

explosion perspective, a serious health hazard would still exist.⁸

Toxic atmospheres—OSHA identifies "toxic atmospheres" as those that contain gases, vapors, fumes or finely divided airborne dust known to have a poisonous physiological effect on the human body. Toxic atmospheres may be caused by a manufacturing process, by a stored product or by an operation performed in a confined space. This toxic effect is independent of the oxygen concentration, which may in fact be greater than 20 percent.⁵

Toxic atmospheres are measured in PPM or approximate milligrams of substance per cubic meter of air (mg/m³). According to OSHA, any atmosphere that exceeds or could reasonably exceed the permissible exposure limit (PEL) for any substance specified in subpart Z of 29 CFR part 1910 is considered toxic. When no PEL exists, exposure limits in *NIOSH Recom-*

TABLE 3

POTENTIAL EFFECTS OF OXYGEN-DEFICIENT ATMOSPHERES

Oxygen Content (Percent by Volume)	Effects and Symptoms (At Atmospheric Pressure)
19.5	(Minimum OSHA permissible oxygen level)
15 to 19	Decreased ability to work strenuously; may impair coordination and may induce early symptoms in people with coronary, pulmonary or circulatory problems
12 to 14	Respiration increases with exertion; increased pulse rate; impaired coordination, perception and judgment
10 to 12	Respiration further increases in rate and depth; poor judgment; blue lips
8 to 10	Mental failure; fainting; unconsciousness; ashen face, blue lips, nausea and vomiting
6 to 8	Eight minutes—100-percent fatal; six minutes—50-percent fatal; four to five minutes—recovery with treatment
4 to 6	Coma in 40 seconds; convulsions; cessation of respiration; death

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TABLE 4

POTENTIAL EFFECTS OF CARBON MONOXIDE EXPOSURE

Parts per Million	Effects and Symptoms	Time
50	(Permissible exposure level)	8 hours
200	Slight headache, discomfort	3 hours
400	Headache, discomfort	2 hours
600	Headache, discomfort	1 hour
1,000 to 2,000	Confusion, headache, nausea	2 hours
1,000 to 2,000	Tendency to stagger	1½ hours
1,000 to 2,000	Slight palpitation of the heart	30 minutes
2,000 to 2,500	Unconsciousness	30 minutes
4,000	Fatal	Less than 1 hour

mendations for Occupational Health Standards (1986), the current American Council of Government Industrial Hygienists (ACGIH) *Threshold Limit Values and Biological Exposure Indices*

or other references, such as Material Safety Data Sheets (MSDS) should be followed.¹⁰

While some toxic atmospheres kill quickly, others may have severe harm-

ful effects that may not manifest themselves until years after exposure. For example, although carbon disulfide at low concentrations may cause no immediate sign of exposure, repeated "harmless" exposures can cause cumulative, permanent brain damage. At higher concentrations, the substance can kill quickly.⁵

Finally, the fact that a confined space has been cleaned, emptied or purged does not necessarily mean that the atmosphere within the confined space is safe for entry.

Toxic Substances

Although there are many different types of gases that can be found in confined spaces, the two most common toxic substances are carbon monoxide and hydrogen sulfide.⁵

Carbon monoxide—Carbon monoxide (CO) is the leading cause of poison-

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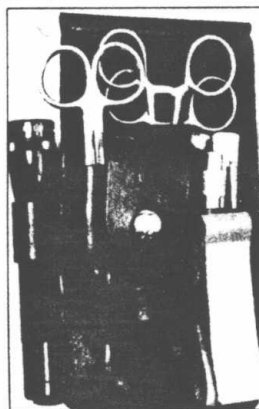


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