of the heat exchanger is recommended, as well as an inspection of the pilot and burner flame with and without the furnace blower operating. This latter step is to detect any differences in the flame pattern as a result of a split seam, open crack or other separation that would allow circulating air into the combustion chamber.

The detector can of course be affected by the presence of natural gas, refrigerant and other open chemical containers in the building --- paints, thinners, solvents, etc. --- so there are a number of preparatory steps that must be followed to assure an accurate and trouble free test.

Equipment that meets the requirements of the gas industry to perform this test is available from several commercial sources. Contact: AGA Laboratories, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131

This recommended test also avoids some of the side effects of other methods --- soot and smoke damage to furnishings when using a smoke candle, corrosion from sodium, etc.