Guide to Irish Hardwoods

Gordon Knaggs and
Stella Xenopoulou

COFORD
NATIONAL COUNCIL FOR FOREST RESEARCH & DEVELOPMENT

GUIDE TO IRISH HARDWOODS

Gordon Knaggs and Stella Xenopoulou

with contributions from Seamus Heaney and Gavin Munro

COFORD, National Council for Forest Research and Development
Agriculture Building
Belfield, Dublin 4
Ireland
Tel: + 353 1 7167700
Fax: + 353 1 7161180

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Authors: Gordon Knaggs and Stella Xenopoulou

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Foreword

The Irish hardwood resource is very limited, with about 20,000 cubic metres of roundwood harvested each year in Ireland. However, the use of Irish hardwoods has grown considerably over the past decade. New processors and designers have entered and energised the market, and advocates such as Duncan Stewart have opened our eyes to the potential of native hardwoods. As a result, more and more architects and designers are keen to specify Irish hardwoods in applications as diverse as cladding, flooring and furniture.

To further develop the existing market and learn more about the needs of users of home-grown hardwoods, COFORD funded a study of the supply, procurement and use of Irish hardwoods under the Operational Programme for Agriculture Rural Development and Forestry. The results of this work led to the development of this *Guide to Irish Hardwoods.* A sister publication, *Market review and technical performance of Irish Hardwoods*, based directly on the project, is also being issued at this time.

The guide is the first comprehensive compliation of the properties, conversion and use of Irish hardwoods. It outlines the primary conversion steps and subsequent drying and storage of sawn timber. The strength and working properties are described, based on Irish research both in the COFORD project and work carried out by Enterprise Ireland's predecessors. Each species is presented in a stand-alone format which will be useful for those engaged in processing or finishing a particular species.

The guide is supported on the COFORD website by a searchable database of users and suppliers of home-grown hardwoods. This can be queried to ascertain suppliers and users of particular species and products in any region of the country.

By end of the decade close on 40,000 hectares - 100,000 acres - of young broadleaved plantations will have been established. This publication shows the potential market and the need for high quality at all stages in the production chain. Developments such as the Native Woodlands Scheme should result in an increase in the sustainable production of native hardwoods in the shorter term as areas are opened up to encourage regeneration. There is also a considerable area of broadleaf woodland in private ownership that has the potential to increase hardwood supply. The guide contains some valuable advice for these landowners on the marketing of hardwoods and how to maximise returns.

We commend the authors and their collaborators on this timely, well researched publication. It will become a valuable reference source for all those involved and interested in Irish hardwoods – be they growers, sawmillers or specifiers.

David Nevins
Chairman

Eugene Hendrick
Director

Timber Drying

For most purposes, it is essential that timber is dried before use. Undried or wet timber, if put into service, can cause many serious problems. Some reasons for drying timber include:

1. improved dimensional stability – timber dried to the correct moisture content will distort, shrink or expand less in service;
2. increased strength;
3. lower weight;
4. greater durability - timber below 20% moisture content does not decay, and is less susceptible to insect attack;
5. better machining, gluing and finishing properties.

Most timber-related standards specify the particular moisture content for particular end uses. This can range from 20%, in the case of structural timber, to 6-8% for hardwood flooring for use with underfloor heating.

For moisture contents of 18% or above, it is possible, if not always practicable, to air-dry timber. To achieve a moisture content below this level, kiln drying is essential. Different species dry at different rates and kiln drying schedules have been devised to dry timber in the most effective manner. PRL* Schedules published in *Timber Drying Manual* (Pratt 1997), and referred to for the individual species in this guide, have been shown to be generally appropriate for use with Irish hardwoods.

Movement values are given for each species. These values, expressed as a percentage, give the expected shrinkage (or swelling) as moisture content changes in service. These are given both for the tangential direction – parallel to the growth rings, and for the radial direction – at right angles to the growth rings. In most species, tangential movement is twice the radial movement. Along the grain – parallel to the axis of the tree trunk – movement is negligible and can normally be ignored.

* *Princes Risborough Laboratory*

Relevant kiln drying schedules

See the *Timber Drying Manual* (Pratt 1997) for full details, including modification actors and other recommendations.

PRL Schedule A

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	35	30.5
60	35	28.5
40	40	31.0
30	45	32.5
20	50	35.0
10	60	40.5

PRL Schedule C

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	40	37.5
60	40	36.5
40	45	40.5
35	45	39.5
30	45	38.5
25	50	42.0
20	60	47.5
15	65	48.5

PRL Schedule D

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	40	37.5
60	40	36.5
40	40	45.0
35	45	37.5
30	45	35.0
25	50	36.5
20	60	40.5
15	65	44.5

PRL Schedule E

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	47.0
60	50	46.0
40	50	45.0
30	55	47.5
25	60	49.0
20	70	54.5
15	75	56.5

PRL Schedule F

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	45.0
60	50	44.0
40	50	42.0
30	55	43.5
25	60	46.0
20	70	52.5
15	75	56.5

PRL Schedule G

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	47.5
60	50	46.0
40	55	51.0
30	60	54.5
25	70	62.5
20	75	62.5
15	80	61.0

PRL Schedule J

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	60	53.5
50	60	50.5
40	60	47.5
30	65	48.5
20	70	52.0

fearnóg

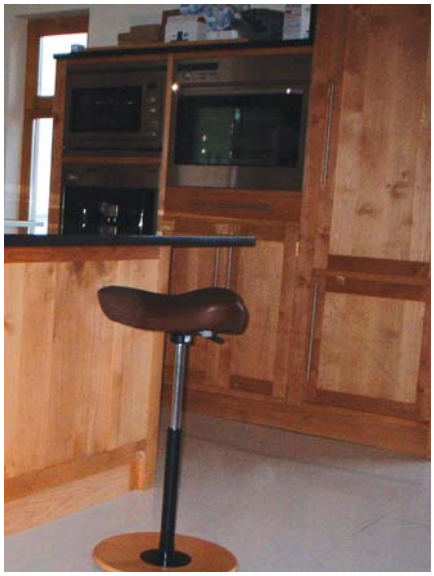
ALDER

Alnus glutinosa

The common alder, *Alnus glutinosa*, is a native species. It produces timber similar to that of the Italian alder, *Alnus cordata*. The timber of the American red alder, *Alnus rubra*, is often imported to Ireland for use in the manufacture of kitchen cabinets.

Alder is a diffuse-porous wood with a pale, pinkish-brown colour which darkens somewhat when exposured to light. Freshly felled alder logs develop a strong orange-brown colour on the end grain, which gradually fades. The timber is fine-grained, with relatively indistinct growth rings and with little lustre.

Alder rockinghorse by Patrick Bradley.



Alder kitchen (photo courtesy of TJ O'Sullivan, Coillte Wood Products, Dundrum).

Physical properties

The density of air-dry Irish-grown alder is around 500 kg/m^3 and is similar to material grown in British. The limited information available indicates that it can be classed as having medium movement: a change in relative humidity from 60 to 90% results in movement of 2.7% and 1.5% in the tangential and radial directions respectively.

Strength properties

Typical strength values for dry, defect-free alder are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions. The Irish values are based on work carried out in the former Forest Products Department of Enterprise Ireland. Italian alder is thought to have similar properties.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free alder.

PROPERTY	VALUE
Irish material (small sample)	
Bending strength (modulus of rupture)	110 N/mm^2
Stiffness	12800 N/mm^2
British-grown material	
Bending strength (modulus of rupture)	80 N/mm^2
Stiffness (modulus of elasticity)	8800 N/mm^2
Shear (parallel to grain)	12 N/mm^2
Compression (parallel to grain)	41 N/mm^2
Hardness (Janka)	2900 N
Impact strength (drop of hammer)	0.64 m

Durability and preservative uptake

Alder is known to be non-durable and is susceptible to woodworm attack, although it is not given a rating in EN 350 Part 2. Both sapwood and heartwood are easy to treat with preservatives.

Processing

Alder requires little power for machining. As the wood is soft, machining sometimes results in surfaces and edges that are irregular or damaged, especially when tools with blunt or poorly sharpened cutting faces are used. Tearing of fibres can occur around knots or where there is a pronounced slope of grain.

Conversion

Alder can be readily converted from the log, although poorly shaped stems, or those with growth stresses, may give a woolly surface. It is recommended that logs be converted quickly after felling as they can discolour rapidly after felling due to blue stain.

Drying

The timber is said to dry fairly rapidly and well. PRL kiln schedule J is suggested (see Table 2).

Machining

Alder can be readily sawn and moulded, but tools should be kept sharp to avoid tearing the wood. Due to its low density, care should be taken during machining to prevent indentations marks on the timber.

