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A FEW CLARIFICATIONS ARE IN ORDER!

TIMBER DURABILITY

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Durability is an intrinsic property of each species: it is their ability to resist attacks from biological degradation agents. Biological degradation agents are defined as: fungi, insects with **xylophagous**¹ larvae (abbreviated to ILX, such as hylotrupes and anobium), termites, marine **borer**² worms, etc.

Note: There is no such thing as **rot-proof**³ timber. If this were the case, the forest would

be a huge pile of dead and un-degraded timber that has been around for several million years. This is the way life is: all timber degrades at different rates depending on the conditions in which they are found. To evaluate this property, laboratory tests have been carried out on various species using a standardised protocol (EN 350-1). The most commonly used durability classes are those that relate to **lignivorous fungi**⁴.

They are classified according to 5 levels:

Durability class	Description
1	Highly durable
2	Durable
3	Moderately durable
4	Slightly durable
5	Non-durable

Note: The tests are carried out on **duraminated**⁵ timber. When referring to the durability of timber, only the heartwood is considered, as the sapwood is never durable.

1. Which eat timber.
2. Which make holes, which perforate.
3. Which does not rot.
4. Which feeds on damp timber, causing it to decay.
5. Timber consists of two parts: the sapwood (in which the raw sap rises) and the heartwood. In some species, the difference between these two parts is clearly visible (the sapwood being generally lighter), in others they cannot be distinguished (examples: fir, spruce).

Durabilities are presented in the EN 350-2 standard (see annex 2), along with:

- Durability against fungi (1 to 5)
- Durability against xylophagous insects (S sensitive, or D durable)
- Durability against termites (S sensitive to D durable)
- Durability against marine borers (S sensitive to D durable)
- Impregnability (1 impregnable to 4 non-impregnable)
- Width of the sapwood (tf < 2 cm, f < 5 cm, m < 10 cm, l > 10 cm, x no distinction)

Not all species are listed in this standard, but it is still possible to find acknowledged information in the **CIRAD's**⁶ technical sheets⁷.

Note: in terms of durability against termites, the tests consist of enclosing the timber with




starving termites. the timber with starving termites. This principle: «you either eat or you die» excludes the notion of palatability, i.e. «although this timber is nutritious, it isn't to my liking so I will go elsewhere».

USAGE CLASSES

Usage classes refer to timber usage situations.




They are defined in standard EN 335 (currently under revision), but slightly different definitions can be found in the NF B 50-105-3 and FD P 20-651 standards.

Note: for a long time they were referred to as «risk classes» (this was deemed too negative).

<p>Usage class 1: Situation in which the timber is under shelter, fully protected from the weather and not exposed to humidification. Examples: flooring, furniture, panelling, etc.</p>	
<p>Usage class 2: Situation in which the timber is under shelter, fully protected from the weather, but where high ambient humidification may lead to occasional non-persistent humidification. Examples: frameworks, roofing elements, etc.</p>	
<p>Usage class 3A: Situation in which the timber is neither sheltered nor in contact with the ground. It is either continuously exposed to the weather, or sheltered but subject to frequent humidification. Examples: joinery, exterior cladding (partially sheltered), etc.</p>	

6. CIRAD is a French research centre based in Montpellier that works with developing countries to address international agricultural and development issues.

7. See the TROPIX sheets.

<p>Usage class 3B: Harsher conditions than in class 3A Examples: joinery, external cladding (exposed to the weather) etc.</p>	
<p>Usage class 4: Situation in which the timber is in contact with the ground or fresh water, and is thus permanently exposed to humidification. Examples: fences, posts, decks, etc.</p>	
<p>Usage class 5: Situation in which the timber is constantly in contact with salt water. Examples: jetties, pontoons, etc.</p>	

With these usage classes, the life span of a species is not defined. For example: a poplar stake (designed to hold a tomato plant) is used in a situation falling under usage class 4. It is not recommended that poplar be used for usage class 4 if a service life of more than one year is desired.

The relationship between the durability of a timber and its usage class is solely based on the expected service life.

Commercially, usage classes are wrongly used to measure durability performance, especially when the timber is chemically treated without the service life being stated.

If the expected service life is defined, it is possible to establish a relationship between usage class and species. The EN 460 standard presents matches, but unfortunately they are still quite imprecise.

