

VENTILATION IN CONFINED SPACES

When a confined space is known to contain hazardous gases or vapours, it is necessary to purge the space completely before any entry. Due to the characteristics of confined spaces, natural ventilation is usually not adequate and some kind of mechanical ventilation is required. Purging of the atmosphere is generally done with a portable ventilation blower, of the type most of us have seen, with an electric blower attached to a long flexible duct. Even after purging it may be necessary to provide continuous ventilation in order to maintain a safe work environment within the confined space. Note that purging and ventilation do not exclude the need for gas testing!

Purging

Purging of a confined space is necessary before any entry in order to remove any dangerous gases, vapours or liquids and to replace these with breathable, uncontaminated air.

The amount of time that is required to purge or replace the air containing the contaminants depends on the capacity of the ventilation device to move air. In a brewery or distillery environment, if no continuing contaminant release within the confined space is expected, it is relatively easy to calculate the amount of time needed to purge.

Supposing we have a volume of 5,000 Litres; if a ventilation device, or blower, can move 1,000 litres per minute of air, then it will take a minimum of 5 minutes to purge the confined space. However, in reality it will take longer because the shape of the confined space and the positioning of the outflows will affect how quickly and how completely the atmosphere is purged. There are also some other considerations that will affect the performance of the blower and the time taken to completely purge a space. The length of the ducting will play a role – generally the longer the ducting the more the airflow will be reduced; bends and angles in the ducting will also throttle the air flow volume – the sharper the bend, the more it will reduce the airflow.

Furthermore, not all blowers are created equal. There are two types of blowers for moving air: axial blowers and radial blowers, terms which refers to the type of mechanism used to move the air, but there are important differences between the two. Axial blowers move the air directly down the duct so it exits in a straight line out of the duct and can be aimed; radial blowers rotate the air in a circular motion as it moves down the duct so that it exits the end of the duct at right angles to the direction of the duct. This is an important consideration when calculating if the space has been properly and completely purged.

Continuous Ventilation

Regardless of the measured air quality within a confined space, even after the confined space has been purged, it is unsafe to enter any confined space when no ventilation is present. Adequate and effective ventilation is required throughout the validity period of the entry permit. Even when the confined space has been certified safe for entry, new contaminants may be introduced from the change in conditions, or when work performed in the space such as welding releases new contaminants, or through the exertions of a worker performing physical work inside the space.

Because of this it is important to provide adequate and effective ventilation to always maintain the contaminant concentration level as low as possible, and the level of oxygen within safe range.

There are two types of ventilation:

- Forced (supplied) ventilation.
- Local exhaust ventilation.

Forced ventilation moves air into the space and allows it to exit via a second opening, whereas exhaust ventilation removes air through one opening and allows it to enter through another opening. In both cases there are considerations that will affect the effectiveness of the ventilation, such as the size of the openings and their position relative to each other and to the volume of the space. In both cases it is important that the air that is drawn into the blower or into the vessel is itself not contaminated.