BANGKIRAI

Family: DIPTEROCARPACEAE (angiosperm)

Scientific name(s): Shorea glauca* (voir note)
Shorea laevis* (voir note)
Shorea spp.* (voir note)

Commercial restriction: no commercial restriction

Note: * Shorea sub-genus Eushorea.
YELLOW BALAU is usually used for woods imported from Malaysia, BANGKIRAI for woods from Indonesia.

WOOD DESCRIPTION

Color: yellow brown
Sapwood: not clearly demarcated
Texture: medium
Grain: straight or interlocked
Interlocked grain: slight

Note: Yellow brown to reddish brown more or less dark. White resin canals. Sawnwoods may present black holes. This defect is acceptable if it remains limited and not frequent.

LOG DESCRIPTION

Diameter: from 70 to 90 cm
Thickness of sapwood: from 2 to 8 cm
Floats: no
Log durability: good

PHYSICAL PROPERTIES

Physical and mechanical properties are based on mature heartwood specimens. These properties can vary greatly depending on origin and growth conditions.

	Mean	Std dev.
Specific gravity *:	0,91	
Monnin hardness *:	7,3	
Coeff. of volumetric shrinkage:	0,68 %	
Total tangential shrinkage (TS):	9,5 %	
Total radial shrinkage (RS):	4,2 %	
TS/RS ratio:	2,3	
Fiber saturation point:	23 %	

Stability: moderately stable

MECHANICAL AND ACOUSTIC PROPERTIES

	Mean	Std dev.
Crushing strength *:	85 MPa	
Static bending strength *:	150 MPa	
Modulus of elasticity *:	22940 MPa	

(*: at 12% moisture content, with 1 MPa = 1 N/mm²)

Musical quality factor: 116,8 measured at 2689 Hz

NATURAL DURABILITY AND TREATABILITY

Fungi and termite resistance refers to end-uses under temperate climate. Except for special comments on sapwood, natural durability is based on mature heartwood. Sapwood must always be considered as non-durable against wood degrading agents.
E.N. = Euro Norm

Funghi (according to E.N. standards): class 2 - durable
Dry wood borers: heartwood durable but sapwood not clearly demarcated
Termites (according to E.N. standards): class D - durable
Treatability (according to E.N. standards): class 4 - not permeable
Use class ensured by natural durability: class 4 - in ground or fresh water contact
Species covering the use class 5: Yes

Note: Shorea laevis is listed in the European standard NF EN 350-2.
The possible presence of few demarcated sapwood in sawnwood may have an influence on the expected durability.
Only Shorea laevis has a good enough natural durability to allow end-uses under use class 5 (end-uses in marine environment or in brackish water). It is due to its high specific gravity and high silica content.
According to the European standard NF EN 335, performance length might be modified by the intensity of end-use exposition.

REQUIREMENT OF A PRESERVATIVE TREATMENT

Against dry wood borer attacks: requires appropriate preservative treatment
In case of risk of temporary humidification: does not require any preservative treatment
In case of risk of permanent humidification: does not require any preservative treatment

DRYING

Drying rate: slow
Risk of distortion: slight risk
Risk of casehardening: no
Risk of checking: high risk
Risk of collapse: no
Note: Initial surface drying is recommended prior to kiln drying.

Possible drying schedule: 5

	Temperature (°C)		
M.C. (%)	dry-bulb	wet-bulb	Air humidity (%)
30	42	41	94
25	42	39	82
20	48	43	74
15	48	43	74

This schedule is given for information only and is applicable to thickness lower or equal to 38 mm.
It must be used in compliance with the code of practice.
For thickness from 38 to 75 mm, the air relative humidity should be increased by 5 % at each step.
For thickness over 75 mm, a 10 % increase should be considered.

SAWING AND MACHINING

Blunting effect: fairly high
Sawteeth recommended: stellite-tipped
Cutting tools: tungsten carbide
Peeling: not recommended or without interest
Slicing: not recommended or without interest
Note: Requires power. Some difficulties due to interlocked grain during planing.

ASSEMBLING

Nailing / screwing: good but pre-boring necessary
Gluing: correct (for interior only)
Note: Tendency to split.

COMMERCIAL GRADING

Appearance grading for sawn timbers: According to MGR grading rules (2009)
Possible grading: Prime, Select, Standard, Serviceable, Utility

FIRE SAFETY

Conventional French grading: Thickness > 14 mm : M.3 (moderately inflammable)
Thickness < 14 mm : M.4 (easily inflammable)

Euroclasses grading: D s2 d0
Default grading for solid wood, according to requirements of European standard EN 14081-1 annex C (April 2009). It concerns structural graded timber in vertical uses with mean density upper 0.35 and thickness upper 22 mm.