Note: Usage classes 1, 2, 3A, 3B, 4 are ranked in increasing order according to the ease with which fungus can degrade the timber. Usage class 5 is separate because it pertains to marine environments.

Example: Basralocus⁸ can be used in usage class 5 because it resists well against marine borer worms, but it is not recommended for usage class 4 because fungi easily degrades it when it is in contact with the ground. It can be used for classes 1, 2, 3A, 3B and 5 but not 4.

THE RIGHT TIMBER IN THE RIGHT PLACE

In practice, these usage class definitions remain difficult to grasp, for example, «exposed to bad weather» is a highly variable notion depending on whether they are the French cities of Montpellier or Brest⁹.

The definitions have therefore been taken up in greater detail in the FD P 20-651 documentation booklet. They take into account the following aspects in particular:

- climate (for a detailed map of France, see annex 1);
- local conditions (coastal zones, valley beds not exposed to sunlight, proximity to sources of humidity generating recurrent periods of mist or fog;
- types of designs (rainwater run-off and desorption¹⁰ conditions directly influence the durability of the part of the structure under consideration with regard to fungal risks¹¹);
- the massiveness (the more massive the timber, the more limited its desorption capacity);
- exposure to the prevailing rain wind.

When the usage class is correctly defined, the choice of timber can be made according to the structure's expected service life.

- L3:** Lifespan of over 100 years;
- L2:** Lifespan between approximately 50 and 100 years in its originally intended use;
- L1:** Lifespan between approximately 10 and 50 years in its originally intended use;
- N:** Longevity uncertain and in any case less than 10 years (solutions not to be prescribed in the building).

In any case, a highly durable timber, falling under durability class 1, can be used with an acceptable life span in an environment favourable to biological degradation agents, i.e. those falling under usage class 4.

Conversely, it is possible to use timber with a low level of durability, i.e. those falling under durability class 5, for usage class 1 purposes (without forgetting the risk of damage by xylophagous larvae insects and termites).

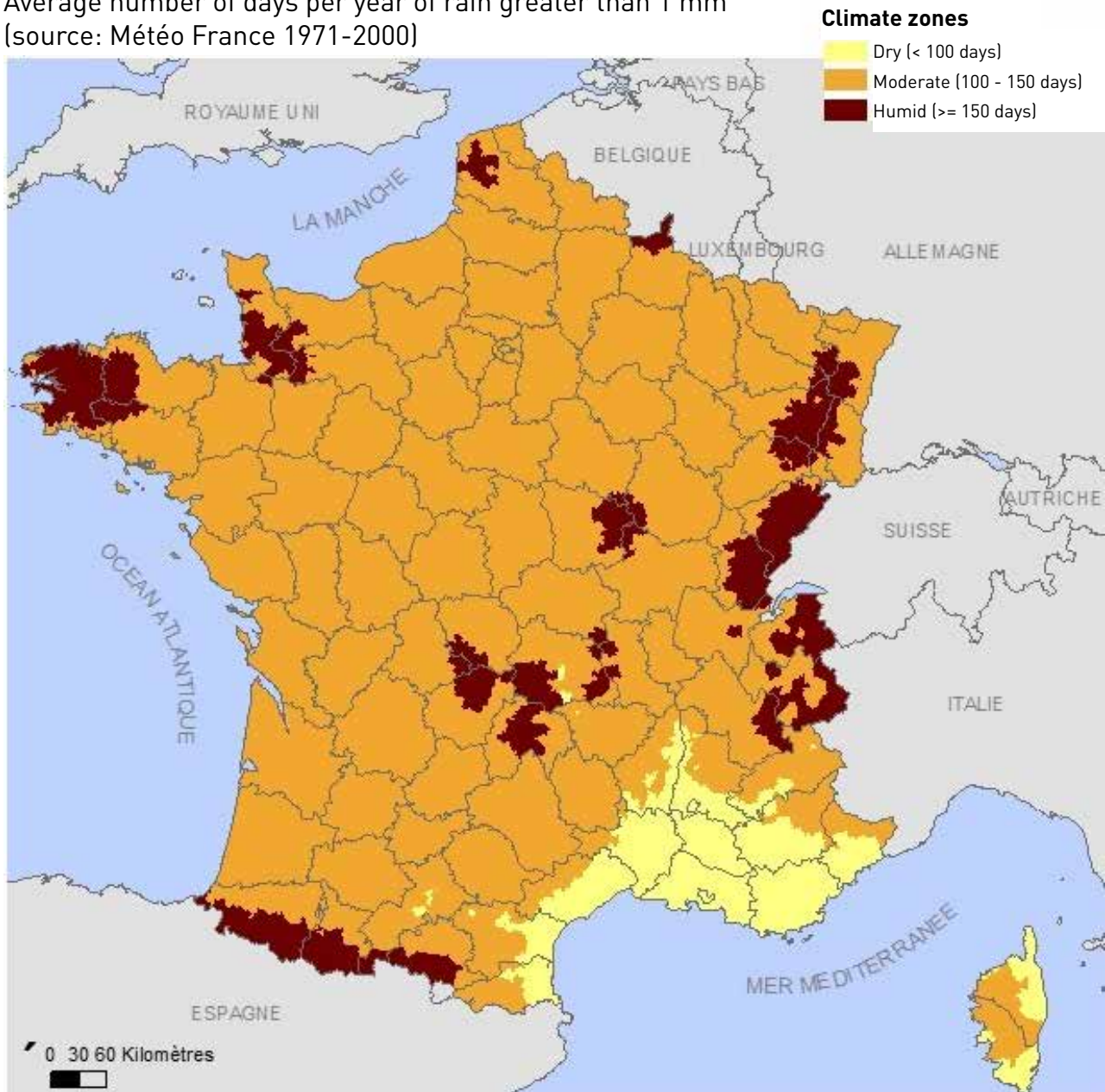
9. View the map of France on the final page.

