

- Draft European standards for non-industrial use of firewood, wood pellets, and wood chips are presented.
- General European standards for solid biofuels are discussed.
- Complete standards can be bought from the National Standards Authority of Ireland (NSAI).

Preview of European standards for solid biofuels

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Introduction

Over the past decade there has been a substantial increase in the amount of biomass being used for energy in Europe. As trade between countries becomes more widespread, it is necessary to create international standards to facilitate buying and selling biomass fuels. The European Committee for Standardisation, CEN, has a mandate from the European Commission to develop standards for solid biofuels, under Technical Committee (TC) 335 Solid Biofuels. At the same time a large European project - Bionorm – has been funded under the EU Framework RTDI Programme, to carry out research to provide a scientific basis for the standards.

Solid biofuel is a wide field and includes woody biomass (chips, hogfuel, firewood, wood pellets, briquettes), herbaceous biomass (straw, grass, miscanthus etc.), fruit biomass (olive stones, cherry pits, grape waste, nut shells etc.), as well as a group called ‘blends and mixtures’. The definition of solid biofuels excludes all animal-based biomass (e.g. manure, meat and bone meal) and aquatic biomass (such as algae); these fuels will be dealt with by other standardization committees. Demolition timber is considered a hazardous waste and is not included in the solid biofuel category.

The fastest way to produce a workable standard is to draft a Technical Specification (TS) and test this for a maximum of five years. A TS can be produced in a relatively short period of time (within a year or two), because it does not go through the complicated and time consuming consultation and balloting procedure required for full standards. Based on experience in use, the TS is updated, revised and issues as a full European Standard (EN) or it may be dropped altogether.

Draft Technical Specifications, which are produced in working groups within the Technical Committee, are discussed in the national mirror committees, which are tasked with collecting the opinions of national experts and users of the specifications. Comments from national mirror committees of the participating

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30 countries are discussed and a text is produced as a pre-standard (prEN). Once the updating is accomplished, prENs are put up for balloting by all the participating countries in CEN. If agreed, ENs are published as national standards, meaning that they get an I.S. number for Ireland. All prior national standards in the area become void.

There is no obligation to use the contents of ENs, but in contracts it is very useful to refer to them to ensure everyone knows what is being referred to and how it is measured.

TC335 Solid Biofuels has produced a long list of Technical Specifications, which are now in the process of being updated to European Standards (EN). The list contains standards on many different aspects of solid biofuels, such as taking samples, analyzing samples for chemical content (macro and micro nutrients, heavy metals etc.), for physical properties (moisture content, size distribution, bulk density, etc.) and definitions of quality requirements and definitions.

For producers and consumers the most interesting standards will be those on nomenclature, on specifications and requirements, and on quality assurance. The nomenclature standard defines all the terms that are being used, the specifications and requirements standard defines the quality of the fuel, and the one on quality assurance enables a system to be put in place to assure the consumer about the quality of fuel being purchased. Most of the other standards are of direct interest to laboratories that do testing, either to document fuel quality for producers or if a dispute has arisen between parties in trade.

All standards can be obtained from the Irish standardization body, NSAI (www.nsai.ie). When ordering standards, remember to ask for the latest version or update. In many cases the officially published Technical Specifications have been revised considerably, and thus the current prEN would be the most up to date document. Since the prENs are working documents, they first become available when they are published as ENs, and until that time the TS is the document referred to in official publications.

Useful standards for producers and consumers

As stated above, for producers as well as consumers of wood fuels, three standards are of most interest:

- prEN14588 *Solid Biofuels - Terminology, definitions and descriptions*;
- prEN14961 *Solid Biofuels - Fuel specifications and classes*, parts 1-6;
- prEN15234 *Solid Biofuels - Fuel quality assurance*, parts 1-6.

Both prEN 14961 and 15234 have been divided into 6 parts, where part 1 gives the general requirements, and parts 2-6 are specific for fuels to be used by relatively small-scale users and non-industrial applications. In the standards, the limit is drawn at boilers with a capacity of 500 kW. All boilers above that size are considered 'industrial', those under that limit are 'non-industrial'.

In the two standards the following parts will come into existence:

- Part 1 General requirements;
- Part 2 Wood pellets for non-industrial use;
- Part 3 Wood briquettes for non-industrial use;
- Part 4 Wood chips for non-industrial use;
- Part 5 Firewood for non-industrial use;
- Part 6 Non woody pellets for non-industrial use.

