



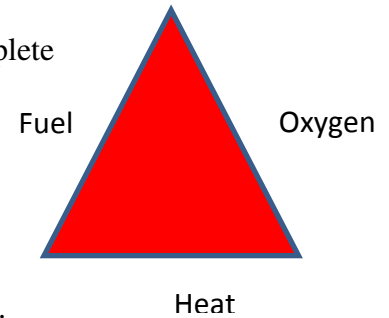
Tech Tip Carbon Monoxide Part 1

Carbon Monoxide is a byproduct of incomplete combustion.

Forced air furnaces in use today typically develop a small amount of CO. This is then vented up the flue and out of the residence.

For complete combustion, exact amounts of Fuel (Natural gas), Oxygen (combustion air), and Heat (ignition source, flame temperature) are needed.

Altering these by adding more or providing less will generate incomplete combustion. This incomplete combustion produces CO.



Causes of incomplete combustion

- Dirty burners
- Insufficient air or Excess fuel
- Poor mix of fuel and air - if oxygen does not come into contact with all of the fuel, some of the fuel will be unburned.
- Insufficient temperature - a flame touching a cooler surface.
- Poor venting - products of combustion cannot get away from the combustion process and are re-circulated back with combustion air.

Physical Properties of Carbon Monoxide

- Carbon monoxide is a highly toxic (poisonous) gas
- It is colorless, odorless, and tasteless
- Specific gravity is 0.980 – (slightly lighter than air)
- Disperses rapidly and evenly into the air in a house
- It is carried readily with convection air currents within the home

CO and the Human Body

- CO can kill humans and animals.
- Absorbed by the body through the lungs directly to the blood
- Binds with blood hemoglobin
- Displaces oxygen
- 242 times more attracted to blood cells than oxygen
- Restricts oxygen flow to the body's vital organs

CO levels in the building

- OSHA maximum 50 ppm over 8 hours
- EPA maximum of 9 ppm over 24 hours
- Any reading of 5 ppm or greater should be an area of concern

CO levels in the flue pipe

- Consumer Product Safety Commission 400 ppm
- Typical maximum on start up 100 ppm
- Typical when running at steady state 20-50 ppm



Tech Tip Carbon Monoxide Part 2

Checking CO in the Flue

To check CO in the flue, drill a hole in the flue pipe approx 1 foot beyond the furnace outlet.

Turn on the furnace and allow 5 minutes for the unit to reach a "steady state" condition. "Steady state" means the unit has warmed up and the readings should become steady at this point

Now that the furnace is warm, cycle the unit off and then start the test.

- Follow manufacturer's instructions for zeroing the meter outdoors.
- Insert the aspirator tube into the vent pipe
- Cycle the furnace on
- After the burners ignite, and before the blower comes on start pumping the aspirator.
- Note the readings while pumping approx 1 pump per second.
- The readings should fall steadily down to the 20-50 ppm range
- If the readings do not drop below 50 there is typically a problem with the combustion process, i.e. too much or too little fuel, air, dirty burners, or venting issues.
- Continue to pump after the blower comes on
- If the CO levels increase after the blower starts it is quite possible that air is entering the chamber through a breach or a crack. Further inspection of the chamber is required



The Carbon Monoxide limits in the vent pipe are 400 parts per million air-free.

This is a standard number, but in reality the modern systems rarely exceed 100 ppm.

Typically the readings in the flue pipe one foot or so from the flue outlet of the furnace are in the 30-50 ppm range.

In the event that a systems readings fall outside of these parameters, the three basics of combustion must be looked at again;

Fuel, Oxygen, and Heat.

Checking CO in the home



After zeroing the meter outdoors, remove the CO 205 aspirator from the CO 220 detector. Walk through the home taking readings on various levels. A home with smokers in it or a customer that burns candles may have readings of 1-3ppm in the home.

While EPA sets the maximum of 9ppm over 24 hours, testing has shown that levels of 5 ppm or greater should be investigated.

Fluke CO-220 Coburn's # FL664711