10. Desorption is the opposite phenomenon of adsorption.

11. Relating to fungi.

ANNEX 1

Average number of days per year of rain greater than 1 mm
(source: Météo France 1971-2000)



ANNEXE 2

SOFTWOODS

French name	MV min kg/m ³	MV kg/ m ³	MV max kg/m ³	Fungus	Hylotrupes	Anobium	Termites	Impregnability	Sapwood	Sapwood width	Marine borers
Agathis	430	490	530	3_4	S	S	S	3	nd	x	
Douglas	510	530	550	3	S	S	S	4	3	f	
Douglas	470	510	520	3_4	S	S	S	4	2_3	f	
Epicéa	440	460	470	4	SH	SH	S	3_4	3v	x	
If	650	690	800	2	S	S	nd	3	2	tf	
Mélèze	470	600	650	3_4	S	S	S	4	2v	f	
Pin des Caraïbes	710	750	770	3	S	S	M_S	4	1	m	
Pin Laricio	510	580	650	4v	S	S	S	4v	1	m_l	
Pin maritime	530	540	550	3_4	S	S	S	4	1	l	
Pin de Parana	500	540	600	4_5	D	S	S	2	1	l	
Pin radiata	420	470	500	4_5	S	SH	S	2_3	1	l	
Pin sylvestre	500	520	540	3_4	S	S	S	3_4	1	f_m	
Pin weymouth	400	410	420	4	S	SH	S	2	1	l	
Pitchpin	650	660	670	3	S	S	M_S	3_4	1	m	
Pitchpin cultivé	400	450	500	4	S	S	S	3	1	m	
Pin de Murray	430	460	470	3_4	S	S	S	3_4	1	m	
Sapin	440	460	480	4	SH	SH	S	2_3	2v	x	
Sitka	400	440	450	4_5	S	SH	S	3	2_3	(x)	
Sugi (Cryptomeria)	280	340	400	5	D	nd	S	3	1	f	
Western red cedar	330	370	390	2	S	S	S	3_4	3	f	
Western red cedar	330	370	390	3	S	S	S	3_4	3	f	
Western hemlock	470	490	510	4	S	SH	S	3	2	x	
Western hemlock	470	490	510	4	S	SH	S	2	1	x	
Yellow Cedar	430	480	530	2_3	S	S	S	3	1	f	