Some parts are more developed than others, for example part 1 of EN14961 *Solid Biofuels - Fuel specifications and classes* has been accepted, while part 6 of the same standard is still being drafted.

prEN14588 Solid biofuels – Terminology, definitions and descriptions

This standard defines many words and terms used in the standards, such as:

- Wood chips: chipped woody biomass in the form of pieces with a defined particle size produced by mechanical treatment with sharp tools such as knives.
- Wood pellets: densified biofuel made from pulverized woody biomass with or without additives, usually with a cylindrical form, random length of typically 5 to 40 mm with broken ends.
- Wood briquettes: densified biofuel made with or without additives in the form of cubiform or cylindrical units, produced by compressing pulverized woody biomass.

- Firewood: cut and split oven-ready fuelwood used in household wood burning appliances like stoves, fireplaces and central heating systems. Firewood usually has a uniform length, typically in the range of 150 to 1,000 mm.
- Hogfuel: fuelwood in the form of pieces of varying size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails.

EN14961 Solid Biofuels – Fuel specifications and classes

EN14961 has evolved from TS14961, which is the official published document at present. The EN differs considerably from the TS in that the standard has been split into a one general part and five product specific parts, and certain property classes have been changed radically. Part 1 of the standard has been accepted and is expected to be published as an official EN early in 2010.

EN14961 is the most interesting and important standard produced by TC335 because it describes the origin of the fuel, the traded form, and for each fuel gives a list of properties and the classes into which these properties are divided. In Part 1, general requirements, quality demands are not formulated as such, but for each property a list of classes is given and how each class is delimited. In parts 2 to 6, quality classes are given for specific fuels (like wood pellets, briquettes, wood chips, firewood, non woody pellets) and the criteria to which that fuel must comply with to belong to a certain quality class.

In delivery contracts for wood fuels it is often difficult to describe what kind of wood is permitted and what is not. This has been solved by the forthcoming standard. Table 1 clearly specifies the origin of the wood. With the permission of NSAI, the first part of the table concerning woody biomass is reproduced here (Table 1). The other main groups of solid biomass are herbaceous biomass (grass, straw, miscanthus, reed canary grass etc.) and fruit biomass (kernels, stones, husks etc.) and then the 'blends and mixtures' group.

Table 2 explains the shape in which biomass can be traded, the main dimensions and how the material is processed (with permission of NSAI).

These two main tables are followed by twelve product-specific tables, listing the properties of the particular solid

biomass. If a fuel is not listed as one of the 12 specific fuels, a final table of properties can be used for general application. In this publication an overview is given, specifying properties for each of the main wood fuels and whether these properties are normative or informative (Table 3). If a property is normative, it means that the information has to be made available; if it is informative, the information may be given. In some cases where the base material may have been treated chemically, some properties change from informative to normative.

In all cases, a range of classes is given for each property. For example, for moisture content the range starts with M10 which means that the product should contain less than 10% moisture. The range then extends in 5% classes from M10 to M55+. M55+ means that the moisture content is higher than 55% and in such cases the maximum value should be stated. In Table 4 an example is given showing how one could define the quality requirements for wood chips of a certain boiler.

As stated, the tables in part 1 of prEN14961 do not prescribe values for certain quality classes. This is done in parts 2-6 where quality classes are formulated with distinct property demands. These parts are not as far in the approval process as part 1 and as such NSAI could not give permission to reproduce the quality class tables from these prENs. These parts have not been published yet and are still in the domain of working group 2 of CEN TC335. However, work on parts 2-5 (wood pellets, wood briquettes, wood chips, firewood) has been completed, while work on non-woody pellets is still ongoing. It is expected that parts 2-6 will be available to the general public within 6-12 months in their final form.

Parts 2-6 of prEN14961 have been formulated for the so-called non-industrial market, meaning for those boilers with a capacity of less than 500 kW. The quality classes have been formulated for typical boilers within that range. The quality classes should make it easier for boiler manufacturers and installers, consumers and suppliers to have the right quality fuel for such boilers. Complicated descriptions using different words and meanings can thus be avoided.

In all the parts dealing with non-industrial boilers, several quality classes have been formulated, usually with two A class fuels (A1 and A2) and one or two B class fuels. The quality requirements for the A class are always higher than for the B class.

Table 1. Classification of origin and sources of woody solid biomass.