Nailing and screwing

The timber nails and screws well but it can split if fixed close to the ends or edges.

Finishing

Alder is easily sanded, and is excellent for staining. It also glues easily and takes all finishes.

TABLE 2: PRL Schedule J, recommended for kiln drying of Irish alder.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	60	53.5
50	60	50.5
40	60	47.5
30	65	48.5
20	70	52.0

Uses

Irish alder appears to have been little used in the past as a timber, although it occurs occasionally in archaeological excavations such as at Dublin's Wood Quay, where it was found as posts and turned items. Traditional European uses include clogs, turnery and brush backs. It has been widely used for plywood, especially in Eastern Europe, and was favoured for the production of charcoal for making gunpowder.

As mentioned above, American red alder is now widely imported for furniture making and, when suitably stained and finished, is almost indistinguishable from cherry. Alder veneer is easy to handle and bonds satisfactorily to substrates, such as chipboard or MDF.

Relative working properties of alder

The relative working properties of alder are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	***

NAILING

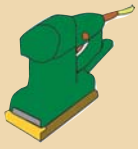
Prime/Select	Character Grade A	Character Grade B
***	*	*

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
***	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
***	***	***



SANDING

Prime/Select	Character Grade A	Character Grade B
***	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
***	***	***

fuinnseóg

ASH

Fraxinus excelsior

Ash or common ash (*Fraxinus excelsior*) is native to Ireland. Of the four ash species that grow naturally in Europe, the common ash and narrow-leaved or brown-bud ash (*Fraxinus angustifolia*) are the most important commercially. Narrow-leaved ash is unsuitable for forestry in Ireland. Although other ash species produce similar timber, the common ash is most extensively used for the production of high value timber in Ireland.

Ash is a ring-porous wood with pronounced grain, resembling oak but without the broad rays characteristic of that genus. This grain is seen to best effect in flat-sawn timber or rotary-cut veneer. The timber is typically white or pale in colour. Older trees can show a pronounced brown or blackish heart, especially those grown on wet sites, and this timber is sometimes referred to as 'olive ash'. This is not necessarily an indication of decay but olive heart can be brittle in larger diameter trees.

Ash vase by William Caffrey.

Ash side table by Patrick Phelan.

Physical properties

The density of Irish ash usually ranges from 670-710 kg/m^3, and is typically denser than ash from continental Europe. This is due to a faster rate of growth in Ireland. Movement in ash is classified as medium: a change from 60 to 90% relative humidity (12-20% moisture content) results in movement of 1.8% and 1.3% in the tangential and radial directions respectively.

Strength properties

Typical strength values for dry, defect-free ash are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions. The values for Irish-grown timber are based on work carried out in the former Forest Products Department of Enterprise Ireland.

In all respects, particularly in impact strength and shock resistance, ash is superior to oak, the species which is most often used as a yardstick. Tests have shown that fast-grown material (4-8 rings/25 mm) is strongest. This is acknowledged in British Standard 1129 for ladders, which specifies that ash for rungs should have a growth rate of between 4-16 rings/25 mm.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free ash.

PROPERTY	VALUE
Irish-grown	
Bending strength (modulus of rupture)	114 N/mm^2
Stiffness (modulus of elasticity)	12,600 N/mm^2
British-grown	
Bending strength (modulus of rupture)	116 N/mm^2
Stiffness (modulus of elasticity)	11,900 N/mm^2
Shear strength (parallel to grain)	16.6 N/mm^2
Compression (parallel to grain)	53 N/mm^2
Hardness (Janka)	6,140 N
Impact strength (drop of hammer)	1.07 m

Durability and preservative uptake

Ash is not a durable wood (Durability Class 5, EN 350 Part 2). It is classified as moderately easy to treat with preservatives but uptake may be erratic. It is not usually considered suitable for exterior use, even when treated. It is susceptible to insect attack, including powder-post beetle (*Lyctus brunneus*).

Processing

Felling period/conversion

Ash is more prone to longitudinal splitting if felled outside the winter months. Ash is readily converted from the log into sawn timber with few problems, and has only a moderately blunting effect on saws. It is essential, however, to convert and dry it promptly if discolouration (initially a greyish tinge) and later fungal and insect attack are to be avoided. It is readily peeled into veneer after pre-steaming.

Drying

Ash is prone to end splitting, and logs need to be end-sealed to prevent moisture loss. The timber dries readily with little tendency to checking, other than occasional end splits. As the moisture content of the wood in the standing tree is relatively low, drying times are short. PRL kiln schedule D (Table 2) is suggested for Irish ash.

TABLE 2: PRL Schedule D, recommended for kiln drying of Irish ash.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	40	37.5
60	40	36.5
40	40	35.0
35	45	37.5
30	45	35.0
25	50	36.5
20	60	40.5
15	65	44.5

Machining

Once dried, Irish ash is relatively stable and can be readily worked by both hand and machine tools. It can be turned, and is one of the best species for steam-bending into tight curves, although this technique is rarely used today except by traditional craftsmen and boatbuilders.

Finishing

Ash can be glued, painted and varnished, and takes a smooth finish, although filler is advised for the finest results due to the large pores.

Uses

In Ireland, the best known use of ash is for hurleys, where its outstanding shock resistance comes to the fore. Trees about 30 cm diameter at breast height (dbh) are suitable, the first 1.3 m – the hurley butt - are used, along with about 60 mm of the below-ground portion. The butt flare – the stem/root buttress - ensures that the grain follows the curve of the bas (head of the hurley), thereby avoiding the weakness which would result from the use of straight-grained material. The same result was achieved in hockey sticks by steam-bending the head, although this use of ash has now been superseded by Indian mulberry.

Many attempts have been made to devise substitutes for the traditional curved grain in hurleys by the use of laminating techniques, finger-jointing or the use of substitute materials but the traditional material still reigns supreme.

The strength and toughness of ash have also led to its use in applications such as tool handles, agricultural implements, snooker cues and other sports goods. Despite its low durability, ash was widely used in vehicle building, and can occasionally still be seen on our roads in the classic Morris Minor Traveller where it was used for the rear bodywork.

With the current fashion for pale-coloured woods, ash is now widely used for interior applications such as joinery and furniture. It is also used for flooring, skirting and architraves. It is an excellent firewood, and due to the low moisture content in the living tree, requires little drying before burning.

Logs with a diameter over 30 cm at the small end, with lengths of 2.4 m are the most acceptable for processing for joinery and furniture trade end-uses. Shorter, small-end diameter logs between 22-25 cm can be used as flooring material.While ash is reasonably widely available, the demand for hurley butts greatly exceeds supply and it is this portion of the stem, if well formed, that fetches the highest price. Upper lengths of these stems are an under-utilised resource. In recent years ash has been quite widely planted and increasing supplies can be expected in the future, particularly if stands are retained beyond hurley ash size.

Relative working properties of ash

The relative working properties of ash are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
*****	****	****

NAILING

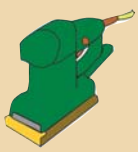
Prime/Select	Character Grade A	Character Grade B
*	*	*

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
****	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
*****	****	****



SANDING

Prime/Select	Character Grade A	Character Grade B
*****	*****	****

TURNING

Prime/Select	Character Grade A	Character Grade B
****	****	****

feá

BEECH

Fagus sylvatica

Although it is not a native species, beech has been widely grown in the past in Ireland. It is generally known as European beech (*Fagus sylvatica*). It usually occurs as a large tree, with most being of considerable age.

Beech is normally white or cream in colour, with no distinction between sapwood and heartwood. In old trees the heartwood can discolour, sometimes resulting in a mixture of red and white colours, known as 'red heart'.

As a diffuse-porous species, the growth rings are indistinct, giving the timber a uniform appearance. Radially cut (quarter-sawn) surfaces show a dark flecking due to the short wide rays, but this is not prominent on other surfaces. A common procedure in continental Europe is to steam the sawn timber before it is dried to give the wood a distinct pink or reddish tinge and reduce colour variation.

Beech chairs by Luc Racine.

Spalted beech salad bowl by Paddy Mulholland.

Physical properties

The density of Irish beech generally ranges between 700-730 kg/m^3. It is slightly heavier than beech from other European sources. It is less stable than most other Irish species: a change in relative humidity from 60 to 90% results in movement of 3.2% and 1.7% in the tangential and radial directions respectively.

Strength properties

Typical strength values for dry, defect-free beech are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions. Although these values are significantly greater than those of oak, beech is rarely used for structural purposes. The steaming process has been found to have no effect on strength or working properties.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free beech.

