Testing for Carbon Monoxide

There are many reasons for a technician to conduct carbon monoxide (CO) tests. Sometimes an offhand comment by a customer will lead cause for the technician to suspect a problem. Occasionally the customer is referred to a heating contractor by a doctor. Generally the customer is reacting to something in their environment; the carbon monoxide test is being done to rule out CO as the cause. Sometimes the media, either on radio or television have alerted people to the potential for a gas fired appliance to create a health hazard. Whatever the reason, after deciding to conduct a test for CO, the steps are the same.

There are two things that need to be determined when testing for CO. First, is there CO in the building? Secondly what is the source? If CO is detected, and the source is a gas fired appliance, the technician is required to make the necessary repairs or place the appliance out of service. If it is determined the source is not a gas appliance, the technician still has a responsibility to attempt to locate and eliminate the CO. In all cases the technician is required to inform the customer of the findings and possible consequences.

There is a variety of test equipment on the market to test for CO. The choice is primarily one of how many substances need to be tested for and the amount of money available for the equipment. Whatever equipment is used, it must be able to discriminate against other gases. Carbon Monoxide is odourless; your nose will not tell you if it is present. Many of the multi-gas detectors available today will indicate the presence of a combustible gas (CO is combustible), but are not capable of determining what the gas is. The detector must be able to quantify the concentration. A series of lights is not sufficient, what is required is a parts per million (ppm) scale. Whatever you choose, learn the equipment, the accuracy, and limitations.

All tests should be conducted with the appliances operating in normal conditions. In other words close any doors that would normally be closed and open any that would normally be open. One of the most common errors is to leave the door to the furnace room open while testing. It may be that the door being closed is what is causing a gas appliance to produce CO or not to vent properly. Do not make any adjustments to the equipment until all tests are complete. Any changes or adjustments, before or during the tests, may lead to inaccurate conclusions.

1. The first test is to take a background reading. How much monoxide is there in the building to begin with? If this step is omitted, further testing may lead to false assumptions. Without knowing the amount of CO present in the air at the time of testing it is impossible to determine whether an appliance is creating CO or the readings taken are an indication of background levels. The test should be done in the ambient air, usually the living room or family room, with all the appliances off.

2. At this time fire the gas appliances, usually a furnace and water heater. After a couple of minutes, take samples near the appliances, in front of the combustion chamber and around the draft hood. This test is to determine if improper venting is the source of CO.

3. Next, allow the appliances to run for ten minutes to make sure the appliances are fully warmed up. All the metal should be as hot as it's going to get. As the metal is heated it will expand, the expansion should cause any cracks in the heat exchanger to enlarge. The sample is taken to find out if any CO is being introduced to the building by the furnace. Take the sample from a heat register or the warm air plenum.

4. Finally, take a sample of the flue gases. To take this sample the gases will have to be cooled using a heat sink. Most manufacturers can supply cooling tubes for their equipment. Take a sample in each flue passage of the appliance, before the draft hood. This will determine if the appliance is creating CO.

Once these tests are complete it is possible to draw some conclusions and make adjustments.

The first test sets the baseline. Any increase in CO found by the tests near the appliances indicates a venting problem. Any problem with the venting system must be repaired even If there is no CO being produced. If there is a venting problem with a natural draft appliance, correcting the venting problem will not correct the CO, other measures will be required. If there is an increase in CO when testing the discharge air of the furnace, the furnace is putting CO into the building; the heat exchanger is probably cracked.

The final tests will tell if the furnace is creating any monoxide in the first place – this test is the most difficult to interpret. There is an allowable amount of monoxide that can be produced by a gas fired appliance. So a positive reading does not necessarily indicate a problem. What should be done is, reduce the CO to a minimum and make sure any CO produced does not enter the building.

The factors to determine are: is there CO present, and what is the source? If it comes from a gas appliance, repair or place the appliance out of service. If the CO is from another source try to locate and eliminate it. If the source cannot be found advise the customer of the possible health hazards of CO and suggest further testing by an Indoor Air Quality (IAQ) consultant. Generally, if the customer is complaining of any symptoms that may be related to Carbon Monoxide poisoning and levels of CO greater than 10 ppm are found within the building, suggest the customer may have their doctor test for CO in the blood.

If no CO is located within the building and the customer is complaining of ongoing symptoms, further testing can be carried out by an IAQ consultant. It is possible the occupants of the building are reacting to something else in the environment. IAQ consultants have the necessary equipment to test for and monitor levels of many known allergens and contaminants that people have shown sensitivity to in the past. This testing is expensive, but what is the value of health?