1. Woody biomass		
1.1 Forest and plantation wood	1.1.1 Whole trees without roots	1.1.1.1 Deciduous
		1.1.1.2 Coniferous
		1.1.1.3 Short rotation coppice
		1.1.1.4 Bushes
		1.1.1.5 Blends and mixtures
	1.1.2 Whole trees with roots	1.1.2.1 Deciduous
		1.1.2.2 Coniferous
		1.1.2.3 Short rotation coppice
		1.1.2.4 Bushes
		1.1.2.5 Blends and mixtures
	1.1.3 Stemwood	1.1.3.1 Deciduous
		1.1.3.2 Coniferous
		1.1.3.3 Blends and mixtures
	1.1.4 Logging residues	1.1.4.1 Fresh/Green, Deciduous (including leaves)
		1.1.4.2 Fresh/Green, (including needles) Coniferous
		1.1.4.3 Stored, Deciduous
		1.1.4.4 Stored, Coniferous
		1.1.4.5 Blends and mixtures
1.1.5 Stumps/roots	1.1.5.1 Deciduous	
	1.1.5.2 Coniferous	
	1.1.5.3 Short rotation coppice	
	1.1.5.4 Bushes	
	1.1.5.5 Blends and mixtures	
1.1.6 Bark (from forestry operations) ^a		
1.1.7 Wood from garden, park, roadside maintenance, vineyards and fruit orchards		
1.1.8 Blends and mixtures		
1.2 By-products and residues from wood processing industry	1.2.1 Chemically untreated wood residues	1.2.1.1 Without bark, Deciduous
		1.2.1.2 Without bark, Coniferous
		1.2.1.3 With bark, Deciduous
		1.2.1.4 With bark, Coniferous
		1.2.1.5 Bark (from industry operations) ^a
	1.2.2 Chemically treated wood residues, fibres and wood constituents	1.2.2.1 Without bark
		1.2.2.2 With bark
		1.2.2.3 Bark (from industry operations) ^a
		1.2.2.4 Fibres and wood constituents
	1.2.3 Blends and mixtures	
1.3 Used wood	1.3.1 Chemically untreated wood	1.3.1.1 Without bark
		1.3.1.2 With bark
		1.3.1.3 Bark ^a
	1.3.2 Chemically treated wood	1.3.2.1 Without bark
		1.3.2.2 With bark
		1.3.2.3 Bark ^a
	1.3.3 Blends and mixtures	
1.4 Blends and mixtures		

^a Cork waste is included in bark sub-groups.

NOTE 1: For the avoidance of doubt, demolition wood is not included in the scope of this European Standard. Demolition wood is "used wood arising from demolition of buildings or civil engineering installations" (see EN 14588).

NOTE 2: If appropriate, also the actual species (e.g. spruce, wheat) of biomass can be stated. Wood species can be stated e.g. according to EN13556 "Round and sawn timber nomenclature".

NOTE 3: Chemical treatment before harvesting of biomass does not need to be stated. Where any operator in the fuel supply chain has reason to suspect serious contamination of land (e.g. coal slag heaps) or if planting has been used specifically for the sequestration of chemicals or biomass is fertilized by sewage sludge (issued from waste water treatment or chemical process), fuel analysis should be carried out to identify any chemical impurities such as halogenated organic compounds or heavy metals.

Table 2. Major traded forms of solid biomass.

Fuel name	Typical particle size	Common preparation method
Whole tree	≥ 500 mm	No preparation or delimbed
Wood chips	5 mm to 100 mm	Cutting with sharp tools
Hog fuel	Varying	Crushing with blunt tools
Log wood /firewood	100 mm to 1000 mm	Cutting with sharp tools
Bark	Varying	Debarking residue from trees Can be shredded or unshredded
Bundle	Varying	Lengthways oriented & bound
Fuel powder	< 1 mm	Milling
Sawdust	1 mm to 5 mm	Cutting with sharp tools
Shavings	1 mm to 30mm	Planing with sharp tools
Briquettes	∅ ≥ 25 mm	Mechanical compression
Pellets	∅ < 25 mm	Mechanical compression
Bales		
Small square bales	0,1 m ³	Compressed and bound to squares
Big square bales	3,7 m ³	Compressed and bound to squares
Round bales	2,1 m ³	Compressed and bound to cylinders
Chopped straw or energy grass	10 mm to 200 mm	Chopped during harvesting or before combustion
Grain or seed	Varying	No preparation or drying except for process operations necessary for storage for cereal grain
Fruit stones or kernel	5 mm to 15 mm	No preparation or pressing and extraction by chemicals
Fibre cake	Varying	Prepared from fibrous waste by dewatering

Table 3. Overview of properties for the five main wood fuels.