PROPERTY	VALUE
Irish-grown	
Bending strength (modulus of rupture)	116 N/mm^2
Stiffness (modulus of elasticity)	11,700 N/mm^2
British-grown	
Bending strength (modulus of rupture)	118 N/mm^2
Stiffness (modulus of elasticity)	12600 N/mm^2
Shear strength (parallel to grain)	16 N/mm^2
Compression (parallel to grain)	56 N/mm^2
Hardness (Janka)	6,400 N
Impact strength (drop of hammer)	1.14 m

Durability and preservative uptake

Beech sapwood and heartwood is not durable (Durability Class 5, EN 350 Part 2). It is susceptible to insect attack, although not to powder-post beetle. It is generally easy to treat with preservatives, although material with 'red-heart' is resistant to treatment. Such material, where the core of the log is a dark red or brown colour, is more common in Irish beech than that from European sources. While beech is not often treated in Ireland, when treated with creosote it is the favoured species for railway sleepers on the Continent.

Processing

Conversion

The conversion of beech from the log to sawn material is usually straightforward. However, stresses may be present, especially in crooked logs, which can lead to binding on the saw, splitting and distortion. It is not particularly abrasive.

Beech is prone to stain and discolour, so logs should be cut and dried promptly after felling. Traditionally, felling takes place during winter when the lower temperatures inhibit fungal growth.

A common Continental practice is to cut in the boule, where the log is cut through-and-through and then reassembled so that boards from the one log are kept together, allowing matching of grain and colour for fine furniture.

Drying

Beech dries rapidly, but it has a tendency to distort, and to develop both end and surface checks. Flat-sawn boards can cup markedly, with consequent loss of yield when planing to a smooth surface. An allowance should be made for this when sawing. Careful stacking and stickering is also advisable. PRL kiln schedule C (Table 2) has been found to be satisfactory; drying times are considerably less than for oak. Beech has a tendency to distort in drying where defects are present, even in air-drying. Knots will also split when drying to a low moisture content.

TABLE 2: PRL Schedule C, recommended for kiln drying of Irish beech.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	40	37.5
60	40	36.5
40	45	40.5
35	45	39.5
30	45	38.5
25	50	42.0
20	60	47.5
15	65	48.5

Machining

Once dry, beech machines well with both hand and machine tools, although the surface has a tendency to char when being sawn if the blade is not kept sharp. It takes an excellent finish when planed, moulded or sanded. It is an excellent timber for turning due to its fine, uniform texture.

Finishing

Beech takes all finishes well, and is particularly suitable for staining. It is readily glued.

Veneering

Beech is not cut for veneer in Ireland, but elsewhere veneering is widely practised. It is used throughout Europe, both sliced and peeled, in the manufacture of plywood, moulded products and furniture.

Uses

Beech is regarded as the standard furniture-making wood across Europe. Irish material has been shown to be eminently suitable for this purpose and is commonly used in the manufacture of kitchen and free-standing furniture. It is also in demand for stair manufacture, but for this market lengths of 3.66 m plus are required, with few defects present. It has a wide range of other uses, primarily indoors, where its lack of durability is not a handicap, including items such as toys, chopping boards, breadboards and tableware (where it will not taint food); craft and turned items; and joinery and tool handles. It is also used for decorative flooring, although allowance should made for the large moisture movement. In the past, it was widely used for steam bending, and this continues to today where it can be seen in the classic bentwood chair. On the Continent it is cut into veneer and used for plywood manufacture. Beech, in the initial stages of fungal attack, can show wide variation in colour with fine black lines when it is known as spalted beech. This is prized for turnery and craft items. Tops and heavy branches of beech, unsuitable for other uses, make excellent firewood when dry.

Beech is still reasonably widely available in Ireland, although many trees are over-mature and can contain internal defects. These affect timber yield and for this reason it can be difficult to determine the quality of beech when standing. A lot of mature beech trees in Ireland have defects in the longer lengths. Irish beech is generally available in logs of 60 cm dbh or more, which tend to be over-mature. It also comes available in smaller diameter logs which may not be very round. It is difficult to obtain 50 cm diameter lengths over 3.66 m in length with no defects.

Relative working properties of beech

The relative working properties of beech are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

NAILING

Prime/Select	Character Grade A	Character Grade B
***	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
***	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
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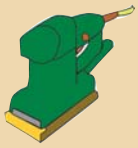


SANDING

Prime/Select	Character Grade A	Character Grade B
*****	*****	*****

TURNING

Prime/Select	Character Grade A	Character Grade B
*****	*****	***

beith

BIRCH

Betula pubescens
Betula pendula

Birch wood in Ireland is from either common birch (*Betula pubescens*) or silver birch (*Betula pendula*). Both are native to Ireland, and are relatively small, fast growing but short-lived trees.

Birch is a white or pale-coloured timber with fine even grain, often with a lustrous sheen. Occasional darker flecks may be present. Tangential (flat-sawn) and radial (quarter-sawn) surfaces are similar in appearance.

Birch kitchen (photo courtesy of TJ O'Sullivan, Coillte Wood Products, Dundrum).

Figured birch vase by Garth May.

Physical properties

Irish birch has a density of 550-590 kg/m^3, similar to European birch. The wood is moderately stable: a change in relative humidity from 60 to 90% results in movement of 2.2% and 1.7% in the tangential and radial directions respectively.

Strength properties

Typical strength values for dry, defect-free birch are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free birch.

PROPERTY	VALUE
Irish-grown (small sample)	
Bending strength (modulus of rupture)	78 N/mm^2
Stiffness	11200 N/mm^2
British-grown	
Bending strength (modulus of rupture)	123 N/mm^2
Stiffness (modulus of elasticity)	13,300 N/mm^2
Shear (parallel to grain)	16 N/mm^2
Compression (parallel to grain)	60 N/mm^2
Hardness (Janka)	5,500 N
Impact strength (drop of hammer)	1.04 m

Durability and preservative uptake

Birch is rated as non-durable (Durability class 5, EN 350 Part 2) and is susceptible to insect attack, but not to powder-post beetle (*Lyctus brunneus*) attack. Both heartwood and sapwood are rated as easy or moderately easy to treat with preservatives.

Processing

Felling period/conversion

The preferred felling time is late autumn or the winter months. However, site conditions might necessitate felling to be held over to early spring. Logs are readily converted to sawn timber, but have a tendency to bind on the saw blade and can give a woolly finish. Birch should be sawn and dried promptly after felling to avoid discolouration and decay. Recovery will be much reduced in trees with fluted stems, which is a common occurrence in Irish birch.

Drying

Birch dries rapidly with little degrade other than a slight tendency to distort, and a susceptibility to stain if drying is delayed. PRL kiln schedule F (Table 2) is suggested. Birch can get sticker stain marks if left to air-dry for prolonged periods.

TABLE 2: PRL Schedule F, recommended for kiln drying of Irish birch.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	45.0
60	50	44.0
40	50	42.0
30	55	43.5
25	60	46.0
20	70	52.5
15	75	56.5

Machining

Once dry, birch wood machines well, and generally takes a good finish, with some tendency to woolliness. It also turns well. Pre-boring is advisable when nailing and screwing.

Finishing

Birch glues well, and is excellent for taking stains and finishes.

Uses

Birch has traditionally been used for a wide range of products in furniture, household articles such as breadboards, brush backs and toys. It is now being used by kitchen manufacturers because of the attractive flecked appearance.

It is readily peeled into veneer and is widely used in the manufacture of plywood in Scandinavia and Russia. (Stress values are given in BS5268 Part 2 for the structural use of this plywood.) Other traditional non-timber uses include hurdles for horse racing and besoms (brooms). The sap can be tapped in springtime and fermented to produce beer. The timber is also being used increasingly for decorative flooring.

Birch is an excellent firewood but should be split and dried promptly to avoid decay and loss of heating value.

Quality birch is not readily available in quantity at present in Ireland. Research has commenced on the species with a view to improved stem and wood quality and increased productivity. Birch is considered to have considerable potential in Ireland.

The market preference is for logs of 2.44 m or longer with a diameter of 30 cm at the small end, with minimal fluting or twisted grain, as the latter will cause reduced yields and defects in the sawn boards.

Relative working properties of birch

The relative working properties of birch are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free) Smaller sized planks than veneer quality, some small live knots present, straight grain.

Character grade A Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.

Character grade B Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	***

NAILING

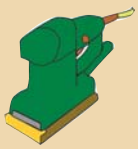
Prime/Select	Character Grade A	Character Grade B
***	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
***	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
***	***	***



SANDING

Prime/Select	Character Grade A	Character Grade B
***	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
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crann siléiní fiáin

CHERRY

Prunus avium
Prunus serotina

Wild cherry (*Prunus avium*) is native to Ireland. However, most cherry wood used in Ireland is imported American black cherry (*Prunus serotina*).

