

An Introduction to Woodfuel Standards



Wood is man's oldest source of controlled heat and our ancestors learnt to manage trees, woods and forests sustainably to provide for their needs. Production, seasoning and use of wood became embedded in their culture. However, in some parts of Europe this culture declined as the use of fossil fuel sources became common.

As interest in using wood as a renewable fuel grows we need to re-establish how we use wood effectively – standards can help us do this.

International standards for fossil fuels have been essential to building a world trade and there are clearly benefits in establishing similar standards for woodfuel, however, implementing such standards isn't as easy as it might seem! Wood is a bulky, variable, locally produced and ideally locally used fuel with many small scale producers and users with a huge range of knowledge, experience and traditions.

Benefits of woodfuel standards:

Standards help both buyers and suppliers by:

- Allowing fuel to be matched to the boiler;
- Helping fuel buyers specify their requirements clearly;
- Helping suppliers know what is needed and how to check that their product meets these needs;
- Helping identify problems;
- Preventing as well as settling disputes; and
- Providing confidence in a growing market.

Essentially standards provide a common vocabulary to describe what consumers need or producers can deliver. Clear labelling backed by fuel quality assurance (FOA) and common testing methods will build the confidence that consumers need to feel if they are to be won away from the better known fossil fuel alternatives.

Main features affecting woodfuel quality:

Source:

Is the wood sourced directly from well managed woods, arboriculture, sawmill co-product or has it been recovered from the waste stream?

Moisture content:

Approximately half the weight of the wood in a growing tree is water (hence it has a moisture content of 50%) and as we all know water doesn't burn! Some woodfuel systems have been designed to cope with woodfuel derived directly from the felled tree but in most cases systems are designed to use wood which has been seasoned i.e. it has been stored in a manner which encourages some of the water in the wood to evaporate. Typically seasoning in the open for a year will reduce the moisture content to about 35% but to achieve moisture contents of less than this a longer period or more direct drying is needed.

Particle size:

Logs, woodchips or wood pellets can all be provided in different sizes to suit different woodfuelled systems

European Woodfuel Standards:

Approximately 12 years ago the European Union commissioned the Comité Européen de Normalisation (CEN) (the European Committee for Standardisation) to develop standards for solid biofuels. Subsequently CEN established Technical Committee 335 – Solid biofuels, which covers woody biomass, including wood from forests, plantations and landscape management. TC/335 then created a suite of interconnected technical standards (TS) defining terminology, specification, fuel quality assurance (FQA), sampling and the range of tests required to quantify fuel properties. Over time the CEN/TSs for solid biofuels are being revised and upgraded to Euro Norms (ENs) displacing all other national standards across the EU (eg ONORM & DIN). They are also being used as the basis for new ISO standards (ISO/TC 238).

In simple terms the standard specifies biomass fuels in terms of:

(a) Origin

Specified to show where the raw wood has been sourced.

The main "codes" relevant to current woodchip production are:

1. Woody Biomass	1.1 Forest, Plantation and other virgin wood	1.1.1 Whole trees without roots	1.1.1.1 Broadleaf
			1.1.1.2 Conifer
			1.1.1.3 Short Rotation Coppice
			1.1.1.4 Bushes
			1.1.1.5 Blends and mixtures
	1.1.3 Stemwood	1.1.3.1 Broadleaf	
		1.1.3.2 Conifer	
1.1.3.3 Blends and mixtures			
1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards and fruit orchards			

see EN14961-1 [5] for full details

(b) Traded form

for instance woodchips, pellets, briquettes or firewood

(c) Properties i.e.

- Particle size distribution e.g. P45
- Moisture e.g. M30
- Ash e.g. A1.5

Woodchips:

If we consider woodchips sourced from woodland management and used in small to medium scale heating systems these standards require the following to be specified:

1. Origin:

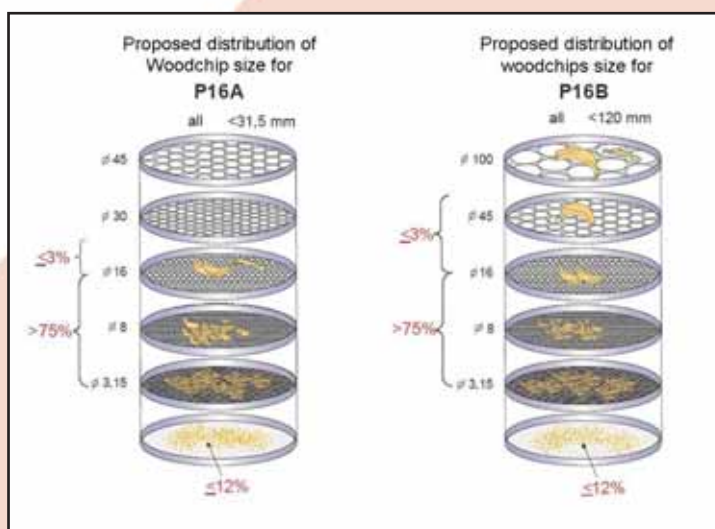
For instance 1.1.3.1 (= woody biomass from forest or plantation, stemwood, broadleaf))

2. Dimensions of the woodchips:

While woodfuelled systems can be designed to burn a variety of woodchip sizes many modern systems have been designed to deliver very high efficiencies in converting the energy stored in the wood into heat. To work well they need woodchips of the correct size, generally with a low proportion of fine material and larger pieces. The size of woodchips and the proportion of a particular size can be assessed using a simple set of calibrated sieves.

