Gas Information Sheet 22

Gas heating in hothouses and carbon dioxide dosing

Introduction

This gas information sheet provides information about the controls required for safely working in hothouses where gas combustion products are present.

Any gas installation associated with a hothouse is deemed to be a Complex Installation, and an Application for Acceptance of Complex Gas Installations and Type B Appliances must be submitted to Energy Safe Victoria prior to supply being approved.

CO2 dosing and exposure to combustion products

Raising the percentage of carbon dioxide (CO2) in a hothouse can accelerate plant growth. This is called CO2 dosing.

Hothouses are generally heated by in-ground hot water coils from a gas-fired water heater. Occasionally, direct-fired air heaters (where fanned air is directly heated by the burner flame) are used to raise both the hothouse's temperature and CO2 levels, with the CO2 coming from the appliance's combustion products.

Hothouses that use combustion products for CO2 dosing must be adequately ventilated. Without sufficient fresh air, the gas appliance will produce more carbon monoxide (CO), which can be extremely hazardous.

The main issues to be considered include:

- hot house worker exposure to combustion products
- Energy Safe's acceptance requirements:
  - for gas-fired water heaters and direct-fired or mobile industrial heaters
  - based on how the appliance is being used.

Hot house worker exposure to combustion products

Exposure to excessive CO levels can be extremely hazardous, and Safe Work Australia provides guidelines for:

- short term CO exposure
- the maximum allowable exposure limits to CO and CO2.[1] [2].

Energy Safe's acceptance requirements

Acceptance requirements for CO2 dosing using:

- gas-fired water heaters
- direct-fired or mobile industrial heaters.

Acceptance requirements for CO2 dosing using gas-fired water heaters

Energy Safe's general acceptance requirements for the controlled release of combustion products into a hothouse using a gas-fired water heater (in-ground heating) are as follows:

- The appliance is required to pre-purge to atmosphere (outside the hothouse) prior to start-up of the appliance burner. Dampers in the appliance or flue controlling this function must be:
  - interlocked
  - in the correct position before pre-purging begins.
- The appliance's main flame must be 'proven' (established and stable) before any combustion gases are allowed to enter the hothouse.
- The CO level in the appliance flue must not exceed 400 ppm.
- The environment within the hot house must be continually monitored as part of the CO2 dosing system, monitored, and interlocked to the appliance.
- The appliance must shut down or the products be directed to atmosphere if the hothouse levels reach:
  - 10 ppm CO, or
  - 3000 ppm CO2.
- Automated ventilation openings in the hothouse must:
  - be interlocked with the gas control system
  - open to introduce fresh air when high CO levels are detected in the hothouse.

Acceptance requirements for CO2 dosing using direct-fired or mobile industrial heaters

Direct-fired heaters

Energy Safe's general acceptance requirements for the controlled release of combustion products into a hot house using a direct-fired appliance are as follows:

- The air supply must be taken from outside the building (as per AS 3814, clause 5.7.2).
- The combustion product limits must comply with AS 3814, clause 5.7.7.1.
- The maximum gas consumption per cubic metre of room volume in a hothouse must not exceed the limits listed in AS/NZS 5601.1, clause 6.10.6.3, Table 6.10.6.3.

Mobile industrial heaters

Mobile industrial heaters are designed for industrial heating applications, not for CO2 dosing, and are not recommended for use. Mobile industrial heaters located indoors also recirculate combustion products and may create a hazardous environment without adequate ventilation.

Acceptance requirements based on how the appliance is being used

An application for acceptance is required via Energy Safe's online application platform GasTrac for acceptance of a Complex Gas or Type B Appliance installation. The application must be made to (and accepted by) Energy Safe before gas can be supplied to the installation.

Other considerations for appliance acceptance depend on whether the appliance is being used for:

- CO2 dosing
- heating only (no CO2 dosing).

CO2 dosing

Any appliance used in conjunction with a CO2 dosing system will be treated as a Type B appliance.

As a result:

- a Schedule 9 gas submission must be made to and accepted by us before any work commences (an on-site inspection will subsequently be carried out by Energy Safe)
- a CO monitoring system interlocked to shut down the appliance if the CO level in the hothouse exceeds 10 ppm or 3000 ppm CO2 is required
- the CO monitoring system must be checked every three months and recalibrated as necessary by an appropriately qualified person
- test records must be kept by the owner/operator
- the appliance must be serviced in accordance with the manufacturer's instructions (at least annually) and be kept in a safe condition and proper state of repair as per the requirements of Regulation 30 of the Gas Safety (Gas Installation) Regulations 2018.

Heating only (no CO2 dosing)

Where the appliance is only being used to produce heat then it must:

- be certified as a Type A appliance or accepted by Energy Safe as a Type B appliance
- not exceed the maximum gas consumption limits in AS/NZS 5601.1, clause 6.10.6.3, Table 6.10.6.3
- be serviced in accordance with the manufacturer's instructions and in the case of a Type B appliance, be kept in a safe condition and proper state of repair as per the requirements of Regulation 30 of the Gas Safety (Gas Installation) Regulations 2018
- have its CO and CO2 readings checked by an appropriately qualified person to ensure they are within safe limits. After continuous operation of at least 2 hours, the atmosphere in the hothouse must be sampled and not exceed the following limits:
  - 10 ppm CO
  - 3000 ppm CO2.

Who we are

At Energy Safe Victoria we work to keep Victoria energy safe.

We regulate the energy industry and sector to ensure generation, supply and usage uphold safety standards, and engage with the community to raise awareness of energy safety risks.

In everything we do, we strive to deliver on our purpose to keep Victoria energy safe. Always.

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