Property	Name	Wood briquettes	Wood pellets	Wood chips	Hogfuel	Firewood
Origin		norm	norm	norm	norm	norm
Traded form		norm	norm	norm	norm	norm
Dimensions	D or P	Norm (D)	Norm (D)	Norm (P)	Norm (P)	Norm (D)
Moisture content	M	norm	norm	norm	norm	norm
Ash content	A	norm	norm	norm	norm	norm
Mechanical durability	DU	NA	norm	NA	NA	NA
Amount of fines	F	NA	norm	NA	NA	NA
Density	BD	inform	inform	inform	inform	inform
Additives		inform	inform	NA	NA	NA
Net calorific value	NCV	inform	inform	inform	inform	inform
Nitrogen content	N	norm/inform	norm/inform	norm/inform	norm/inform	NA
Sulphur content	S	norm/inform	norm/inform	inform	inform	NA
Chlorine content	Cl	norm/inform	norm/inform	norm/inform	norm/inform	NA
Ash melting behaviour	DT	inform	inform	inform	inform	NA

Norm: normative, has to be stated

Inform: informative, may be stated

Norm/inform: has to be stated if base material is chemically treated, otherwise informative

NA: not applicable

Table 4. Example of quality requirements for wood chips for a small boiler.

Property	Class	Explanation
Origin	1.1.1.1	Woody biomass, from forest or plantation wood, from whole trees without roots, from deciduous trees
Traded form	Wood chips	Cut with sharp instruments
Dimensions	P16	Chip particles of which 75% will fall through a screen of 16 mm round holes, with maximum 12% fines (less than 3.15 mm in size) and $\leq 3\% > 45$ mm and all < 120 mm. The cross sectional area of the oversized particles < 1 cm ²
Moisture content	M35	Fuel with a moisture content of less than 35% of total weight
Ash content	A1.0	Fuel with an ash content of less than 1% on dry basis
Bulk density	BD200	Bulk density of the loose chips to be larger than 200 kg/m ³ loose volume at the moisture content as received
Net calorific value	NCV	Can be calculated from the moisture content
Nitrogen content	N	Does not have to be specified since the fuel comes from a virgin source
Sulphur content	S	Does not have to be specified since the fuel comes from a virgin source
Chlorine content	Cl	Does not have to be specified since the fuel comes from a virgin source
Ash melting behaviour	DT	Does not have to be specified since the fuel comes from a virgin source

prEN14961 Part 2 Solid biofuels – quality requirements and classes. Part 2 Non industrial wood pellets - product standard

Stringent quality requirements have been formulated for wood pellets: for stoves and small boilers class A pellets; while for the larger boilers up to 500 kW, class B pellets with slightly lower quality requirements.

Important properties of wood pellets are the origin of the base material, the ash content, the durability and the chlorine content.

A1 class pellets have to be produced from either sawdust or from debarked roundwood. These materials have a low chemical content. Pellets in the A2 class may be produced from materials containing bark, while B class pellets may also contain by-products from board and paper mills as well as clean, used wood.

Since most stoves or small boilers do not have automatic de-ashing, it is important that the ash content of wood pellets is as low as possible. With a low ash content, one should only have to remove the ash once a week. So for Class A1 and A2 there is a low ash content, while for class B, which is meant for larger boilers with automatic de-ashing, a higher ash content can be tolerated.

Pellets endure a lot of wear from the moment they are produced until they arrive in the boiler. Wear produces fines, which have a different burning characteristic to whole pellets. If the fines content gets too large, the boiler will burn hotter than usual and the ash might form clinker. Therefore pellet durability should be in excess of 97.5%, meaning that the pellets can withstand normal handling without falling apart.

The chlorine content of the wood pellets is important, because the increased risk of corrosion with an increased amount of chlorine in the pellets.

The provisional table with all the quality requirements is given based on the latest version of December 2009.

prEN14961 Part 3 Solid biofuels – quality requirements and classes. Part 3 Non industrial wood briquettes - product standard

This draft standard is very much the same as the pellets standard with the quality classes A and B. In the briquette standard the durability test has been replaced by a measurement of the basic density. Briquettes do not sustain as much wear as wood pellets. The specifications can be found in Table 6.