Cherry is a semi-ring porous wood. It has a fine texture, a pale sapwood and pinkish-brown heartwood, sometimes with a green tinge through the wood. The colour tends to darken appreciably on exposure to light. Growth rings are normally not prominent. As the trees are relatively small, commercial supplies usually incorporate both sapwood and heartwood, giving a contrast in colour. Occasional dark pith flecks may be present.

Irish cherry trees are sometimes frost-damaged when they are young. This can cause internal damage to the bole, and consequentially trees can be prone to butt rot when mature.

Cherry bed by Robert English.

Cherry and leather bowl by Seamus Cassidy.

Physical properties

The density of cherry ranges from 600-630 kg/m^3 in the air-dry condition. It is a relatively stable timber: an change in relative humidity from 60 to 90% results in movement of 2.0% and 1.2% in the tangential and radial directions respectively.

Strength properties

No information is available on the strength of Irish-grown cherry. Values for British-grown material have been published (see Table 1). These values are indicative only and will vary according to age, location and silvicultural conditions. The values are comparable to oak.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free British-grown cherry.

PROPERTY	VALUE
Bending strength (modulus of rupture)	110 N/mm^2
Stiffness (modulus of elasticity)	10,200 N/mm^2
Shear strength (parallel to grain)	16.5 N/mm^2
Compression strength (parallel to grain)	55 N/mm^2
Hardness (Janka)	5,800 N
Impact strength (drop of hammer)	1.09 m

Durability and preservative uptake

There is little information available on these properties. Cherry is probably moderately durable (Durability Class 3, EN 350 Part 2). It is known to be susceptible to insect attack.

Processing

Conversion

Wide boards are generally not available from home-grown sources because of the small diameter of logs available. Lengths are generally short, 2.44 m (8 ft) on average. Cherry logs can have some fluting present, especially in older logs, and this reduces recovery rate.

Cherry logs are readily sawn, with little tendency to bind or split. The timber can also be peeled or sliced for veneer.

Drying

The timber dries rapidly but has a tendency to distort in drying. End-sealing is recommended to minimise splitting. Preliminary air-drying will reduce the level of distortion. Care is required in the stacking and stickering of boards to reduce distortion. The timber will discolour under the sticker if it is allowed to air-dry for too long. Once dried, it remains relatively stable. PRL kiln schedule A (Table 2) is recommended.

TABLE 2: PRL Schedule A, recommended for kiln drying of Irish cherry.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	35	30.5
60	35	28.5
40	40	31.0
30	45	32.5
20	50	35.0
10	60	40.5

Machining

Cherry, if straight-grained, is easily worked by both hand and machine tools. Cross-grained material can pick up on cutters and a reduction in cutter angle may be beneficial. It turns well. There is a slight tendency to split when screwing or nailing.

Finishing

Cherry is easily sanded and takes finishes and stains well.

Uses

Cherry is an excellent timber for furniture, internal joinery and shopfitting, and is widely used in veneer form for panelling. It is also suitable for turnery and craft products. It has been used for decorative flooring but is relatively soft and is not suitable for heavily trafficked areas.

Cherry trees are not often found in the forest in quantity, they usually occur as single trees or in small groups. As a consequence, supplies are limited. It is, however, a fast-growing tree and has a significant potential for the future, mainly as a tree in mixture with other species.

Relative working properties of cherry

The relative working properties of cherry are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
*****	***	*

NAILING

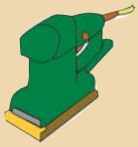
Prime/Select	Character Grade A	Character Grade B
***	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
***	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
***	***	***



SANDING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
***	***	***

leamhán
ELM

Ulmus glabra
Ulmus procera

Wych elm (*Ulmus glabra*) and English elm (*Ulmus procera*) occur in Ireland, the latter always planted. Dutch elm disease has killed most mature trees. Some small pockets remain, and suckers arise from roots, achieving a height of 3-5 m before succumbing to the disease. Logs which become available are from dead trees, and incipient decay can be present, so careful selection is necessary.

Elms typically have a medium brown timber, often with a variegated appearance. There is little colour differentiation between heartwood and sapwood. Wych elm frequently has a greenish tinge or may have distinctive green streaking. The grain is moderately fine, with the ring-porous growth giving an attractive grain pattern.

Sideboard in elm by Luc Racine.

"Celtic Moor" elm bowl by Paddy Mulholland.

Physical properties

The density of English elm ranges from 530-570 kg/m^3 and that of wych elm from 580-620 kg/m^3, although different sources quote quite a wide range for both species. Movement in English elm is classified as medium: an increase in relative humidity from 60 to 90% results in movement of 2.4% and 1.8% in the tangential and radial directions respectively. Movement in wych elm is similar.

Strength properties

Typical strength values for dry, defect-free English elm (British-grown) are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions.

Due to the interlocked grain, elm is particularly strong in cleavage (resistance to splitting). In line with its greater density, wych elm is significantly stronger than English elm. Timber from dead trees is likely to have significantly lower strength.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free English elm (British-grown).

PROPERTY	VALUE
Bending strength (modulus of rupture)	68 N/mm^2
Stiffness (modulus of elasticity)	7,000 N/mm^2
Shear strength (parallel to grain)	12.5 N/mm^2
Compression (parallel to grain)	34 N/mm^2
Hardness (Janka)	3,650 N
Impact strength* (drop of hammer)	0.58 m

** This value is for freshly felled logs from live trees. Present day supplies from dead trees may not reach these values.*

Durability and preservative uptake

Both species are classified as slightly durable (Durability class 4, EN350 Part 2). Wych elm is reputed to have superior decay resistance. They are susceptible to insect attack, but usually not to powder-post beetle (*Lyctus brunneus*). The sapwood is in Class 1 (easy to treat), while the heartwood falls into Class 2 or 3 (moderately easy to difficult to treat).

Processing

Conversion

Elm logs, especially those with distorted grain, can be difficult to saw and tend to bind on the saw blade. Blunting is moderate. If quantities of elm logs are to be sawn. a wider set to the saw teeth can be advantageous although it will reduce yield to some extent. Some loss in conversion can be expected due to splitting of core material during drying.

Drying

Elm dries relatively rapidly but has a very marked tendency to distort. Extreme care is needed in stacking and stickers should be carefully positioned at close intervals. Weighting the top of the stack assists in reducing distortion and twist. PRL kiln schedule A (Table 2) is recommended. Preliminary air-drying is beneficial as it reduces the tendency to distort.

TABLE 2: PRL Schedule A, recommended for kiln drying of Irish elm.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	35	30.5
60	35	28.5
40	40	31.0
30	45	32.5
20	50	35.0
10	60	40.5

Machining

Even when dry, elm is difficult to saw and machine cleanly. Woolliness frequently occurs in the saw cut, and raised or torn grain can be a problem when planing and moulding, particularly with wych elm. A reduction in the cutting angle can be useful, but further sanding is frequently necessary.

Finishing

Once a good surface is achieved, elm takes finishes well. It glues well and will take nails and screws without splitting.

Uses

Elm has a wide range of traditional uses, including coffins, weatherboarding, boatbuilding, furniture and turned items. It was the preferred species for water pipes (before metal was used) and specimens are still unearthed from time to time. Their longevity is due to the absence of oxygen in saturated soil, which prevents fungal attack. Today, when it is available, elm is used for furniture, craft items, and flooring.

Elm is a diminishing resource and virtually all supplies are from dead trees. Careful selection is necessary to avoid material which has some decay, especially for applications such as flooring where strength and abrasion resistance are important.

Relative working properties of elm

The relative working properties of elm are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	***

NAILING

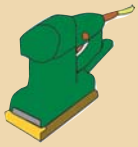
Prime/Select	Character Grade A	Character Grade B
***	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
***	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
***	***	***



SANDING

Prime/Select	Character Grade A	Character Grade B
***	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
***	***	***

dair OAK

Quercus robur
Quercus petraea

Irish oak wood comes from two species: pedunculate (*Quercus robur*) and sessile oak (*Q. petraea*). Hybrids also occur. The wood from the species cannot be distinguished with any certainty. It is the same as European oak, which is often described by the country or region of origin, for example French, German, or Spessart[1].

Oak is a coarse-grained, ring-porous wood with pronounced annual rings. Typically it has pale sapwood and yellowish-brown heartwood, although some examples may have dark brown heartwood. Irish-grown oak, due to its fast rate of growth, tends to have a more pronounced grain than oak from Europe. Quarter-sawn or radially cut oak shows a prominent 'silver figure' due to the broad rays, whereas the growth rings are more noticeable on the flat-sawn or tangential face.

[1] *A region of Germany renowned for the quality of oak produced.*

Oak floor by Frank Tormey.

Oak and bog oak chess set by Brian Murray.

