

TECHNICAL NOTE

E3Point

NO₂ Sensor Positioning for Diesel Exhaust

Regions affected: Americas

There are many viewpoints in regards to placement of NO₂ sensors in parking structures, loading docks, and indoor vehicle facilities; while no national codes are currently in place, final placements of the NO₂ is up to the individual's discretion, knowing the facts will help you make a sound and safe decision!

FACT - Diesel exhaust vapors are known to contain carcinogens

FACT - NO₂ is a by-product of Diesel exhaust vapors

FACT - Exhaust gas temperature can be as high as 695 °F

FACT – Hot air rises

FACT – NO₂ at normal temperature the density is 2.83 in relation to air (1.00)

Why should you place NO₂ sensors at the ceiling?

Diesel exhaust (and fuels) contain carcinogens (refer to the MSDS for No. 2 Diesel Fuel for further details). Therefore, proper placement of gas detectors are critical to reduce any unnecessary exposures. With the typical exhaust temperatures ranging from 396 °F to 695 °F¹ and known fact that hot air will rise (refer to Table 1²), placement of the NO₂ detectors near the roof line this will achieve early activation of the ventilation thus reducing the exposure to the exhaust vapors.

Should the sensors be placed at eye level?

Placing the sensors at eye level increases the individual exposure to the exhaust vapors and their associated carcinogens. As the vapors exits the exhaust, due to the heat factors, the sensor will struggle to accurately measure the vapors due to speed in which the vapors will pass the sensing elements. Thus, an individual's exposure increases as hot diesel exhaust vapors cool and transition from the roof line into the breathing zone.

Table #1

Temperature in relation to air density

Physical Properties of Air (p = 101.13 kPa)

F temperature (Fahrenheit); T temperature (Kelvin); ρ density

F = Temp (F)	T = Temp (K)	ρ = density	Notes
80	300	1.161	Normal condition
170	350	0.995	Normal condition
260	400	0.871	
350	450	0.774	Diesel Exhaust
440	500	0.696	Diesel Exhaust
620	600	0.580	Diesel Exhaust
980	800	0.435	

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Best Practice Sensor Placement

E3Point®
NO₂ Remote Sensor

E3Point®
CO Sensor



References

¹ <http://www.fs.fed.us/eng/pubs/pdf/08511816.pdf>, Table 1 – Average maximum temperatures along the exhaust system.

² <https://www.dieselnet.com>, Table 1 – Physical Properties of Air (p = 101.13 kPa)

Excerpt from Citgo MSDS – “No. 2 Diesel Fuel, Low Sulfur, All Grades”:

Diesel exhaust particulate: Lung tumor and lymphomas were identified in rats and mice exposed to unfiltered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.