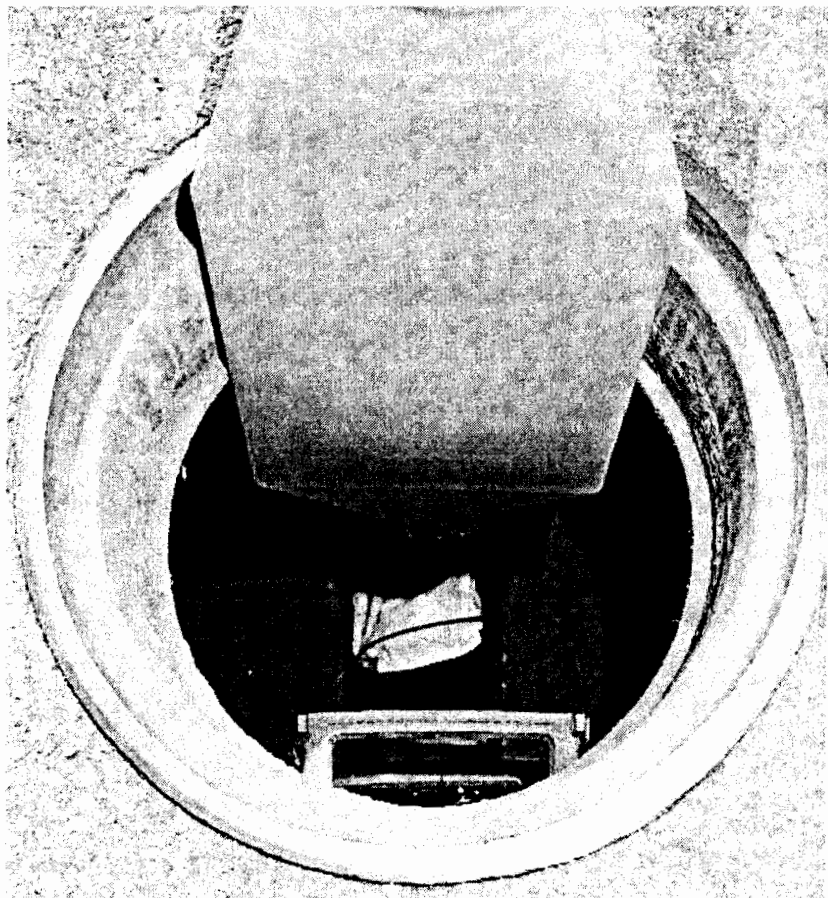


Confined Spaces: Does Ventilation Control or Eliminate Atmospheric Hazards?



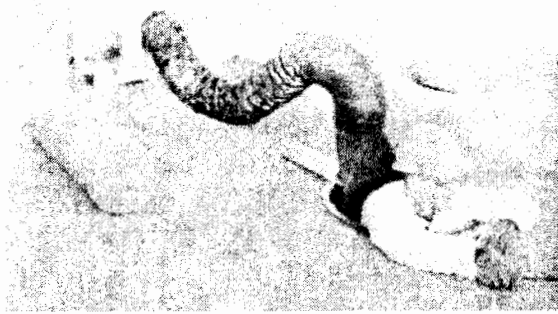
Two scenarios help answer this apparent conundrum.

by John F. Rekus PE, CIH, CSP

When I first read the preamble to the then new OSHA confined space standard, I was struck by an interesting paradox that appeared on page 4,487 of the Jan. 14, 1993, *Federal Register*. In one breath, OSHA said that continuous ventilation eliminated atmospheric hazards in confined spaces, but in the next breath, it said that it should be noted that continuous forced ventilation controls atmospheric hazards but does not eliminate them.

Specifically, about midway down the first column of the page, the preamble reads "Testing the atmosphere within the space and providing adequate continuous ventilation **can normally eliminate the hazardous atmosphere producing the equivalent of a non-permit confined space.**" [emphasis added] But

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Continuous forced ventilation controls atmospheric hazards, but it does not eliminate them.