Physical properties

The density of Irish oak generally ranges from 650-750 kg/m^3, air-dry, and is heavier than oak from European sources. A change in relative humidity from 60 to 90% results in movement of 2.5% and 1.5% in the tangential and radial directions respectively.

Strength properties

Typical strength values for dry, defect-free oak are given in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions. BS 5268 Part 2: Structural Use of Timber gives grade stresses for oak for structural purposes.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free oak.

PROPERTY	VALUE
Irish-grown	
Bending strength (modulus of rupture)	128 N/mm^2
Stiffness (modulus of elasticity)	14,800 N/mm^2
British-grown	
Bending strength (modulus of rupture)	97 N/mm^2
Stiffness (modulus of elasticity)	10,000 N/mm^2
Shear strength (parallel to grain)	13 N/mm^2
Compression (parallel to grain)	52 N/mm^2
Hardness (Janka scale)	5,500 N
Impact strength (drop of hammer)	0.84 m

Durability and preservative uptake

Oak heartwood is durable (Durability Class 2, EN 350 Part 2). Historically Irish oak has been regarded as particularly durable. However, as with all species, the sapwood is not durable, and due to the presence of large pores it is susceptible to powder-post beetle (*Lyctus brunneus*) attack. The sapwood is permeable and can be readily treated with preservatives. The heartwood is impermeable, and this property has led to its use for whiskey and wine barrels. (American red oak is more permeable and is not suitable for this purpose.)

Processing

Conversion

The conversion of oak from the log to sawn material is relatively straightforward with straight-grained material. Some logs may contain internal stresses (tension wood), which can lead to binding of the saw blade in the cut or to splitting of the log. Considering its density, it is not particularly abrasive and normal steel saws can be used, although Stellite tipping will increase blade life. If quarter-sawn material is required, considerable handling is necessary and the yield is markedly reduced.

Smaller diameter logs are more wasteful to process due to the greater proportion of knotty, distorted core material which causes reduced yield due to splitting during drying.

Oak, generally of the highest quality, is also sliced into veneer for the furniture and panelling industries. It slices and peels satisfactorily after appropriate pre-steaming.

It is one of the most suitable species for steam bending and can be bent into a tight radius of curvature.

Drying

Oak is one of the most difficult timbers to dry and is extremely prone to checking and distortion, even when air-drying in the Irish climate. The ends of boards should be painted or sealed to prevent end-splitting, and the stacks roofed to protect the timber from direct sunlight. Oak will, however, dry quite well, albeit slowly, if no defects are present. For kiln-drying, a very mild schedule is necessary and drying times are lengthy, particularly when drying heavier (e.g. 75 mm) sections from green. PRL schedule C (Table 2) has been found to be satisfactory. It is not economically feasible to kiln-dry thicker material such as beams for traditional construction due to the prolonged drying times.

TABLE 2: PRL Schedule C, recommended for kiln drying of Irish oak.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	40	37.5
60	40	36.5
40	45	40.5
35	45	39.5
30	45	38.5
25	50	42.0
20	60	47.5
15	65	48.5

Machining

Once dried, oak is moderately stable and is easily worked with both hand and machine tools. It does have a tendency to splinter on cross-cutting, and to split. Pre-boring when using screws and nails is advisable. It planes and sands satisfactorily.

Finishing

Due to the coarse grain, it is advisable to use filler if a fine finish is required, although it takes paints and varnishes without difficulty. Traditional finishes such as ‘liming’ or ‘fuming’ can produce effects from a pale grey, with enhanced grain, to a jet black – the so-called Tudor or Jacobean oak.

Oak has a high tannin content. In contact with mild steel or iron in damp conditions, an intense blue-black colour is produced in the wood which cannot be removed. When processing, care must be taken to avoid such contact – steel wool should not be used in finishing and adhesives must be iron-free and stored in non-metallic containers. For external use, fixings must be of stainless steel or other non-ferrous metals.

Uses

Oak has a very long history of use, both in this country and elsewhere. Due to its durability and former abundance, it is the species most often encountered on archaeological sites. Traditional uses include structural work, boatbuilding and furniture and joinery.

Today, oak still has many uses, from external applications such as cladding, joinery and fencing; internal uses such as structural applications, furniture, joinery and shopfitting; to specialised uses such as cooperage, craftwork and turnery and coffin-making. It is being used increasingly in decorative flooring.

Oak is the most widely available of all Irish hardwoods, although kiln-dried material suitable for internal use may have to be ordered specially. Long lengths of the lower grades suitable for structural use are available but defect free lengths over 3.66 m (12 ft) are more difficult to source. Smaller diameter logs can be used for flooring where shorter, narrower boards with sapwood are acceptable.

Relative working properties of oak

The relative working properties of oak are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

NAILING

Prime/Select	Character Grade A	Character Grade B
*****	***	*

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
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GLUING

Prime/Select	Character Grade A	Character Grade B
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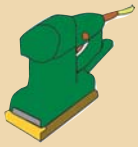

SANDING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
***	***	***

phoipleog

POPLAR

Populus tremula
Populus nigra

Poplar, as a genus, is found throughout the northern hemisphere, with two species native to Ireland: aspen, *Populus tremula* and black poplar, *Populus nigra*. Poplars hybridise readily and most plantation-grown trees are hybrids.

Poplar wood is generally light in colour but is occasionally pale brown or reddish. It is light in weight, of fine texture and typically rapidly grown with wide but indistinct rings.

While poplar is not often marketed, reasonable volumes are available in Ireland.

Poplar shelving by Patrick Phelan.

Poplar lamp shade on spalted beech stand by John Kemp.

Physical properties

The density of air-dry Irish grown poplar is low but can be quite variable, generally ranging from 380-450 kg/m^3. Poplar is classed as having medium movement: a change in relative humidity from 60-90% results in movement of 2.8% and 1.2% in the tangential and radial directions respectively. Initial shrinkage from green can be quite high.

Strength properties

Typical strength values for dry, defect-free black poplar of British origin are given in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions. Certain clones of poplar are included with coniferous species in EN 1912:1998 – Structural timber – Strength classes – Assignment of visual grades and species, and are assigned to strength classes C18 and C24 in France.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free black poplar of British origin.

PROPERTY	VALUE
Bending strength (modulus of rupture)	72 N/mm^2
Stiffness (modulus of elasticity)	8,600 N/mm^2
Shear strength (parallel to grain)	10.5 N/mm^2
Compression (parallel to grain)	37 N/mm^2
Hardness (Janka scale)	2,360 N
Impact strength (drop of hammer)	0.61 m

Durability and preservative uptake

In common with many other white or pale timbers, poplar is not durable (Durability class 5, EN 350 Part 2) and is susceptible to insect attack. Sapwood is usually easy to treat while heartwood is difficult, although uptake of preservatives may be variable.

Processing

Conversion

The poplars are generally easy to convert, although sawing often produces a woolly surface.

Drying

Most poplars dry easily and well, but have a tendency to retain pockets of moisture. The initial moisture content can be very high (up to 300% has been recorded) so drying times can be prolonged. PRL kiln schedule E is suggested (Table 2). It has a tendency to suffer from distortion (spring and bow) in drying, especially in longer lengths (over about 3 m).

TABLE 2: PRL Schedule E, recommended for kiln drying of Irish poplar.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	47.0
60	50	46.0
40	50	45.0
30	55	47.5
25	60	49.0
20	70	54.5
15	75	56.5

Machining

Poplar saws and machines well, but has a tendency to a woolly finish so sharp cutters should be used. Chipping of the end grain is very likely to occur, even with sharp cutters. Because of its softness, care has to be taken when handling machined timber to avoid indentations.

Finishing

Poplar sands and glues well, and generally takes a reasonable finish, although occasionally the uptake of stains and varnishes can be patchy.

Uses

Poplar is regarded as a low strength, utility timber and has been widely grown across Europe. It is used for plywood manufacture, boxes for foodstuffs (being free of taint), pallets and packaging, including woodwool. Aspen is a poplar species which has been widely used for the manufacture of OSB (oriented strand board) in the United States and Canada. In the 1960s, poplar was widely planted in Ireland with the intention of use for match splints from peeled veneer, although the manufacturing plant closed before sizeable timber was available. It has also been used for disposable chopsticks. Poplar can be used for furniture manufacture and is not unlike sycamore in appearance. It is also suitable for sheeting and mouldings.

Relative working properties of poplar

The relative working properties of poplar are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	***

NAILING

Prime/Select	Character Grade A	Character Grade B
***	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
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GLUING

Prime/Select	Character Grade A	Character Grade B
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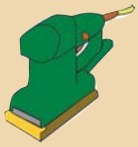

SANDING

Prime/Select	Character Grade A	Character Grade B
***	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
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castán

SPANISH CHESTNUT

Castanea sativa

Spanish, or sweet chestnut (*Castanea sativa*) is an introduced species. It is not related to the horse chestnut (*Aesculus hippocastanum*), which is of little value as a timber tree.