A common specification is likely to be **P16A** and this will comprise:

- 75% of the total volume of woodchips will be between 3.15mm and 16mm in size
- Less than 12% of the total volume of woodchips will be less than 3.15mm in size and
- No more than 3% will be more than 16mm and all will be less than 31mm



3. Moisture content:

Specified in terms of the maximum moisture content (by proportion of overall weight)

Hence an **M35** woodchip would be 35% water, or less, and an **M25** woodchip would be 25% water, or less.

4. Ash content:

Specified in terms of a proportion of the dry weight of the wood.

Hence an **A0.7** woodchip would produce no more than 0.7% of its' dry weight as ash if burnt efficiently and an **A1.5** woodchip would produce no more than 1.5% of its' dry weight as ash.

In addition the standard provides a simple way for suppliers to describe other characteristics of the woodchips, which may be of interest to the buyer.

For instance:

- In a **N0.5** woodchip there will be no more than 0.5% nitrogen (as a proportion of its dry weight);
- In a **Cl0.03** woodchip there will be no more than 0.03% chlorine (as a proportion of its dry weight);
- A **Q3.5kWh/kg** woodchip will deliver approximately 3.5kWhrs of energy per kilogram (based on 30% moisture content)
- An **E800kWh/m³** woodchip will deliver 800kWhrs of energy for each loose cubic meter of woodchips;
- A **BD300** woodchip will have a bulk density of at least 300 kg per cubic meter of loose woodchips
- Ash melting point is described simply as the temperature in °C at which the ash starts to melt.

Of these 'additional', or 'informative', descriptions of woodchip it would seem that the energy density (E) would be most helpful as this will vary most depending on the species of wood chipped (broadleaved wood is denser than conifer wood and hence a loose m³ of woodchip from oak will contain more energy than a loose m³ of pine) and the moisture content of the woodchip (the higher the moisture content the greater the proportion of energy embedded in the wood which is needed to evaporate this moisture, hence a loose m³ of woodchip at 30% moisture content will contain more usable energy than a loose m³ of woodchip of 40% moisture content). As the use of woodfuel becomes more common this allows:

- fuel costs to be easily compared with alternatives such as oil or gas; and
- the supplier to receive the full value of his/her product (i.e. more money for well seasoned broadleaved wood)

Sampling: Inevitably there will be variations within a 'load' of woodchip and hence selecting a sample to test for the characteristics described above is crucial. A sample of woodchips from different parts of the load should be collected and mixed to determine the characteristics of a specific load. The CEN standards provide detailed guidance on how best to do this.

Firewood (conventional logs):

Interest in using firewood in modern wood burning stoves and boilers has surged in recent years and buyers are increasingly appreciate the benefits of good quality firewood. The most important factors are: will it fit into my fire, will it burn well and is the price reasonable. We're also noting increasing interest in ensuring that the wood is sourced from a well managed local wood.

CEN standards describe firewood in terms of:

1. **Origin:** Woody biomass from specified species (for instance oak, ash);
2. **Length:** Sometimes a narrow range of lengths is specified, for instance **L25** logs would all be between 23 and 27cm, however, more pragmatically the maximum length in cm is provided;
3. **Width: D20** logs would all be between 10 and 20cm wide;
4. **Moisture content:** so a delivery of **M25** logs would have a moisture content of no more than 25% by weight;
5. **Volume or weight:** deliveries should specify the volume in stacked or loose m³ OR the weight in kg.

Additionally suppliers can specify:

- the energy density (E) in kWh/kg or kWh/m³ loose or stacked;
- the proportion of split volume: No split (i.e. roundwood), split (>85% split) or mixed;
- the cut-off surface: (smooth or uneven ends of logs); and
- the proportion of mould or decay (if >10% it should be stated).

Further information:

Woodheat Solutions: Roadmap for implementing standards

Woodheat Solutions: Summary of woodfuel standards

Woodheat Solutions: Approximate determination of moisture content of woodfuel using a domestic oven

Producers and suppliers can currently download the key standards, free of charge, from the Forestry Commission's [Biomass Energy Centre \(BEC\) website](#) under the licence for which BEC has paid. We recommend reading the following first:

- BS EN 14961 – 1:2010 Solid biofuels — Fuel specifications and classes Part 1: General requirements
- FprEN 14788-1:2005 Solid biofuels – sampling part 1 – Method for sampling
- BS EN 14774-2:2009 Solid biofuels – Determination of moisture content – oven dry method

The full set of standards documents can be bought from the [BSI](#).

[HETAS Solid Biomass Assurance Scheme](#)

