

Date	August 27, 2001
N ^o	AN20010827
By	Lars Boettern

Preface

Many toxic substances are commonly encountered in industry. The presence of toxic substances may be due to materials being stored or used, the work being performed, or may be generated by natural processes. Exposure to toxic substances can produce disease, bodily injury, or death in unprotected workers.

It is important to determine the amounts of any toxic materials potentially present in the workplace. The amounts of toxic materials potentially present will determine the procedures and personal protective equipment, which must be used. The safest course of action is to eliminate or permanently control hazards through engineering, workplace controls, ventilation, or other safety procedures. Unprotected workers may not be exposed to levels of toxic contaminants, which exceed Permissible Exposure Limit (PEL) concentrations. Ongoing monitoring is necessary to insure that exposure levels have not changed in a way that requires the use of different or more rigorous procedures or equipment.

Airborne toxic substances are typically classified on the basis of their ability to produce physiological effects on exposed workers. Toxic substances tend to produce symptoms in two time frames.

Higher levels of exposure tend to produce immediate and acute physiological responses, while lower levels of exposure over long periods of time may not produce physical symptoms for years.

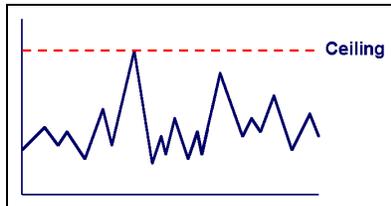
Hydrogen sulfide (H₂S) is a good example of an acutely toxic substance, which is immediately lethal at relatively low concentrations. Exposure to a 1,000 PPM (parts per million) concentration of H₂S in air produces rapid paralysis of the respiratory system, cardiac arrest, and death within minutes.

Carbon monoxide (CO) is a good example of a chronically toxic gas. Carbon monoxide bonds to the hemoglobin molecules in red blood cells. Red blood cells contaminated with CO are unable to transport Oxygen. Although very high concentrations of carbon monoxide may be acutely toxic, and lead to immediate respiratory arrest or death, it is the long term physiological effects due to chronic exposure at lower levels that take the greatest toll on affected workers. This is the situation with regards to smokers, parking garage attendants, or others chronically exposed to carbon monoxide in the workplace. Exposure levels are frequently too low to produce immediate symptoms, but small repeated exposures systematically reduce the blood's capacity to carry oxygen. This partial impairment of the blood supply may lead over time to serious physiological consequences.

Prudent monitoring programs must take both short and long-term exposures risks into account, so there are three independent exposure measurements and alarm types built into the design of all Biosystems toxic gas detectors.

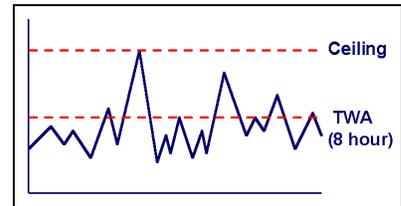
Ceiling level

OSHA has assigned some, but not all, toxic substances with a ceiling level. This is the highest concentration of a toxic substance to which an unprotected worker should ever be exposed, even for a very short time. Never enter an environment even momentarily when concentrations of toxic substances exceed the ceiling level.



Time Weighted Average (TWA):

TWA values are calculated by taking the sum of exposure during a workday to a particular toxic contaminant in terms of parts-per-million-hours and dividing by an eight-hour period.

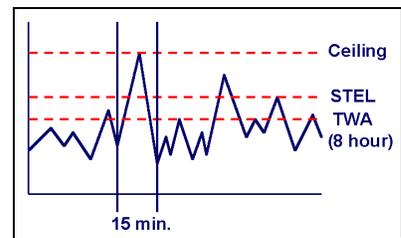


Due to the fact that the TWA calculation involves the division of the sum of exposure by 8 hours, the TWA value varies with the length of the exposure as shown in the chart below.

Exposure Time	Avg. Concentration	TWA
4 Hours	100 PPM	50 PPM
8 Hours	100 PPM	100 PPM
12 Hours	100 PPM	150 PPM

Short Term Exposure Limits (STEL)

Toxic substances may have short-term exposure limits, which are higher than the eight hour TWA. The STEL is the maximum average concentration to which an unprotected worker may be exposed in any fifteen-minute interval during the day.



Any fifteen-minute periods in which the average STEL concentration exceeds the permissible level must be separated from each other by at least one hour. A maximum of four of these periods is allowed per eight-hour shift.