The grain and overall appearance of Spanish chestnut is very similar to oak, but it lacks its broad rays and does not produce that species's silver figure on quarter sawn surfaces. The colour tends to a fairly uniform golden brown. It is a moderately coarse grained wood with prominent growth rings.

Spanish chestnut is not widely available. The quality of large trees can be variable, and smaller logs are usually of better quality with less shake or spiral grain.

Rustic table in Spanish chestnut by Andrew St Ledger.

Spanish chestnut sculpture by Michael Warren.

Physical properties

Chestnut is a ring-porous wood, with a density of 500-550 kg/m^3 (less dense than oak). Irish-grown chestnut appears to be denser than that from British or European sources. It is an exceptionally stable timber: a change in relative humidity from 60 to 90% results in movement of 1.4% and 0.8% in the tangential and radial directions respectively

Strength properties

Typical strength values for dry, defect-free Spanish chestnut are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions. All of the values for Spanish chestnut are considerably lower than those for oak.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free Spanish chestnut.

PROPERTY	VALUE
Irish-grown	
Bending strength (modulus of rupture)	72 N/mm^2
Stiffness (modulus of elasticity)	9,400 N/mm^2
British-grown	
Bending strength (modulus of rupture)	79 N/mm^2
Stiffness (modulus of elasticity)	8,200 N/mm^2
Shear strength (parallel to grain)	10.5 N/mm^2
Compression (parallel to grain)	44 N/mm^2
Hardness (Janka scale)	3,200 N
Impact strength (drop of hammer)	0.58 m

Durability and preservative uptake

Chestnut heartwood is durable (Durability Class 2, EN 350 Part 2). As with all species, the sapwood is not durable and, due to the large pores, is susceptible to powder-post beetle (*Lyctus brunneus*). The sapwood is moderately easy to treat (treatability Class 2), while the heartwood is extremely difficult to treat (treatability Class 4), although this is of little consequence as it has good natural durability.

Processing

Conversion

Clean, straight-grained logs can be converted to sawn timber with little degrade. Larger, older logs are prone to contain shakes and can have pronounced spiral grain near the bark, which leads to severe distortion of the sawn boards. Chestnut typically has very narrow sapwood so that yields of heartwood can be high.

Drying

Chestnut is a difficult and slow species to dry, so extreme care is necessary. While checking is not usually severe, collapse and honeycombing frequently occur with rapid drying. PRL kiln schedule D (Table 2) is appropriate. If not dried soon after sawing, it is susceptible to a yellow staining (this can also affect oak). Preliminary air-drying can reduce the level of distortion and collapse. This should be done under cover to reduce the risk of staining.

TABLE 2: PRL Schedule D, recommended for kiln drying of Irish-grown Spanish chestnut.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	40	37.5
60	40	36.5
40	40	35.0
35	45	3.5
30	45	35.0
25	50	36.5
20	60	40.5
15	65	44.5

Machining

Good quality material saws, planes and moulds satisfactorily. It has a tendency to split, and pre-boring for nails and screws is advisable. Overall, however, it is easier to work than oak.

Finishing

Due to the coarse grain, it is advisable to use filler if a fine finish is required. It can be sanded readily and takes stains and finishes well. Chestnut has an extremely high tannin content. In contact with mild steel in damp conditions, this produces an intense blue-black discolouration which cannot be removed. Brass or stainless fixings should be used. Ordinary steel wool should not be used for finishing, nor should adhesive be mixed or stored in metallic containers.

Uses

Due to its close resemblance to oak, chestnut is frequently used for the same purposes, other than structural. It is excellent for furniture and joinery, and for decorative turned items and craftwork. Spanish chestnut is now frequently used for flooring. While not as hard wearing as beech or oak, it is particularly stable and has an attractive grain when flat sawn. Traditionally it has been used for coffins, split (or cleft) fencing, and gates. In Europe, it is the standard species for poles to support vines and hops.

Relative working properties of Spanish chestnut

The relative working properties of Spanish chestnut are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	***

NAILING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
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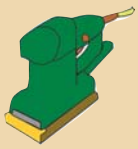

SANDING

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TURNING

Prime/Select	Character Grade A	Character Grade B
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seiceamóir

SYCAMORE

Acer pseudoplatanus

Sycamore (*Acer pseudoplatanus*) is a European species and, although not native to Ireland, it has become naturalised and is a common component of many hedgerows. Trees can grow rapidly and reach a large size.

Sycamore is a diffuse-porous wood, white or pale cream in colour, with a fine texture and a moderate lustre. Growth rings are indistinct. Although the timber is usually straight-grained, some trees can have marked grain patterns, such as fiddle-back or bird's eye figure, which are highly prized.

Sycamore is reasonably widely available in moderate quantities. Figured material is scarce and valuable.

Sycamore kitchen by Patrick Phelan.

Sycamore plate and bowls by Cyril Moran.

Physical properties

The density of air-dry Irish-grown sycamore ranges from 600-660 kg/m^3. It is classed as having medium movement: a change in relative humidity from 60 to 90% results in movement of 2.8% and 1.4% in the tangential and radial directions respectively.

Strength properties

Typical strength values for dry, defect-free sycamore are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free sycamore.

PROPERTY	VALUE
Bending strength (modulus of rupture)	99 N/mm^2
Stiffness (modulus of elasticity)	9,400 N/mm^2
Shear strength (parallel to grain)	17 N/mm^2
Compression (parallel to grain)	48 N/mm^2
Hardness (Janka scale)	4,850 N
Impact strength (drop of hammer)	0.84 m

Durability and preservative uptake

In common with many other white or pale timbers, sycamore is not durable (Durability class 5, EN 350 Part 2) and it is susceptible to insect attack. Both sapwood and heartwood are easy to treat with preservatives.

Processing

Felling period/conversion

To retain the pure white colour, felling in November and December is recommended, followed by immediate conversion and drying.

Sycamore is generally easy to saw from the log, although poorly shaped stems with growth stresses may bind on the saw blade. Straight, knot-free logs are easier to saw and dry.

Drying

While sycamore dries rapidly with little distortion or splitting, it is extremely prone to discolouration, due not only to fungal attack but also to a chemical or enzymatic process which leaves marks under the stickers used to separate boards – so-called sticker-stain. The traditional, although costly, method for avoiding this is to ‘end-rear’ or stack the boards on end for a period before piling. Where it is desired that the timber remains as white as possible, kiln temperatures should not exceed 50oC, using PRL kiln schedule A, otherwise schedule E should be used (Table 2).

TABLE 2: PRL Schedules A and E, recommended for kiln drying of Irish sycamore.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Schedule A (white timber)		
Green	35	30.5
60	35	28.5
40	40	31.0
30	45	32.5
20	50	35.0
10	60	40.5
Schedule E		
Green	50	47.0
60	50	46.0
40	50	45.0
30	55	47.5
25	60	49.0
20	70	54.5
15	75	56.5

Machining

The timber is readily sawn or moulded when dry, although a reduction in cutter angle is necessary for ripple figure. Cutters should be kept sharp to avoid charring. Sycamore timber turns smoothly.

Finishing

Sycamore is easily sanded and is excellent for staining. It also glues easily and takes all finishes.

Uses

Sycamore has traditionally been used for domestic items such as cheeseboards and breadboards as it will not taint food. It is also used for turned items and brush heads. It is being used increasingly for furniture and craftwork, and has been found to be suitable for decorative flooring. Figured logs are often sliced into veneer for use in panel furniture and in the manufacture of musical instruments, as is non-figured material.

Logs for processing should be 30 cm at the small end and a minimum of 2.5 m long.

Relative working properties of sycamore

The relative working properties of sycamore are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	***

NAILING

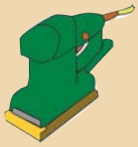
Prime/Select	Character Grade A	Character Grade B
***	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
***	***	***

GLUING

Prime/Select	Character Grade A	Character Grade B
***	***	***



SANDING

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***	***	***

TURNING

Prime/Select	Character Grade A	Character Grade B
***	***	***

gallchnó

WALNUT

Juglans regia
Juglans nigra

Walnut is not a native tree. The two species commonly used are European walnut *Juglans regia*, and American or black walnut, *Juglans nigra*. Both are only occasionally found growing in Ireland but produce excellent and highly prized timber.

European walnut can be quite variable in colour, but is typically a greyish-brown with streaks of lighter and darker wood, often with a noticeable waviness. American black walnut is generally darker and more uniform in colour, the heartwood contrasting with the pale sapwood, although the wood is often steamed which darkens the sapwood considerably.

Walnut tallboy by Patrick Phelan.

