



Domestic flueless space heaters: what's the truth?

In the decade or so that modern gas-fired flueless space heaters have been available in the UK, there has been a good deal of debate about their safety and some resistance to their use. Nevertheless, they hold a significant share of the market and gas engineers often install and maintain them. It's time to separate fact from fiction, particularly where the ventilation requirements are concerned.

As with all gas-fired space heaters – of any type – the main danger is the build-up of carbon monoxide (CO) in the atmosphere. As many flueless space heaters in the UK have a catalytic converter, there is some confusion as to what happens if the catalytic converter fails.

Part of the testing criteria for domestic flueless space heaters in the UK is that all appliances must operate safely with the catalytic converter (cat) totally removed. It's perhaps worth noting that of the 70 million or so flueless fires used in the US

and Japan, very few are fitted with catalytic converters.

The use of the cat is to 'capture' oxygen molecules and combine them with any traces of CO to form carbon dioxide (CO₂).

However, this is something of a belt and braces approach in that all flueless space heaters must be able to operate without a catalytic converter – the ability to do so forms part of the Gas Appliances Directive (GAD) and CE approvals regime – which requires room CO to be below 9 parts per million (ppm) when tested.

For example, CVO's Azar Flueless space heater – which doesn't have a cat – has a rating of CO @ 3ppm and CO₂ @ 0.23 per cent. This means the space heater is also available without a glass front. And there are two other appliances in the range (the Angel and Fireline) which similarly also do not need catalytic converters. These space heaters have full CE approval across Europe for natural gas and LPG.

Additionally, to meet the CE approval requirements, all flueless space heaters must be fitted with a safety device that is designed to cut off the gas supply to the burner and hence turn off the appliance off should the CO₂ level fall below a pre-determined level. In the case of Burley that level is 1.5 per cent below the normal ambient oxygen level of around 20.5 per cent.

Of course, given that there is no flue, the combustion products are released into the room and will create higher levels of CO₂ and water vapour than that found in fresh air, hence the need for adequate ventilation of the space.

Combustion process

On the face of it, because the combustion process relies on the oxygen that is present in the room, you might assume that it is important – perhaps even vital – that there is a

source of 'fresh' air coming into the room to replace the oxygen used up in the combustion process.

"But," as Steve Barson, managing director of Burley Appliances, one of the UK's largest flueless space heater manufacturers, points out, "one of the many tests that flueless space heaters must pass during approval is to be run in a totally air-tight room with the catalytic converter disabled. Even under these conditions the appliance must continue to operate completely safely."

It is virtually impossible to seal a room so tightly that sufficient air can't get in for the appliance to operate. Nevertheless, there is a specific Building Regulation Approved Document (ADP1 Means of Ventilation for England and Wales and for Scotland, Technical Handbook Domestic, Section 3 Environment), which demands adequate ventilation for people in the building. In addition, ADJ Combustion appliances and fuel storage systems and Technical Handbook Domestic, Section 3 Environment, respectively, provide guidance on additional permanently open ventilation and rapid ventilation requirements for flueless appliances.

British Standard 5871-4: 2007 also draws attention to the necessity to use flueless space heaters only as secondary heating. Having primary heating (such as a central heating radiator or electric storage heater) in place – and functioning, of course – ensures that the ambient temperature is above the dew point so condensation doesn't generally form.

For this reason therefore, the Building Regulations are very clear about the ventilation requirements in a room that is – or is about to be – fitted with a flueless appliance of any sort.

The availability of the correct level of oxygen and the volume of air required in a room to disperse the CO₂ and water vapour being emitted by the space heater means that the gas engineer's first job is to ascertain whether the room is large enough to be suitable for the appliance – or any other flueless device for that matter – in the first place.

The room volume is laid down within the relevant Approved Document/Technical Handbook according to the net input and type of appliance. The various manufacturers also specify minimum room volume requirements for their products.

For example, Burley's flueless space heaters require 30m³, 40m³ or 50m³ of room volume, depending

'One of the many tests that flueless space heaters must pass is to be run in a totally air-tight room with the catalytic converted disabled'



on the heat input of the model chosen. Another manufacturer, CVO, has as its smallest, lowest output fire a 2.35kW model (the Azar) but this still requires a room volume of 24m³.

CVO managing director Andrew Munro says: "It is important that gas engineers do measure the room volume accurately to make sure that the correct output appliance is specified for the given room size."

The fundamental requirement is that any room or internal space where a flueless appliance (and this includes gas cookers) is installed contains a means of ventilation that communicates directly with outside air. "Although originally different appliances had different sized air

vents, space heater manufacturers and test houses met and agreed that for simplicity every appliance would have a vent of 100cm²," says Steve. "This was the largest vent specified so all the manufacturers agreed on that."

Building Regulations⁵ also specify the area of the air vent and this varies according to the heat input – and type – of the appliance to be installed (see table below). In addition to the air vent, all rooms must be fitted with an openable window 'or similar'.

Where the appliance manufacturer does not specify a specific air vent size, BS 5440-2: 2000 Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd family gases), specifies the ventilation criteria that needs to be followed. This is shown in the table below. In addition to the air vent, all rooms must be fitted with an openable 'window 'or similar'.

British Standard (BS 5440-2) on the maintenance of air vents states that whenever maintenance work on an installation is carried out, then both visual and physical checks on the air vents should also be made. Fly screens should be removed and closeable vents replaced, as under the Gas Industry Unsafe Situations Procedure this type of vent is considered an 'At Risk' situation.

The air vent should also be checked to ensure that there are no mortar extrusions nor any other type of blockage. The air vent should also be measured to ensure that the cross-sectional free area is the minimum of 100cm² per appliance.

"One thing that the Standards don't stipulate but that any sensible gas engineer ought to be doing is making sure that the client is aware of the importance of the ventilation, why it is there and the importance of not blocking it," says Steve. ■

Type of appliance	Maximum rated heat input limit (net)	Room volume (cubic metres)				Openable window required*
		Below 5	>5-10	>10-20	Above 20	
Fixed space heater in a room	45W per cubic metre of heated space	100 cm ² plus 55 cm ² per kW (net) by which the rated input exceeds 2.7kW (net)				Yes
Fixed space heater in an internal space	90W per cubic metre of heated space	100 cm ² plus 27.5 cm ² per kW (net) by which the rated input exceeds 1.8kW (net)				Yes

*Alternative acceptable forms of ventilation include any adjustable louvre, binged or other means of ventilation that opens directly to outside air