SENSOR MOUNTING HEIGHTS

A gas detector can only be effective if the sensor is in close proximity to where the leaking gas will accumulate. The height at which you mount the sensor depends on the density of the gas you are monitoring relative to air. As a general rule, heavier than air gases sensors should be placed 6 inches from the floor, lighter than air gas sensors should be placed on or near the ceiling, and gases which have a density close to that of air should have sensors installed in the "breathing zone". The breathing zone refers to the area 1.2 to 1.8 m (4 - 6 ft) from the floor, where most human breathing takes place. This is a good default location for sensors, as many gases are often well dispersed in air.

Consideration should be given to the accessibility for calibration and maintenance when locating sensors. For example, a sensor mounted 9 m (30 feet) off the floor will be difficult or even hazardous to service.

Sensor should not be placed near ventilation fans, openings to outside or in the path of rapidly moving air. They should be placed in areas where there is good air circulation and particular attention should be paid to "dead air spots" where there is little or no air movement. Sensors should be placed near the source of the gas if possible. For example, near the compressor or piping.

On or Near the Ceiling:

- Ammonia (NH_3)
- Hydrogen (H_2)
- Methane (CH_4)
- Methanol (CH_4O)
- Silane (SiH_4)

Breathing Zone (1.2 - 1.8 m / 4 - 6 ft above floor):

- Acetylene (C_2H_2)
- Carbon Dioxide (CO_2)
- Carbon Monoxide (CO)
- Ethylene (C_2H_4)
- Formaldehyde (CH_2O)
- TVOC (target gas dependent)
- Hydrogen Sulphide (H_2S)
- Oxygen (O_2)
- Nitric Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Phosphine (PH_3)

Near the Floor (15 cm / 6 inches above floor):

- Alcohol
- Benzene (C_6H_6)
- Chlorine (Cl_2)
- Diesel Fuel
- Ethanol (C_2H_6O)
- Fluorine (F_2)
- Gasoline
- Hydrogen Chloride (HCl)
- Hydrogen Cyanide (HCN)
- Hydrogen Fluoride (HF)
- Hexane (C_6H_{14})
- Isobutane (C_4H_{10})
- Isobutylene (C_4H_8)
- Jet Fuel
- Ozone (O_3)
- TVOC (target gas dependent)
- Pentane (C_5H_{12})
- Propylene / Propene (C_3H_6)
- Refrigerants
- Sulphur Dioxide (SO_2)
- Toluene (C_7H_8)
- Propane (C_3H_8)
- Xylene (C_8H_{10})

WHAT IS THE PROPER HEIGHT AT WHICH TO MOUNT NO_2 SENSORS?

CETCI recommends that Nitrogen Dioxide (NO_2) sensors should be mounted in the breathing zone, 1.2 to 1.8 m (4 to 6 ft) from the floor. This is primarily because NO_2 is a poisonous gas which should be detected in the area where people would be exposed to it, but also because 1.2 to 1.8 m (4 to 6 ft) from the floor is an appropriate elevation to detect NO_2.

Some specs have been written though, with NO_2 sensors mounted near the ceiling. So, which height is correct?

Let's consider the evidence:

- Nitrogen Dioxide is heavier than air. NO_2 has a molecular weight of 46, compared to air which has a molecular weight of 29.
- Graham's Law describes how gases diffuse and the rate of diffusion. Under normal conditions, gases diffuse rapidly in air. An excellent way to illustrate this is to observe the exhaust from a car starting up on a cold morning. It can be easily seen that the exhaust gases expand upon leaving the tailpipe and rapidly diffuse into the air. In a steady state, a gas will diffuse throughout a space until it reaches equilibrium.
- Hot exhaust gas will tend to rise initially because of its lower density, but the kinetic energy of the exhaust gas molecules, combined with any air movement in the space will cause the gases to disperse throughout the space.
- It is true that the diesel exhaust from truck exhaust stacks is relatively high off the ground. However, many vehicles with diesel engines have their exhaust pipes near the ground, including most fire trucks.
- All internal combustion engines produce Oxides of Nitrogen, including NO_2, as a component of vehicle exhaust. So exhaust from cars and light trucks must be taken into account when monitoring for the presence of NO_2. These vehicles, of course, have their exhaust pipes near to the ground.
- Nitrogen Dioxide is a very toxic substance and can cause health problems at very low concentrations. Worksafe BC, the British Columbia workplace health and safety authority, has set a 1 ppm ceiling for NO_2 exposure. NIOSH has set the NO_2 short term exposure limit at 1ppm. So worker safety is vitally important reason to monitor for the presence of NO_2 in the ware where workers are most likely to be exposed to it.

Considering all the evidence, mounting NO_2 sensors 1.2 to 1.8 m (4 to 6 ft) from the floor, in the "breathing zone", is appropriate and backed by the facts.