Walnut plate by Paddy Mulholland (photo by Ken Finegan).

Physical properties

Walnut is a semi-ring porous to diffuse-porous wood; the density of air-dry European walnut averages 630 kg/m^3, while that of American black walnut averages 610 kg/m^3. It is classed as having medium movement: a change in relative humidity from 60 to 90 % results in movement of 2.0 and 1.6% in the tangential and radial directions respectively (similar for both species).

Strength properties

No information is available for Irish-grown material, although New Zealand work has shown that black walnut grown there had similar properties to American-grown material.

Typical strength values for dry, defect-free walnut are shown in Table 1. These values are indicative only and will vary according to age, location and silvicultural conditions.

TABLE 1: Typical strength values for dry (12% moisture content), defect-free walnut.

PROPERTY	VALUE
European walnut	
Bending strength (modulus of rupture)	100 N/mm^2
Stiffness	10,500 N/mm^2
Hardness (Janka scale)	4,500-5,000 N
American/black walnut	
Bending strength (modulus of rupture)	110 N/mm^2
Stiffness (modulus of elasticity)	11,600 N/mm^2
Compression (parallel to grain)	54 N/mm^2
Hardness (Janka)	2,900 N

Durability and preservative uptake

European walnut is moderately durable (Durability class 3, EN 350 Part 2), but is susceptible to insect attack. The sapwood is easy to treat while the heartwood is difficult to treat. The durability of American walnut is similar to that of European walnut.

Processing

Conversion

Despite its hardness, walnut saws easily. Yields can be low as trees typically are found in parkland settings rather than in high forest, with a consequent increase in misshapen trunks. It is generally cut through-and-through leaving both sides of the plank with wane.

Drying

Walnut dries rather slowly, with some tendency to develop honeycomb. PRL kiln schedule E is suggested (Table 2). The end grain should be sealed to prevent end splits.

TABLE 2: PRL Schedule E, recommended for kiln drying of Irish walnut.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	47.0
60	50	46.0
40	50	45.0
30	55	47.5
25	60	49.0
20	70	54.5
15	75	56.5

Machining

Once dry, walnut machines well on saw or moulder. It is an excellent wood for turning. While it has a high resistance to splitting, it should be pre-drilled before screwing.

Finishing

Walnut sands and glues easily and takes an excellent finish.

Uses

Walnut is one of the prime cabinet-making woods and has been used in furniture for many centuries. Due to its high value, it is often sliced for veneer in Europe. It is the traditional wood for high-class gun butts and is favoured for turnery. It is also used for high quality flooring, particularly where a contrast is required with paler species. However, it is not particularly hard-wearing and should not be used in areas of heavy traffic.

Relative working properties of walnut

The relative working properties of walnut are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
*****	*****	*****

NAILING

Prime/Select	Character Grade A	Character Grade B
*****	***	***

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
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GLUING

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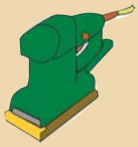

SANDING

Prime/Select	Character Grade A	Character Grade B
*****	*****	*****

TURNING

Prime/Select	Character Grade A	Character Grade B
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iubhar
YEW
Taxus baccata

Yew, *Taxus baccata*, is botanically classed as a conifer but is actually harder and heavier than most hardwoods. It is one of the few native Irish softwoods. It has been included here as its properties and applications are similar to those of home-grown hardwoods.

Yew is a long-lived tree and a symbol of everlasting life, which accounts for its frequent planting in, and surrounding, graveyards. It is also said that yew was planted to supply material for bow making, in walled churchyards to prevent livestock from eating its toxic foliage. The frequently planted Irish yew is a fastigiate form (*fastigiata*) that originates from Florencecourt in Co Fermanagh.

Yew heartwood is quite variable in colour, ranging from a rich red to a pale brown, frequently with a streaky appearance. The pale sapwood is clearly marked. As the logs are often irregular with deep fluting, the grain can be variable and encased bark is common. The texture is fine and the growth rings are often narrow but distinct.

Yew is not widely available in Ireland. It generally becomes available as a result of one or two trees being felled in the course of construction and other developments. It is not grown as a forest tree but it occurs naturally in mixed native woodland and is slowly spreading back naturally into plantations at a number of locations.

Yew bowl by Seamus Cassidy.

Yew chair and table by William Keniry.

Physical properties

Yew is a heavy timber, with an average density of 670 kg/m^3. Little has been published regarding its movement characteristics but, because of its low shrinkage, it is considered to be stable in service.

Strength properties

There is not much published information on the strength properties of yew. It is probably the equal of oak in most parameters. It has good shock resistance.

Durability and preservative uptake

Yew heartwood is regarded as durable, although it is not listed in EN 350 Part 2. The sapwood, as with other species, is not durable, and is susceptible to woodworm attack. The heartwood is difficult to treat with preservatives, the sapwood moderately so. Yew was used in the past for fence posts because of its durability.

Processing

Conversion

When straight-grained, yew can be sawn reasonably easily, although, due to the high density, a slow feed speed is advised. Distorted grain can bind in the saw, and checks can open. It can be readily sliced for veneer after steaming. Care must be taken to avoid contact with steel when moist, which causes severe staining similar to that experienced with oak. Yew can have a very low conversion rate due to the irregular form of the logs and the presence of bark-encased knots. Heart shake can also reduce the conversion rate.

Drying

For its density, yew dries reasonably rapidly, with a tendency for checks to develop. PRL kiln schedule G is appropriate (see Table 1).

TABLE 1: PRL Schedule G, recommended for kiln drying of Irish yew.

Timber moisture content %	Dry bulb temperature °C	Wet bulb temperature °C
Green	50	47.5
60	50	46.0
40	55	51.0
30	60	54.5
25	70	62.5
20	75	62.5
15	80	61.0

Machining

Where it is straight-grained yew saws, turns and moulds to an excellent finish, but cross-grained material can pick up and tear. Where this is severe, cutter angles should be reduced and the sharpness of edges maintained.

Finishing

Yew can be brought to a very smooth finish and takes finishes well. Some material can be somewhat greasy and care in gluing is needed. Pre-drilling for screws is essential.

Uses

Yew is currently very popular for furniture manufacture and is often used in veneer form. It is also widely used for carving, craftwork and turnery. It was the traditional timber for longbows. It is one of the species found in our bogs, although sizeable sections are rare, and great care is needed in drying bog yew.

In recent times, the anti-cancer drug, Taxol, has been extracted from the needles of the Pacific yew, Taxus brevifolia. Yields from the European yew are said to be poor.

Relative working properties of yew

The relative working properties of yew are shown below. These properties are based on the results of a questionnaire and reflect the experiences of woodworking companies and individuals in Ireland. They are intended for guidance only and are not definitive, as wood properties can vary within grades. The characteristics of the three grades are:

Prime/Select (defect-free)	Smaller sized planks than veneer quality, some small live knots present, straight grain.
Character grade A	Smaller sized planks than the select grade, mainly straight grain, big live knots that disturb the regularity of grain to a minor degree, pith excluded.
Character grade B	Any size of plank, irregular grain, large live and dead knots, pith can be included.

Scale: ***** excellent ⟷ * poor

MACHINING

Prime/Select	Character Grade A	Character Grade B
***	***	*

NAILING

Prime/Select	Character Grade A	Character Grade B
***	***	

SPLITTING IN SCREWING

Prime/Select	Character Grade A	Character Grade B
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GLUING

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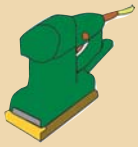

SANDING

Prime/Select	Character Grade A	Character Grade B
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TURNING

Prime/Select	Character Grade A	Character Grade B
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Other Native Species

BLACKTHORN

draighean — *Prunus spinosa*

Blackthorn is a spiny shrub that occurs along roadsides and in hedgerows. It forms dense scrub cover where it is left untrimmed and ungrazed. The wood has a light yellow sapwood and a brown heartwood. Density is about 700 kg/m^3 at 12% moisture content. It is hard and tough and polishes up well. Traditionally blackthorn wood is used for walking sticks, and for the Irish shillelagh.

HAWTHORN

sceach gheal — *Crataegus monogyna*

Due to its impenetrable growth, hawthorn is mainly used for hedging. Its density is 700-800 kg/m^3 at 12% moisture content. Being small in size, the uses of its timber are limited but it was once favoured for wood engravers' blocks, mallet heads and tool handles. It grows in wonderfully twisted shapes and it is an excellent wood for carving for ornaments.

HAZEL

coll — *Corylus avellana*

Hazel is a native species with many uses and an ancient history. It is a deciduous tree, or most usually a bushy shrub, up to 6 m tall. Its wood is white when freshly sawn and darkens to pale brown. It usually has straight grain and fine texture. Its density is usually at 600-700 kg/m^3 at 12% moisture content. Hazel is a strong flexible timber. The slender coppice shoots were used for traditional crafts such as basketmaking.