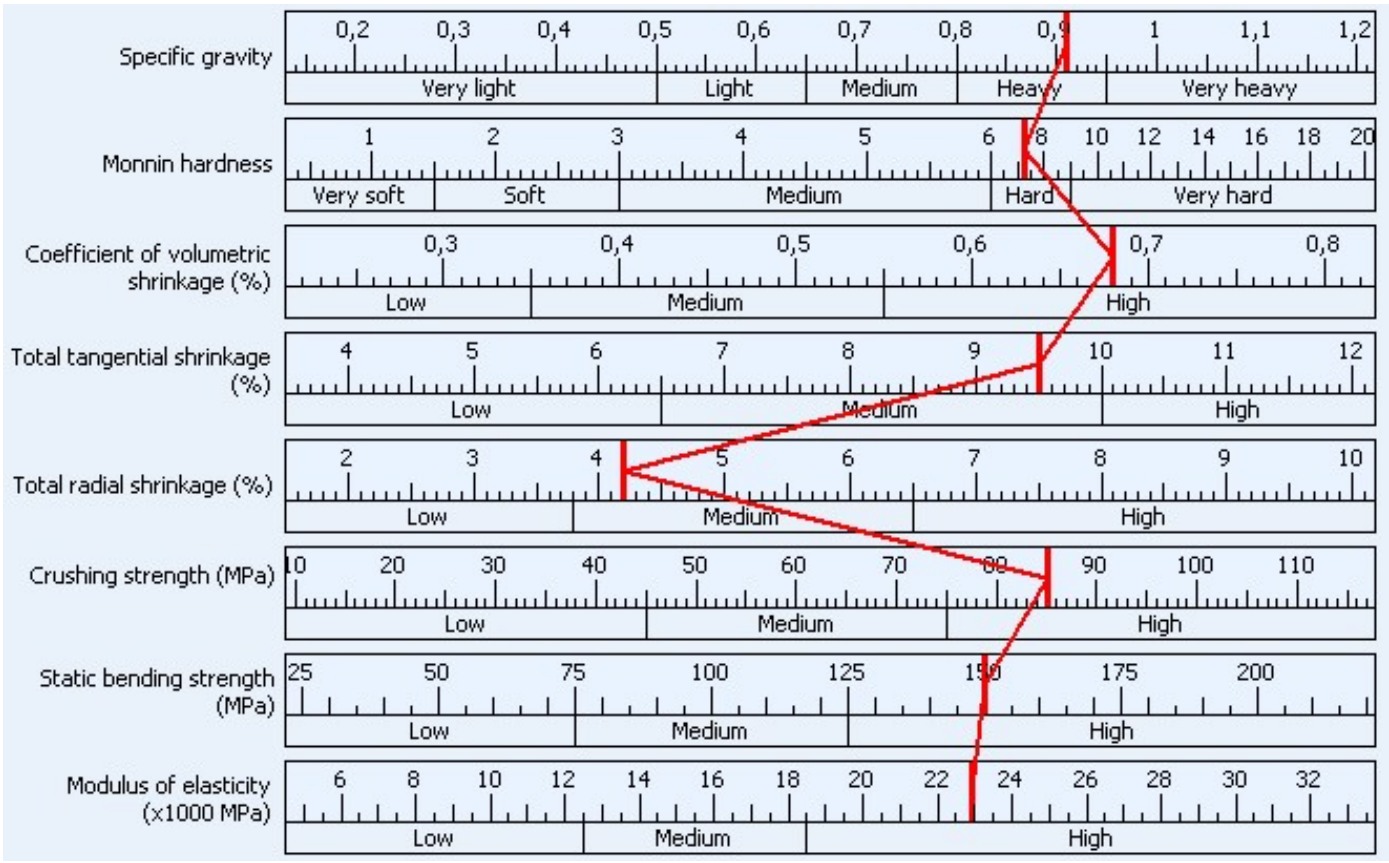
END-USES

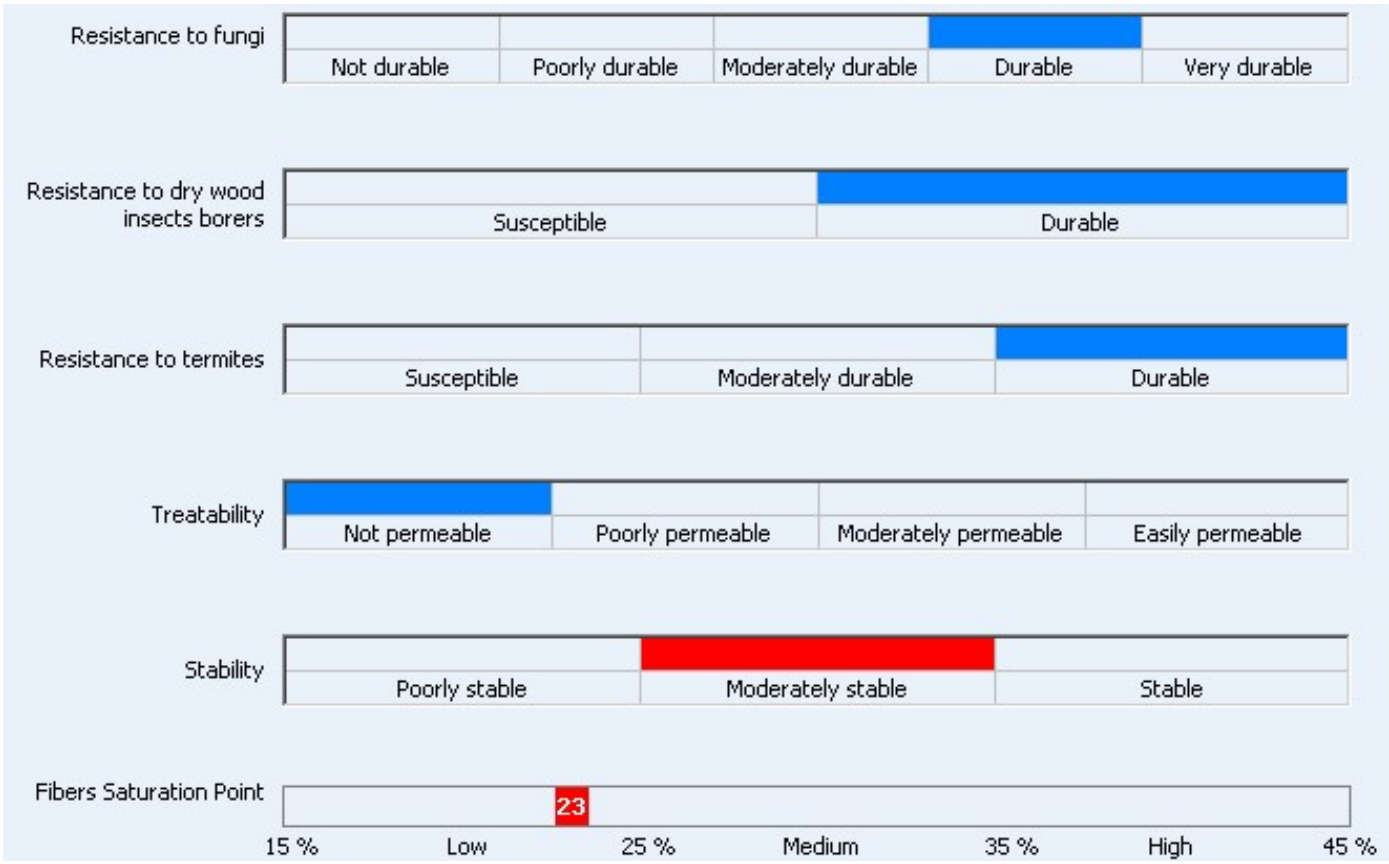
Sleepers
Bridges (parts in contact with water or ground)
Flooring
Heavy carpentry
Cooperage
Poles
Boxes and crates
Ship building (planking and deck)
Industrial or heavy flooring
Vehicle or container flooring
Bridges (parts not in contact with water or ground)
Hydraulic works (fresh water)
Exterior joinery

Note: Other possible end-uses: garden furniture.

MAIN LOCAL NAMES

Country	Local name	Country	Local name
Indonesia	BALAU	Indonesia	BANGKIRAI
Indonesia	KEDAWANG	Indonesia	SELANGAN BATU KUMUS
Indonesia (Sulawesi)	POOTI	Peninsular Malaysia	SELANGAN BATU
Malaysia (islands)	BALAU	Malaysia (islands)	BALAU KUMUS
Malaysia (islands)	DAMAR LAUT	Malaysia (islands)	SENGKAWANG
Myanmar	THITYA	Philippines	GISOK
Philippines	YAKAL	Thailand	CHAN


Specific gravity
0,2 0,3 0,4 0,5 0,6 0,7 0,8 0,9 1 1,1 1,2
Very light
Light
Medium
Heavy
Very heavy
Monnin hardness
1 2 3 4 5 6 8 10 12 14 16 18 20
Very soft
Soft
Medium
Hard
Very hard
Coefficient of volumetric shrinkage (%)
0,3 0,4 0,5 0,6 0,7 0,8
Low
Medium
High
Total tangential shrinkage (%)
4 5 6 7 8 9 10 11 12
Low
Medium
High
Total radial shrinkage (%)
2 3 4 5 6 7 8 9 10
Low
Medium
High
Crushing strength (MPa)
10 20 30 40 50 60 70 90 100 110
Low
Medium
High
Static bending strength (MPa)
25 50 75 100 125 150 175 200
Low
Medium
High
Modulus of elasticity (x1000 MPa)
6 8 10 12 14 16 18 20 22 24 26 28 30 32
Low
Medium
High


Resistance to fungi
Not durable
Poorly durable
Moderately durable
Durable
Very durable
Resistance to dry wood insects borers
Susceptible
Durable
Resistance to termites
Susceptible
Moderately durable
Durable
Treatability
Not permeable
Poorly permeable
Moderately permeable
Easily permeable
Stability
Poorly stable
Moderately stable
Stable
Fibers Saturation Point
23
15 %
Low
25 %
Medium
35 %
High
45 %