Table 5 – Specification of wood pellets for non-industrial use

Property class /Analysis method	Unit	A1	A2	B	
Origin and source		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.1.6 Bark 1.2.1 Chemically untreated wood residues	1.1 Forest, plantation and other virgin wood 1.2 By-products and residues from wood processing industry 1.3 Used wood	
Diameter, D ^a and Length. L ^b ENXXXX	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40	D06 6 ± 1; 3,15 ≤ L ≤ 40 D08 8 ± 1; 3,15 ≤ L ≤ 40	
Moisture, M EN 14774-1, EN 14774-2	as received, w-% wet basis	M10 ≤ 10	M10 ≤ 10	M10 ≤ 10	
Ash, A EN14775	w-% dry	A0.7 ≤ 0,7	A1.5 ≤ 1,5	A3.0 ≤ 3,0	
Mechanical durability, DU EN 15210-1	as received, w-%	DU97.5 ≥ 97,5	DU97.5 ≥ 97,5	DU96.5 ≥ 96,5	
Normative	Fines at factory gate in bulk transport (at the time of loading) and in small (up to 20 kg) and large sacks (at time of packing or when delivering to end-user), F prEN 15149-1	w-% as received	F1.0 ≤ 1,0	F1.0 ≤ 1,0	F1.0 ≤ 1,0
	Additives c	w-% dry	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated
Net calorific value, Q EN 14918	as received, MJ/kg or kWh/kg	Q16.5, 16,5 ≤ Q ≤ 19 or Q4.6, 4,6 ≤ Q ≤ 5,3	Q16.3, 16,3 ≤ Q ≤ 19 or Q4.5, 4,5 ≤ Q ≤ 5,3	Q16.0, 16,0 ≤ Q ≤ 19 or Q4.4, 4,4 ≤ Q ≤ 5,3	
Bulk density, BD, EN 15103	kg/m ³	BD600 ≥ 600	BD600 ≥ 600	BD600 ≥ 600	
Nitrogen, N, prEN 15104	w-% dry	N0.3 ≤ 0,3	N0.5 ≤ 0,5	N1.0 ≤ 1,0	
Sulphur, S, prEN 15289	w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03	S0.04 ≤ 0,04	
Chlorine, Cl, prEN 15289	w-% dry	Cl0.02 ≤ 0,02	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03	
Arsenic, As, prEN 15297	mg/kg dry	≤ 1	≤ 1	≤ 1	
Cadmium, Cd, prEN 15297	mg/kg dry	≤ 0,5	≤ 0,5	≤ 0,5	
Chromium, Cr, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Copper, Cu, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Lead, Pb, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Mercury, Hg, prEN 15297	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1	
Nickel, Ni, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Zinc, Zn, prEN 15297	mg/kg dry	≤ 100	≤ 100	≤ 100	
Ash melting behaviour, DT ^d prEN15370	°C	Should be stated	Should be stated	Should be stated	

^a Selected size of pellets to be stated.

^b Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.

^c Type (e.g. starch, corn flour, potato flour, vegetable oil)

^d All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidized conditions should be stated

Table 6. Specification of wood briquettes for non-industrial use.

Property class Analysis method	Units	A		B ^a
		1	2	
Origin and source ^a		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.1.6 Bark 1.2.1 Chemically untreated wood residues	1.1 Forest, plantation and other virgin wood 1.2 By-products and residues from wood processing industry 1.3 Used wood
Diameter (D) or length (L ₁), width (L ₂) and height (L ₃) EN xxxxx	mm	Diameter, width and length to be stated	Diameter, width and length to be stated	Diameter,width and length to be stated
	Shape	Specify shape according to Figure 1 e.g. A or B, etc.	Specify shape according to Figure 1 e.g. A or B, etc.	Specify shape according to Figure 1 e.g. A or B, etc.
Moisture, M, EN 14774-1, EN 14774-2	as received, w-%	M12 ≤ 12	M15 ≤ 15	M15 ≤ 15
Ash, A EN 14775	w-% dry	A0.7 ≤ 0,7	A1.5 ≤ 1,5	A3.0 ≤ 3.0
Particle density, DE EN15150	g/cm ³	DE1.0 ≥ 1,0	DE1.0 ≥ 1,0	DE0.9 ≥ 0,9
Additives ^{b,c}	w-% dry	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated
Net calorific value, Q EN 14918	as received, MJ/kg or kWh/kg	Q15.5 ≥ 15,5 or Q4.3 ≥ 4,3	Q15.3 ≥ 15,3 or Q4.25 ≥ 4,25	Q14.9 ≥ 14,9 or Q4.15 ≥ 4,15
Nitrogen, N prEN 15104	w-% dry	N0.3 ≤ 0,3	N0.5 ≤ 0,5	N1.0 ≤ 1,0
Sulphur , S prEN 15289	w-% dry	S0.05 ≤ 0,05	S0.05 ≤ 0,05	S0.05 ≤ 0,05
Chlorine, Cl prEN 15289	w-% dry	Cl0.02 ≤ 0,02	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03
Arsenic, As prEN 15297	mg/kg dry	≤ 1	≤ 1	≤ 1
Cadmium, Cd prEN 15297	mg/kg dry	≤ 0,5	≤ 0,5	≤ 0,5
Chromium, Cr prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10
Copper, Cu prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10
Lead, Pb prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10
Mercury, Hg prEN 15297	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1
Nickel, Ni prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10
Zinc, Zn prEN 15297	mg/kg dry	≤ 100	≤ 100	≤ 100

^a Class B is not recommended for baking ovens.

^b Type (e.g. starch, corn flour, potato flour, vegetable oil).

