

7 Ventilation

7.1 Introduction

7.1.1 **Closed CTUs** are enclosed spaces and care should be taken before entering. Even without toxic gases and other asphyxiates oxygen supply may be depleted which could make normal breathing difficult. Ventilating a CTU will allow fresh air to circulate into the CTU and around any cargo carried and remove any harmful or toxic gases or fumes. The most effective method is to use forced ventilation.

7.1.2 It is a risky activity and it is important that CTUs are ventilated responsibly. The person who opens and closes the doors should be aware of the possible risks involved and, if required, wear personal protective equipment (PPE). The selection of the appropriate PPE will depend on measurements taken to determine the concentration and toxicity of the gases within the CTU and may require a combination of breathing apparatus and skin protection.

7.2 Planning

7.2.1 When ventilating CTUs a number of factors will determine the action required:

7.2.1.1 The concentration of the gas. The greater the concentration the longer the CTU will require for ventilation.

7.2.1.2 The nature of the gas. Some gases are very light and volatile and will evaporate quickly. Others are less volatile and/or adhere to the cargo, such as methyl bromide and 1,2-dichloroethane. The time for ventilation will need to be decided upon accordingly. It may not be possible to completely remove traces of gases that adhere to the cargo and the CTU may only be declared clean and safe to enter after the cargo has been removed and the CTU washed.

7.2.1.3 Ambient temperature. Higher temperatures will generally permit faster evaporation thus reducing the time to declare the CTU safe to enter. At lower temperatures, some fumigants stop working and remain inert until the temperature again rises. This can mean that the correct volume of a fumigant for the journey initially applied in a hot packing location which then passes into a colder area may arrive at the destination with high levels of fumigant still remaining in the CTU.

7.2.1.4 The size of the CTU. A 12 m long CTU has approximately twice the internal volume of a 6 m unit, and if the doors are only at one end, the circulation of gas has to travel considerably further.

7.2.1.5 The packing method. A CTU that has been tightly packed and is especially full will be more difficult to ventilate than one with many gaps and "open air" around the **packages**.

7.2.1.6 The nature of the cargo. Cargo that absorbs gases, such as mattresses and clothes, requires more time for ventilation than hard surfaced products. Absorbent materials hermetically sealed within a plastic or similar cover will not require the same time to ventilate as an uncovered item.

7.2.1.7 Packing material used. Absorbent packing materials will require extra time for any gases to leach out. Such materials may require special disposal to meet local environmental regulations.

7.2.1.8 The time which elapsed after the CTU has been closed.

7.3 Ventilation of CTUs can happen in two ways, natural or forced ventilation.

7.3.1 Natural ventilation

7.3.1.1 This can be done by simply opening the doors.

7.3.1.2 In some countries local regulations require an environmental permit for opening CTUs with high concentrations of dangerous gases. Once the application is received the Competent Authority determines under what conditions the company may ventilate on site. The granting of an environmental permit may take up to 6 months.

7.3.1.3 Estimate the necessary ventilation time in advance. CO, CO₂ or O₂ degas quickly. At encountering these substances start with a minimum of 2 hours ventilation. For other substances this will be insufficient and it is suggested that the CTU is ventilated for at least 24 hours. Record start and end time.

7.3.2 Forced ventilation

7.3.2.1 To carry out forced ventilation or degassing there are several possibilities. A few examples:

- Powerful fans, one or more fans directing air into and/or out of the CTU will stimulate the circulation of gases within the CTU.
- A "degassing door" (Ventilation & Gas Recapture System). This door will completely seal off the CTU and is fitted with two sealable openings. When for example air is blown through the top opening and is extracted at the bottom the unwanted gas disappears with the air from the CTU. At the end of the hose where the air from the CTU comes out, a suitable filter can be placed so the gases don't end up in the environment.

7.3.2.2 The advantage of forced ventilation is that it reduces the time necessary to remove high concentration of residual gas, partly because the climatic conditions can be optimized.

7.3.3 General safety

7.3.3.1 Do not enter the CTU during ventilation.

7.3.3.2 Make sure that during ventilation warning signs or otherwise clearly indicate that the CTU should not be approached or entered. For methyl bromide, phosphine and sulfuryl fluoride, for example, a minimum distance of 20 m all around the CTU should be set.

7.3.3.3 Toxic gas concentrations in the cargo space and the cargo itself should be measured and once they fall below the limit(s) the CTU may be released for entry. Carry out additional measurements if the doors are closed without the cargo being unpacked and the interior cleaned for a period of 12 or more hours.

7.3.3.4 The climatic conditions should also be monitored and action taken if:

- The outside temperature falls below 10°C. It is unlikely that ventilation will occur as gases will not evaporate at this temperature;
- There is no wind. Gases expelled from the CTU will not be diluted into the atmosphere and may linger at the CTU's doors.

7.3.3.5 A specialist gas removal contractor should be used if:

- The concentration exceeds 6 times the limit;
- If phosphine is detected. When opening a CTU or when unpacking or transferring cargo, highly toxic gas may be released as a result of residues of tablets not yet exhausted. In this case, the limit of the substance concerned may be exceeded.

7.3.3.6 Specialist gas removal contractors may move the CTU off site into closed and regulated area. The premises are inaccessible to unauthorized persons and the company guarantees that the cargo is monitored.

7.3.3.7 If in doubt, or for questions always contact a local company who specializes in the ventilation and degassing of CTUs.

7.3.4 Environment

7.3.4.1 Remember that toxic gases within the CTU will dissipate into the atmosphere. It should be remembered that the higher the gas concentration the greater the harm to the environment.

7.3.4.2 Consider the waste (residue) as hazardous waste. In practice this means that the waste should be offered to a certified collector to be processed or destroyed.

7.4 Ventilation first, then measure. This means that if the quantity and concentration of a toxic gas is known, then the CTU may be ventilated in accordance with the calculated time without the need for measuring the atmosphere until the ventilation time has expired. As always a test should be carried out before entering the CTU.