Prudent practice is to ventilate continuously and test the atmosphere

Considering that the vast majority of confined space fatalities can be attributed to atmospheric hazards, it is prudent practice to provide continuous forced ventilation whenever employees are working in a confined space. It is also prudent to provide continuous atmospheric monitoring of the confined space atmosphere. The monitor also should be equipped with an audible alarm that will sound if atmospheric conditions begin to deteriorate. Prompt notification of changing atmospheric conditions can signal entrants to exit the space before conditions become life-threatening.

when you read the top of the third column of the page, you learn that "OSHA has determined that spaces that have all hazards eliminated can be reclassified as non-permit spaces for as long as the hazards remain eliminated. **(It should be noted that continuous forced ventilation controls atmospheric hazards, it does not eliminate them.)**" [emphasis added]

So which is it – does ventilation eliminate atmospheric hazards or merely control them? After pondering this question for some time, I deduced that the answer depends on the nature of the atmospheric hazard.

The following two scenarios illustrate the difference. First, consider a stainless steel holding tank at a distillery that is used to store whiskey (ethyl alcohol) for a bottling line. Once the tank is drained, any surface residue will be evaporated by the forced ventilation. After these vapors are forced out of the space and thoroughly mix with ambient air, they are not going to defy the laws of chemistry and physics and mysteriously coagulate and flow back into the space. Since both the vapors and the source of the vapors has been eliminated, the atmospheric hazard has also been eliminated. Of course, this presumes that there is no other source of contamination other than the residual whiskey in the bottom of the tank. If there are any attached lines or pipes, they must be isolated or disconnected to ensure that they do not introduce contaminants into the space.

Next, consider an above-ground drinking water storage tank, the interior of which is being sprayed with a flammable, solvent-based protective

coating. Continuous ventilation may be effective in maintaining the levels of flammable vapors at less than the lower explosive level or even below an established occupational exposure level, but the source of the vapors – the spraying – is still present. Note that in this case, the ventilation is being used to dilute the contaminant concentration to an acceptable level. Yet the source of the contamination, the spraying, remains. Consequently, although the hazard may be controlled to an acceptable level, it has not been eliminated.

Nitrogen gas is frequently used intentionally to displace atmospheric air in confined spaces to reduce fire hazards or prevent oxidation of a product by air in the space. For example, the head space of a tank truck of cooking oil may be blanketed with nitrogen to prevent degradation from oxidation during transport. If the truck is emptied and forced ventilation is provided to restore a breathable atmosphere, the oxygen-deficient atmosphere has been eliminated, provided that there is no other way by which the space may become oxygen deficient. For example, some sugar-containing products such as molasses may ferment, producing carbon dioxide as a by-product. If the space is entered to remove residue, continuous forced ventilation might control the hazard of carbon dioxide displacing air, but it would not eliminate it. Similarly, some welding operations use argon as an inert shielding gas. Ventilation used to maintain an acceptable level of oxygen displaced by the argon would be considered control rather than elimination.

After ventilating a below-ground utility manhole, atmospheric testing may indi-

cate adequate oxygen and acceptable levels of toxic or flammable gasses, even though the test results may suggest that atmospheric hazards have been eliminated. This conclusion may be doubtful since toxic, flammable or oxygen-displacing gasses can enter the space through the soil or through conduits, pipes or other appurtenances attached to, or passing through, the space. Forced ventilation would result in controlling the hazard, but not eliminating it.

The hazard posed by contaminants migrating through the soil is not theoretical. In one case, workers who were building a new storm water drainage system were overcome by carbon monoxide that migrated from a nearby blasting operation where explosives were used to break up a strata of buried rock. In another case, workers in communications and signal manhole in a railroad yard were burned when propane leaking from a buried line seeped through the ground into the manhole and was ignited.

In these and similar situations involving entry into below-ground vaults or manholes, forced ventilation may control the hazard but not necessarily eliminate it.

Summary

Whether atmospheric hazards in a confined space are eliminated or controlled depends on if the ventilation is able to remove the hazard. If the hazard is entirely removed by ventilation, it is eliminated. If, on the other hand, the ventilation is used to ensure that an atmospheric hazard is maintained at an acceptable level, the hazard is controlled but not eliminated. **OH**