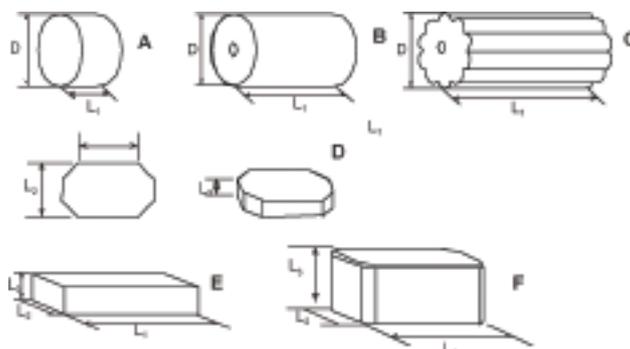


Figure 1. Examples of briquettes with different shapes.

prEN14961 Part 4 Solid biofuels – quality requirements and classes. Part 4 Non industrial wood chips - product standard

Quality requirements have been formulated for wood chips. Property classes A1 and A2 represent virgin wood and chemically untreated wood residues. A1 represents fuels with lower ash content indicating no or little bark, and a lower moisture content, while class A2 has slightly higher ash content and/or moisture content. B1 extended the origin and source of class A to include other material, such as short rotation coppice, wood from gardens etc., and chemically untreated industrial by-products and residues. Property class B2 also includes chemically treated industrial by-products and residues and used wood, but without harmful chemicals or heavy metals.

For wood chips the most important issues are the moisture content, the size distribution and the ash content.

The moisture content more or less dictates the type of boiler in which the chips can be used. Small boilers need a dry fuel, while the larger boilers can often work with a higher moisture content.

Since boilers up to 500 kW usually are fed with an auger, it is important that the chips are of an even size and do not contain too many oversized particles. Long thin particles might bridge over the intake opening of the fuel and prevent it from entering the boiler. Blocky oversized pieces can get stuck in the auger and prevent it from feeding fuel to the boiler.

Small boilers usually do not have automatic de-ashing and thus it is important to have a low ash content in the fuel,

which is the case in the class A fuels. Larger boilers usually have automatic de-ashing and so can tolerate the B class fuel with a higher ash content is tolerated.

The size distribution of wood chips is somewhat complicated, which is why the size requirements for the different classes are given in Table 7, while the full requirements for wood chips are given in Table 8.

N14961 Part 5 Solid biofuels – quality requirements and classes. Part 5 Non industrial firewood - product standard

Specification of firewood is stated in accordance with Table 1. It should be noted that the standard assumes that combustion-ready firewood is being traded. In case the wood is not seasoned enough, the standard can still be used but the actual moisture content shall be indicated.

The moisture content is the most important issue for firewood. Wood should be seasoned properly before being used, to prevent pollution due to unburned gasses, the build-up of running soot in the chimney and the emission of fine dust.

Since most stoves and small boilers have a relatively small burning chamber, the length and diameter of the logs is also important. In addition, the amount of split wood is important, because splitting helps in the seasoning of the wood.

Firewood specified according to classes A1 and A2 is suitable for use in stoves and fireplaces and class B in log wood boilers. The requirements are shown in Table 9.

Table 7. Particle size of wood chips.

Dimensions (mm) prEN 15149-1, prEN15149-2			
	Minimum 75 w-% in main fraction mm ^a	Fines fraction, w-% (< 3,15 mm)	Coarse fraction, (w-%), max. length of particle, mm
P16A	3,15 ≤ P ≤ 16 mm	≤ 12 %	≤ 3 % > 16 mm, and all < 31,5 mm The cross sectional area of the oversized particles < 1 cm ²
P16B	3,15 ≤ P ≤ 16 mm	≤ 12 %	≤ 3 % > 45 mm and all < 120 mm The cross sectional area of the oversized particles < 1 cm ²
P31,5	8 ≤ P ≤ 31,5 mm	≤ 8 %	≤ 6 % > 45 mm, and all < 120 mm The cross sectional area of the oversized particles < 2 cm ²
P45A	8 ≤ P ≤ 45 mm	≤ 8 %	≤ 6 % > 63 mm and maximum 3,5 % > 100 mm, all < 120 mm The cross sectional area of the oversized particles < 5 cm ²

^a The numerical values (P-class) for dimension refer to the particle sizes (at least 75 w-%) passing through the mentioned round hole sieve size (EN 15149-1).

Table 8. Specification of wood chips for non-industrial use.

