



- *Maintain your boiler according to the operation manual*
- *Have your chimney swept at least once a year*
- *Do not enter your fuel storage area until properly ventilated*
- *Place a safety notice on the door leading to your fuel storage area*

## Handling and using wood fuels in a safe manner with regard to carbon monoxide (CO)

*Pieter D. Kofman*

### Background

Woodfuel is increasingly being used in Irish homes and businesses as a convenient and cost-effective replacement for fossil fuels such as oil, gas and coal. The safe use of oil and gas is well understood and includes simple safety precautions in fuel storage and ventilation of combustion spaces. How to handle and use woodfuel is less well known, but with the help of some simple procedures one can avoid problems.

### Woodfuels

There are three main woodfuels used in Ireland:

- Wood pellets (and briquettes),
- Woodchip and
- Firewood.

Wood pellets are mainly used in domestic and commercial boilers, while woodchip is more suited for commercial and industrial-scale installations. Firewood is (nearly) always used only in domestic applications. For small-scale installations one uses dry wood chips (less than 30% moisture content), for the larger installations wetter woodchip can be used (moisture content between 30-55%), provided the boiler specification enables the use of such fuel.

### Common precautions

Electric installations in the storage area have to be grounded and be explosion proof.

Accidents involving carbon monoxide are usually caused by faulty installations or blocked chimneys. Therefore all boiler installations, be they based on woodfuel or fossil fuel, should be maintained according to the manufacturer's maintenance schedule and/or the installer's instructions.

COFORD  
Dept. Agriculture, Food and the Marine  
Kildare Street,  
Dublin 2, Ireland  
Telephone: +353 1 607 2487  
Email: [info@coford.ie](mailto:info@coford.ie)  
<http://www.coford.ie>

If any boiler malfunctions, it should be switched off and an authorized installer ([www.seai.ie/Grants/GreenerHomes/Installers](http://www.seai.ie/Grants/GreenerHomes/Installers)) should be contacted immediately.

Woodfuel boilers need more maintenance than oil or gas appliances. Ash needs to be removed on a regular basis and fly ash cleaned from the heat exchange pipes (flue gasses pass through the heat exchange pipes, if these become blocked with fly ash the boiler may malfunction).

For solid fuel boilers (mainly wood, peat, and coal) it is also important to have the chimney swept regularly. Besides sweeping the chimney walls, the chimney should also be inspected for any blockages.

All boiler-rooms must be well ventilated. Boilers need a lot of air to burn woodfuel; for example, to burn 1 kg of bone-dry wood, about 8 cubic metres of air is needed - so with a woodfuel moisture content of 20%, one needs about 6 cubic metres of air for every kg of firewood or chips. Air supply to the boiler should be through an opening to the outside of the building, at least 6500 mm<sup>2</sup> in size and in conformity with the Building Regulations.

Not only should the boiler-room be well ventilated, but free air flow is also needed in the fuel store room, in order to reduce any condensation and to keep dust levels down.

It is a good precaution to install carbon monoxide (CO) alarms in the boiler-room and the woodfuel store room. Unlike a smoke alarm, which is mounted high on the wall, CO alarms should be mounted at breathing height or closer to the floor (as CO is heavier than air it is usually more concentrated at floor level). Always use a CO alarm which has been EN 50291 approved. Preferably the alarm should have an 'end of life' indicator, as CO alarms have a limited life span. For more information see [www.carbonmonoxide.ie](http://www.carbonmonoxide.ie).

## Storage of woodfuel

Since woodfuels have a much larger bulk volume than fossil fuels, they take up a lot more storage: to store the same amount of fuel as 1,000 litres of oil, one needs to store 14,000 litres of woodchip or 3,300 litres of wood pellets.

That is also the reason why woodfuels for commercial installations are often delivered in this way. For domestic use it can also be more advantageous and cheaper to get wood pellets delivered in bulk; packaging pellets in 15 kg bags is an expensive operation, and they are much more expensive than an equal amount of pellets delivered in bulk.

Wood pellets and woodchip consume small amounts of oxygen during storage, so when they are stored in unventilated storage rooms, the oxygen can become depleted. This can also be the case in below-ground silos with insufficient ventilation. Entering a fuel store should thus only be done after proper and prolonged ventilation. In larger installations, one should not work alone and a second person should be outside the fuel store.

In closed silos, wood pellets are also known to produce small amounts of CO, another reason not to enter the fuel store without due precaution. Always follow the rules as laid down in the Health and Safety Authority's *Code of Practice for Working in Confined Spaces* ([www.hsa.ie](http://www.hsa.ie)).

Woodfuels should be stored in a dry, well-ventilated room or structure – if they get wet it will encourage the growth of bacteria and fungi (especially moulds). Bacterial and fungal spores can be detrimental to health. This is another reason why fuel stores should preferably be located outside the house, or else in a room which is separated from the rest of the building by a dust-proof door.

## Handling of woodfuel

Woodfuel, be it woodchips or pellets often contain dust, and if it not stored in well-ventilated, dry conditions, may contain fungal and bacterial spores. Therefore if one has to shovel wood fuels, one should always have good ventilation in the storage space and wear a face mask with a P3 particle filter (European Standard EN 143:2000/AC:2005, *Respiratory protective devices - Particle filters - Requirements, testing, marking*). Remember to clean the mask each time it is used, and to store it outside the fuel storage room.

## Spontaneous combustion

In domestic and commercial installations, the amount of fuel stored is so small that spontaneous combustion is extremely unlikely to occur. If heat is generated in such situations, it will generally dissipate through the surrounding air and structures, without building-up to a level that would result in spontaneous combustion. Only in cases where large volumes (typically thousands of cubic metres) of wet fuel are stored for prolonged periods of time, and under damp conditions, does spontaneous combustion occur, and even then it is rare.

## Conclusions

Woodfuel is just as safe to use as fossil fuel. The following simple rules should be adhered to at all times:

- Maintain all boilers regularly and have them professionally checked on an annual basis;
- Sweep chimneys and flues frequently, again at least once a year;
- Ensure full and unhindered ventilation of the boiler and boiler-room;
- Ventilate all fuel stores for at least 15 minutes before entering;
- Install approved carbon monoxide detectors in the boiler-room and fuel store
- Follow the Health and Safety Authority's *Code of Practice for Working in Confined Spaces*.

If you are using wood pellets it is recommended that you print off the following page and securely fix it to the door leading to the boiler-room and/or fuel store.

# Wood Pellets – Storage Room



No access for unauthorized persons -  
keep children away



Enter the storage area only  
under the supervision of a  
person standing outside of it



Smoking and use of open fire and  
other ignition sources are forbidden



Ventilate at least 15 minutes before  
entering and switch off pellet boiler



Moving parts may cause injury



Switch off pellet boiler before filling



Filling should only be done  
under conditions specified  
by the boiler supplier



Protect wood pellets from moisture