HARDWOODS

French name	MV min kg/m ³	MV kg/ m ³	MV max kg/m ³	Fungus	Hylotrupes	Anobium	Termites	Impregnability	Sapwood	Sapwood width	Marine borers
Abura	550	560	600	5		nd	S	2	1	m	
Acajou d'Afrique	490	520	530	3		nd	S	4	2	f	
Afrormosia	680	690	710	1_2		nd	D	4	1	tf	M
Aiélé	490	500	530	5		nd	S	4	1	m	
Ako	430	450	460	5		nd	S	1	1	x	
Amarante	830	860	880	2_3		nd	D	4	1	f	
Andiroba	610	620	640	3_4		nd	M	3	nd	f	
Aniégré	540	580	630	4_5		nd	S	1	1	x	
Aulne	500	530	550	5		S	S	1	1	x	
Avodiré	540	550	560	4		nd	S	4	1	x	
Ayous	370	390	400	5		nd	S	3	1	x	
Azobé	950	1060	1100	2v		nd	D	4	2	f	M
Bangkirai	700	930	1150	2		nd	D	4	1_2	f	
Basralocus	720	750	790	2v		nd	M	4	2	f	D
Bilinga	740	750	780	1		nd	D	2	1	f	M
Bintangor	630	660	690	3		nd	M	4	2	f	
Blue Gum	700	750	800	5		nd	S	3	1	f	
Bouleau	640	660	670	5		S	S	1_2	1_2	x	
Bouleau jaune d'Amérique	550	670	710	5		S	S	1_2	1_2	x	
Bouleau à papier	580	620	740	5		S	S	1_2	1_2	x	
Bossé clair	570	580	630	2v		nd	S	4	1	m	
Bossé foncé	600	690	850	2		nd	S	4	1	m	
Bubinga	700	830	910	2		nd	D	4	1	f	
Cedro	450	490	600	2		nd	M	3_4	1_2	f	
Cerejeira	550	600	650	3		nd	M	2	2	m	
Charme	750	800	850	5		nd	S	1	1	x	
Chataignier	540	590	650	2		S	M	4	2	f	
Chêne chevelu	710	770	860	3		nd	M	4	1	l	

French name	MV min kg/m³	MV kg/ m³	MV max kg/m³	Fungus	Hylotrupes	Anobium	Termites	Impregnability	Sapwood	Sapwood width	Marine borers
Chêne rouvre	670	710	760	2		S	M	4	1	f	
Chêne blanc d'Amérique	670	730	770	2_3		S	M	4	2	f	
Chêne rouge d'Amérique	650	700	790	4		nd	S	2_3	1	f	
Dibétou	520	550	590	3_4		nd	S	3_4	2	f	
Doussié	730	800	830	1		nd	D	4	2	f	
Erable sycomore	610	640	680	5		S	S	1	1	x	
Eyong	700	730	800	4		nd	S	3_4	1	x	
Faro	480	490	510	4_5		nd	S	2_3	1	l	
Framiré	520	550	560	2_3		nd	S	4	2	(x)	
Freijo	520	540	550	2		nd	M	3	1	f	
Frêne	680	700	750	5		S	S	2	2	(x)	
Fromager	290	320	350	5		nd	S	1	1	x	
Greenheart	980	1030	1150	1		nd	D	4	2	f	D
Hêtre	690	710	750	5		S	S	1_(4)	1	x	
Hickory	790	800	830	4		nd	S	2	1	x	
Ilomba	440	480	510	5		nd	S	1	1	x	
Iroko	630	650	670	1_2j		nd	D	4	1	m	
Jarrah	790	830	900	1		nd	M	4	1	f	
Kapur	630	700	790	1_2		nd	M	4	1	m	
Karri	800	880	900	2		nd	nd	4	1	f	
Kasai	650	710	750	3		nd	M	3_4	2	m	
Kempas	850	860	880	2		nd	S	3	1_2	f	
Keruing	740	750	780	3v		nd	S	3v	2	f	
Kondroti	470	480	490	5		nd	S	1	1	l	
Kosipo	640	670	720	2_3		nd	M	3	1	f	
Kotibé	710	730	760	3v		nd	M	3_4	1_2	f	
Koto	510	560	630	5		nd	S	1	1	x	
Lati	730	750	770	3		nd	M	4	2	m	
Lenga	530	540	550	5		nd	S	4	nd	f	
Limba	550	560	600	4		nd	S	2	1	(x)	