Property class Analysis method	Unit	A		B	
		1	2	1	2
Origin and source		1.1.1 Whole trees without roots ^a 1.1.3 Stemwood 1.2.1 Chemically untreated wood residues 1.1.4.3 Logging residues, stored broadleaf	1.1.1 Whole trees without roots ^a 1.1.3 Stemwood 1.2.1 Chemically untreated wood residues 1.1.4.3 Logging residues, stored broadleaf	1.1 Forest, plantation and other virgin wood ^b 1.2.1 Chemically untreated wood residues	1.2. By-products and residues from wood processing industry 1.3.Used wood
Particle size, P	mm	to be selected from Table 1		to be selected from Table 1	
Moisture, M ^c EN 14774-1, EN 14774-2	w-%	M10 ≤ 10 M25 ≤ 25	M35 ≤ 35	to be specified	
Ash, A, A EN 14775	w-% dry	A1.0 ≤ 1,0	A1.5 ≤ 1,5	A3.0 ≤ 3,0	
Net calorific value as received, Q EN 14918	MJ/kg or kWh/kg	Q13.0 ≥ 13,0 or Q3.6 ≥ 3,6	Q11.0 ≥ 11,0 or Q3.1 ≥ 3,1	To be specified	
Bulk density, BD as received ^d EN 15103	kg/loose m ³	BD150 ≥ 150 BD200 ≥ 200	BD150 ≥ 150 BD200 ≥ 200	To be specified	
Nitrogen, N prEN 15104	w-% dry	-	-	N1.0 ≤ 1,0	
Sulphur, S prEN 15289	w-% dry	-	-	S0.1 ≤ 0,1	
Chlorine, Cl prEN 15289	w-% dry	-	-	Cl0.05 ≤ 0,05	
Arsenic, As prEN 15297	mg/kg dry	-	-	≤ 1	
Cadmium, Cd prEN 15297	mg/kg dry	-	-	≤ 2,0	
Chromium prEN 15297, Cr	mg/kg dry	-	-	≤ 10	
Copper, Cu prEN 15297	mg/kg dry	-	-	≤ 10	
Lead, Pb prEN 15297	mg/kg dry	-	-	≤ 10	
Mercury, Hg prEN 15297	mg/kg dry	-	-	≤ 0,1	
Nickel, Ni prEN 15297	mg/kg dry	-	-	≤ 10	
Zinc, Zn prEN 15297	mg/kg dry	-	-	≤ 100	

^a Excluding class 1.1.1.3 Short rotation coppice, if reason to suspect contamination of land or if planting has been used for the sequestration of chemicals or wood is fertilized by sewage sludge (issued from waste water treatment or chemical process).

^b Excluding classes 1.1.5 Stumps/roots and 1.1.6 Bark

^c Actual property class for moisture content to be stated. Moisture class M10 is for artificial dried wood chips.

^d Actual property class for bulk density to be stated. The bulk density is lower for coniferous (BD150) than for broadleaf (BD200) wood, see informative Annex A.

Table 9. Specification of oven-ready firewood for non-industrial use.

	Property class	Units	A1	A2	B
Normative	Origin and source		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues
	Wood species ^a		To be stated		To be stated
	Diameter, D ^b See Figure 2.	cm	D2 ≤ 2 D5 2 ≤ D ≤ 5 D10 5 ≤ D ≤ 10 D15 10 ≤ D ≤ 15 D15+ ≥ 15 (actual value to be stated)		D15 ≤ 15 D15+ ≥ 15 (actual value to be stated)
	Length, L ^{b, d} See Figure 2.	cm	L20 ≤ 20 L25 ≤ 25 L33 ≤ 33 L50 ≤ 50 L100 ≤ 100		L33 ≤ 33 L50 ≤ 50 L100 ≤ 100
	Moisture, M ^{b, f} EN 14774-1, EN 14774-2	w-% wet basis	M20 ≤ 20 M25 ≤ 25		M25 ≤ 25 M35 ≤ 35
	Moisture, U ^{b, f}	w-% dry basis	U25 ≤ 25 U33 ≤ 33		U33 ≤ 33 U54 ≤ 54
	Volume or weight	m ³ stacked or m ³ loose or kg	To be stated which volume or weight is used when retailed		
	Proportion of split volume	% of pieces	≥ 90 %	≥ 50 %	No requirements
	The cut-off surface		Even and smooth ^e	No requirements	No requirements
	Decay	% of pieces	No visible decay	≤ 5 %	If significant amount (more than 10 % of pieces) of decay exists it should be stated. In case of doubt particle density or net calorific value could be used as indicator.
Informative	Energy density, E ^g	kWh/m ³ loose or stacked kWh/kg	Recommended to be stated.		
	Drying		Recommended to be stated, if firewood is dried by natural seasoning by ambient air or artificially by hot air.		