HOLLY

cuileann — *Ilex aquifolium*

The evergreen holly is a native species which forms the shrub layer in some of Ireland's oldest woods. The hard pale wood is valued for wood carving and turning. The density varies between 750 and 800 kg/m^3 at 12% moisture content. It can be stained readily and has been used as a substitute for ebony when stained black. It saws and planes well.

MOUNTAIN ASH

caorthannus — *Sorbus aucuparia*

The mountain ash, or rowan, produces a dense, pale brown wood. As it is not a large tree, available section sizes are small. It has been used in the past for tool handles, carving, and for turned items. If available, it could probably be used for small craft items and turnery.

WILLOW

saileach — *Salix* species

Willow has a density of 380-500 kg/m^3 at 12% moisture content. Its volumetric shrinkage is small, less than 12%. It is a non-durable species. The sapwood is permeable but the heartwood is difficult to treat with preservatives.

Machining of willow is easy and does not use a lot of power. To achieve smooth surfaces and clear profiles tools should be used at an acute angle, sharpened well and so maintained. Willow timber marks easily due to its low hardness. It is an easy timber to turn and sculpt. It has traditionally been used in the manufacture of harps.

All types of glue are suitable for use on willow. Use glues of higher viscosity to avoid problems with unequal absorption of the glue.

It nails and screws easily, with little risk of splitting, except near edges and ends. However, its nail and screw holding properties are poor.

Willow sands very well.

Log Conversion

When converting logs to sawn lumber, various sawing patterns can be adopted to maximise the return to the sawmiller. For the milling of structural softwoods logs are usually cut in a manner that maximises the yield of sawn timber and minimises the volume of low-value residues such as slabs and sawdust. However, hardwoods are often utilised primarily for their appearance, so several other factors have to be considered, including:

- grain pattern
- stability
- sapwood-heartwood
- boxed heart
- presence of knots or other defects.

Grain pattern

The appearance of some species will vary greatly according to the angle which the cut surface makes with the growth rings, especially those species with a pronounced grain pattern or with large rays. The best-known example is 'silver figure' in oak where the broad rays give a lustrous appearance when seen on a radial or 'quarter-sawn' surface. This is absent on the tangential or 'flat-sawn' surface. A similar effect seen in plane is referred to as 'lacewood', due to the appearance of the rays. The pronounced growth rings of certain timbers will also show more prominently on a tangential surface.

Stability

Because shrinkage in drying is less in the radial direction than in the tangential direction, 'quarter-sawn' boards will remain flat, while 'flat-sawn boards' will tend to cup in drying. Shrinkage in the width of the flat-sawn boards is greater than with quarter-sawn boards (although shrinkage in the thickness is greater).

Sapwood-heartwood

In species which produce a distinctly coloured heartwood it may be desired to remove the sapwood entirely, with obvious effect on the yield of sawn timber. This is normally the case with durable species for use externally, where the perishable sapwood would soon decay, but may also be the case for aesthetic reasons. Commercially, timber from some trees is normally sold with a proportion of sapwood, for example cherry and walnut.

Boxed heart

In the early years of a tree's life, particularly in some hardwood species, the stem often does not grow straight and the core of the log will also have numerous small knots, producing poorer quality timber. The practice of "boxing the heart" is sometimes adopted where a narrow core of timber close to the pith is removed and only the better, more mature material is utilised.

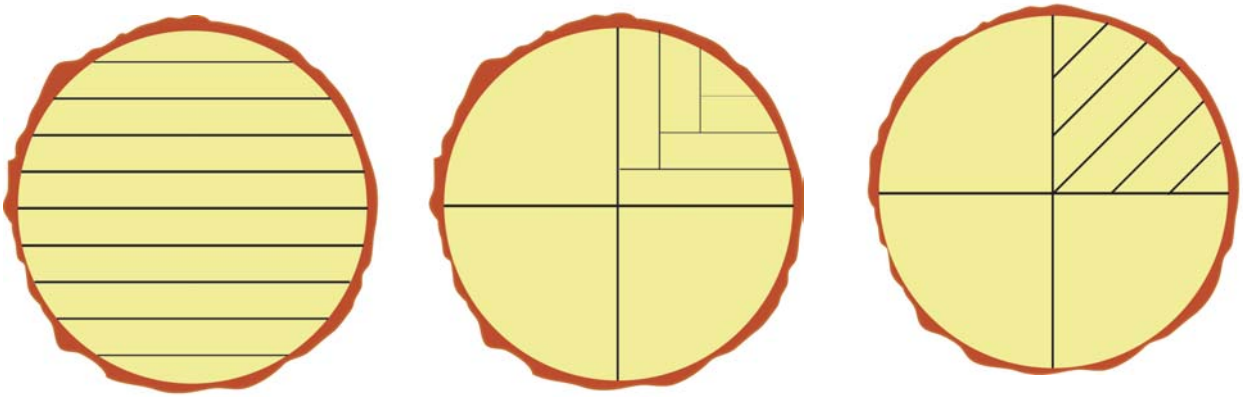
Knots and other defects

In the past, many Irish hardwoods had not been managed for the production of quality timber and as a consequence may have large knots or distorted grain. Also, the trees are often over-mature and have internal defects such as heart rot. In such cases, sawmillers have to use their judgement in cutting the log in a manner which will maximise the yield of useable timber.

Deciding on a sawing pattern

Taking all the above into consideration one might conclude that it would be best to convert all logs in such a way as to produce 'quarter-sawn' boards. However, this entails extra work in positioning the log and also produces a high proportion of very narrow boards of lesser value and use. Due to the extra cutting, there is greater waste in the form of sawdust and offcuts. In practice, 'quarter sawing' can only be justified in the conversion of large logs where the buyer is prepared to pay a considerable premium for such material.

The diagram below illustrates the difference between 'quarter-sawn' and 'flat-sawn' (also known as 'through-and-through sawn') patterns.



Flat-sawn

Quarter-sawn

Alternative method of producing mainly quarter-sawn boards.

A Guide to the Marketing of Hardwoods

Timing and nature of sale

High grade hardwood generally sells better during the winter months. This is particularly so with sycamore: high prices will not be obtained for this species unless the sap is down. Low grade logs can be sold all year round.

Do not fell speculatively: make sure you have a market prior to felling. A little canvassing will quickly give you an idea of what the market requires and who are the interested parties, both on a local and national basis.

Make every attempt to sell parcels that are properly graded - do not compromise good quality by including low grade logs. If necessary, conduct separate sales, for example oak planking will generally sell well as a parcel, but do not include oak fencing and firewood.

Method of sale

Standing

When using this method all the risk inherent in the timber remains in the hands of the purchaser. Any suspect signs in the stems will be observed and graded down in the buyer's valuation book.

If selling standing timber, remember that extraction damage to ground flora, racks, rides and roads etc. are very much out of the seller's hands.

Stump/roadside

This type of sale affords the purchaser some idea of what is inside the logs, so a more realistic sale value can be easily ascertained. Remember, however, that in deciding to fell, the vendor has accepted a great deal of the risk in damage to the timber.

If using the stump/roadside route ensure that you have investigated the sales options such as:

- negotiation with local mill or merchant you know and trust,
- advertising in national and forestry press,
- advertising in local press to attract local interest,
- use of the Internet - this option is becoming more used, you have the ability to display a photograph of your sale items.

Preparation and presentation

Ensure that there is adequate walking access to the sale logs. Prospective buyers will need to view each log. If necessary, improve the ground conditions by cutting away scrub, briars etc. In the case of roadside sales, ensure that logs are placed on bearers to facilitate measurement. If a log is tight to the ground, the buyer will estimate girth to his/her own advantage.

Mark each log with a tag or identity number, let the buyer know exactly what is for sale.

Make a genuine and honest attempt at both volume estimation and grading. Give an approximate total volume and average log size by grade on your sale schedule.

Include in your sales schedule words to the effect: "*estimates have been carried out by taped measure but cannot be guaranteed, buyers should ascertain both volume and quality before bidding*".

Ensure logs are well felled, toes trimmed, well sned. Valuation of hardwood logs is a visual operation, and a good appearance makes an impact. If you are not entirely sure and confident of setting up a parcel, get someone who is.

Information for potential buyers

Give buyers a comprehensive picture of the areas concerned. Map references, detailed map of boundaries, roads, rides, water courses/supplies, culverts, weight limits, over-head cables should all be included in the sale particulars.

Do not be too intractable with your contract - make it flexible. The weather can play a serious part in both the vendor's and purchaser's circumstances. However, it is a good idea to stipulate a time frame for the removal of the timber.

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