French name	MV min kg/m³	MV kg/ m³	MV max kg/m³	Fungus	Hylotrupes	Anobium	Termites	Impregnability	Sapwood	Sapwood width	Marine borers
Longhi	700	730	800	4		nd	M	2	1	x	
Louro vermelho	600	620	650	2		nd	D	4	2	m	
Mahogany	510	550	580	2		nd	S	4	2_3	m	
Makoré	620	660	720	1		nd	D	4	2	m	
Mansonia	610	620	630	1		nd	D	4	1	f	
Maronnier d'Inde	500	540	590	5		SH	S	1	1	x	
Mengkulang	680	710	720	4		nd	S	3	2	f	
Meranti Dark red	600	680	730	2_4		nd	M	4v	2	f	
Meranti Light red	490	520	550	3_4		nd	S	4v	2	m	
Meranti Yellow	560	630	660	4		nd	S	3_4	2	m	
Meranti White	600	630	670	5		nd	S	3v	2	f	
Merbau	730	800	830	1_2		nd	M	4	nd	m	
Mersawa	520	650	740	4		nd	M	3_4	nd	x	
Moabi	770	800	830	1		nd	D	3_4	nd	m	
Moral	750	890	960	1		nd	D	3_4	nd	f	
Movingui	690	710	740	3		nd	M	4	nd	f	
Muhuhu	830	910	960	1		nd	S	4	nd	f	
Mutenyé	760	820	880	3		nd	M	3_4	2	f	
Niangon	670	680	710	3		nd	M	4	3	m	
Noyer	630	670	680	3		S	S	3	1	f	
Noyer d'Amérique	550	620	660	3		nd	nd	3_4	1	f	
Okan	850	920	960	1		nd	D	4	3	f	
Okoumé	430	440	450	4		nd	S	3	nd	f	
Olon	500	550	640	3		nd	M	2_3	2_3	x	
Orme	630	650	680	4		S	S	2_3	1	f	
Ovengkol	720	780	820	2		nd	D	3	1	m	
Padouk	720	740	820	1		nd	D	2	nd	m	
Pau Amarello	730	770	810	1		nd	D	3_4	nd	x	
Peroba rosa	650	750	800	3v		nd	S	3	1	f	
Peuplier	420	440	480	5		S	S	3v	1v	x	

French name	MV min kg/m ³	MV kg/m ³	MV max kg/m ³	Fungus	Hylotrupes	Anobium	Termites	Impregnability	Sapwood	Sapwood width	Marine borers
Quaruba	450	490	510	4		nd	S	3	2	m	
Ramin	560	630	670	5		nd	S	1	1	x	
Rauli	530	580	610	4		nd	S	2	2	f	
Red Balau	750	800	900	3_4		nd	M	4v	2	f	
Robinier	720	740	800	1_2		S	D	4	1	tf	
Sapelli	640	650	700	3		nd	M	3	2	m	M
Sepetir	650	660	670	2		nd	S	4	2	l	
Sesendok	420	480	530	5		nd	S	1	1	nd	
Silver Beach	540		550	5		nd	nd	4	1	m	
Sipo	590	640	660	2_3		nd	M	4	2	m	
Tchitola	590	610	640	3		nd	M	3_4	1	l	
Teck	650	680	750	1		nd	M	4	3	f	M
Teck de plantation				1_3		nd	M_S	nd	nd	nd	
Tiama	550	560	570	3		nd	S	4	3	l	
Tilleul	520	540	560	5		nd	S	1	1	x	
Tola	480	500	510	2_3		nd	S	3	1	m	
Tornillo	370	520	660	3		nd	S	2_3	nd	f	
Virola	400	440	480	5		nd	S	1_2	1	x	
Walaba	890	900	910	1		nd	D	4	3	f	
Wengé	780	830	900	2		nd	D	4	nd	f	

Key for the above tables:

Durability against fungi: 1 = very durable; 2 = durable; 3 = moderately durable; 4 = slightly durable; 5 = not durable

Durability against xylophagous larvae insects, Hylotrupes (woodboring beetles) and Anobium (furniture beetles): S = sensitive, D = durable

Durability against termites: S = sensitive, M = moderately durable, D = durable

Durability against marine borers: S = sensitive, M = moderately durable, D = durable

Impregnability: 1 = impregnable, 2 = moderately impregnable, 3 = slightly impregnable, 4 = non-impregnable

Sapwood width: tf < 2 cm, f < 5 cm, m < 10 cm, l > 10 cm, x no distinction

Durability against marine borers: D = durable, M = moderately durable, S = sensitive.

<<nd>> = performance not determined



Fair&Precious recommends the purchase of FSC® and PEFC-PAFC certified tropical timber.