^a Wood species (e.g. spruce, birch, beech) can be stated by using EN 13556 Round and sawn timber Nomenclature [1]. If firewood includes different wood species, the main wood species should be mentioned first.

^b The selected diameter, length and moisture contents of firewood have to be stated.

^c 85% of the firewood should be kept in specified diameter property class. For stoves it is recommended to use firewood with a diameter less than 15 cm. D2 and D5 are recommended for cookers and as kindling (ignition wood).

^d Length should be in the limits of ± 2 cm. It is allowed to have 15% firewood shorter than requested length including the limit value.

^e Use of chainsaw is considered to be smooth and even.

^f Both determination of moisture contents have to be stated: M (w-%) on wet basis and U (w-%) on dry basis. Moisture content should not be less 12 w-% on wet basis (M) or 13,64 w-% on dry basis (U). Calculation from M to U-basis is shown in informative Annex A.

^g The energy density (E) may be calculated according to Annex D in EN 14961-1, on the basis of the bulk density (BD) and the net calorific value. Example: For a firewood with a net calorific value on dry basis of 19 MJ/kg (5,28 kWh/kg) and a actual moisture content of 15 w-%, the net calorific value on as received basis is 15,78 MJ/kg (4,38 kWh/kg). For a bulk density of 410 kg/stacked m³, the energy density (E) then is 6 480 MJ/stacked m³ (1 800 kWh/stacked m³).

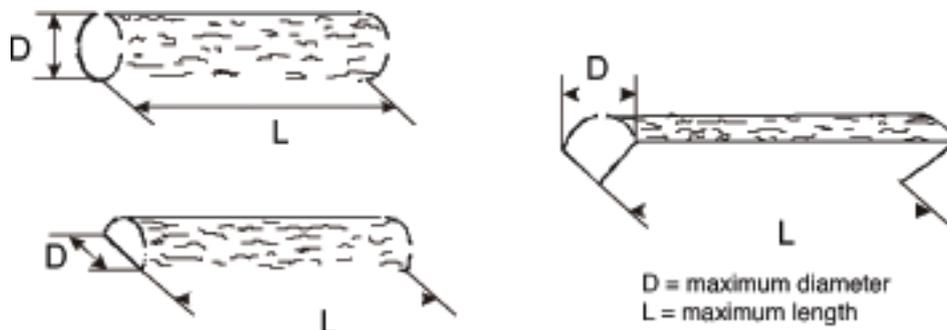


Figure 2. Dimensions of firewood.

prEN15234 Solid biofuels - Quality assurance

This standard will be divided into 6 parts: the first will give the general requirements, while the following 5 parts will deal with the quality assurance for the individual fuels like wood pellets, wood briquettes, wood chips, firewood and non woody pellets. Parts 2-6 are still being developed and are expected by the end of 2010. The general part 1 has been concluded by the working group and has been sent for a general hearing in the member countries.

The task of quality assurance is to guarantee to the buyer that the quality of the delivered fuel is in agreement with what was specified in the contract. This is done by internal auditing of the produced fuel and by presenting a quality declaration to the customer.

Quality assurance thus does not have to mean that the quality of the fuel is as required by a standard. Supplier and customer can agree to a set of specifications for a contract. Quality assurance will then check that the delivered fuel complies with that agreement.

In Ireland a Wood Fuel Quality Assurance scheme is being organized, attached to the Irish Bioenergy Association (IrBEA). Members of the WQFA will submit their internal quality control measures to outside auditing, to include random testing of their products to see if the quality of the products is in agreement with the contracts. The scheme will be operated by NSAI with the help of recognized Irish testing laboratories.

The WFQA will develop a quality mark, so that one can see on the packing materials or on the delivery notice that the products comply to the quality requirements.

More information

Standards cannot be read on online, but copies can be purchased from the National Standards Authority of Ireland (NSAI): 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. T + 353 1 807 3800, F + 353 1 807 3838, www.nsai.ie.

The development state of the standards can be found at: <http://www.cen.eu/CENORM/Sectors/TechnicalCommittees/Workshops/CENTechnicalCommittees/WP.asp?param=19930&title=CEN%2FTC+335>

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Information on the Irish Wood Fuel Quality Association: http://www.irbea.org/index.php?option=com_content&task=blogsection&id=20&Itemid=99

NOTE

All information is based on drafts from working group TC335 WG2 of March 2010. This COFORD Connects note will be updated when updated information becomes available from the standardization working group CEN TC335. The updated version of this COFORD Connects note will be made available on www.coford.ie and www.woodenergy.ie.

For information and a free on-line advisory service on the wood energy supply chain, the quality of wood fuels and internal handling visit www.woodenergy.ie

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