PAMPHLET 03

# MAIN GRADING RULES FOR SAWN TROPICAL TIMBER

également disponible en Français

**This pamphlet on the rules for grading sawn timber comprises the following six sections:**

1. Conventional grading rules for African and South American sawn tropical timber
2. AIP (Avivés Industriels Parallèles, Industrial parallel sawn timber) and AINP (Avivés Industriels Non Parallèles, Industrial non-parallel sawn timber) grading rules for African sawn tropical timber
3. AIC (Avivés Industriels Cantibay, Industrial Cantibay sawn timber)
4. Grading rules for South Asian sawn tropical timber: the *Malaysian Grading Rules* (MGR)
5. Other rules for grading the appearance of sawn timber or specific wood products and lumber
6. Visual grading of structure used in Europe for sawn tropical timber

## 1. CONVENTIONAL GRADING RULES FOR AFRICAN AND SOUTH AMERICAN SAWN TROPICAL TIMBER

### 1.1. INTRODUCTION

The grading rules presented in this section tacitly apply to African and South American sawn timber. **These rules predominate in the international trade of African and South American tropical timber to Europe.**

This appearance grading system is based on the number of standard defects that the pieces of wood have in relation to their dimensions.

Unlike the SATA[1], NHLA[2] or MGR[3] rules (see next section), defect-free areas and material yields are not taken into account.

For historical reasons, the names of certain choices are common to the different sets of rules, although no correspondence can be established between them.

1. Cirad-Forêt, 1996. **Sciages avivés tropicaux africains (SATA). Règles de classement.** Nouvelle édition, Montpellier, France, 193 p.
2. National Hardwood Lumber Association (NHLA), 2015. **Rules for the Measurement & Inspection of Hardwood & Cypress.** Memphis, Tennessee, États-Unis, 104 p.
3. Malaysian Timber Industry Board (MTIB), 2009. **Malaysian Grading Rules for Sawn Hardwood Timber (MGR)**. New edition, Kuala Lumpur, Malaisie, 109 p.

## 1.2. GENERAL INFORMATION

These grading rules define the piece of wood with the most defects for each grade; other pieces corresponding to a higher grade can of course be accepted.
Unless otherwise stipulated, **each piece must be graded on its worst side.**
Percentages are always calculated on the basis of volume per bundle, unless otherwise stated.
In the context of quality control, it is accepted that 5% of pieces may not meet the requirements of the target grade, as some defects may have escaped the attention of the grader.

## 1.3. DEFINITION OF STANDARD DEFECTS

**** One standard defect***

- One knot between 16 and 32 mm in diameter, or two knots where the sum of the diameters does not exceed 32 mm.
- Two knots less than 16 mm in diameter (except for certain species, see § 1.6 Tolerances applicable to certain species).
- An isolated pinhole or a cluster of shot holes with a diameter of less than 32 mm.
- A gum pocket with a surface area of no more than 32 cm².
- A straight end split not exceeding 10% of the length of the piece.

**** Two standard defects***

- A knot between 32 and 64 mm in diameter, or knots where the sum of the diameters does not exceed 64 mm.
- A gum pocket with a surface area of no more than 64 cm².
- An oblique end split not exceeding 10% of the length of the piece.

**** Three standard defects***

- A knot with a diameter of 64 to 89 mm, or knots where the sum of the diameters does not exceed 89 mm.
- A gum pocket not exceeding 97 cm².

Insect holes in felled green wood and internal tunnels can be considered as knots depending on the areas affected.

The following do not count as defects:

- sapwood within tolerances
- spring within the following limits

- length of piece up to 2.70 m: 13 mm
- length of piece from 2.70 m to 3.60 m: 19 mm
- length of piece over 3.60 m: 32 mm

- slight warping or cup that does not prevent normal planning of the workpiece (over 3 mm).

Pieces that are 30 cm wide or more should be treated as two boards 15 cm wide or more. Pieces that are deformed (warped, cupped, etc.) beyond these limits shall be excluded from all grades.

Pieces of wood that have been partially damaged by rotting fungi, windburn or reaction wood are systematically downgraded.

## 1.4. STANDARD GRADES

***FAS (First And Second) grade***

Must contain at least 40% wood free of defects and sapwood, and no more than 60% wood with defects within the limits shown below, with sound sapwood not exceeding 10% of the width of the piece.

- Graded face < 1 m² : 1 defect
- Graded face from 1 m² to 1,50 m² : 2 defects
- Graded face > 1,50 m² : 3 defects

The tolerances relating to grain singularities (interlocked grain, mottled wood, figured wood, ribbon-striped wood, etc.) are to be defined contractually.

***No. 1 Common and select grade***
This grade allows defects within the limits indicated below.

- Graded face < 0,6 m² : 1 defect
- Graded face from 0,6 m² to 1 m² : 2 defects
- Graded face from 1 m² to 1,50 m² : 3 defects
- Graded face > 1,50 m² : 4 defects

Sound sapwood not exceeding 20% of the width of the piece is tolerated.
This grade tolerates some variation in grain.

***No. 2 Common grade***
This grade tolerates defects within the limits indicated below.

- Graded face < 0,6 m² : 1 defect
- Graded face from 0,6 m² to 1 m² : 2 defects
- Graded face from 1 m² to 1,50 m² : 3 defects
- Graded face > 1,50 m² : 4 defects

Sound sapwood is tolerated without limit.
Slight to moderate blue stain is tolerated.
Isolated and/or clustered dead pinholes, covering less than half of the surface of the piece, are tolerated on a maximum of 10% of the number of pieces in a batch.Irregular grain and flatness are tolerated.
Variations in colour and density are tolerated.

### 1.5. SPECIAL GRADES

**The "old" special choices *Prime, Narrows, FAS Shorts, Prime Strips, Prime Blocks and Shorts, Prime Furniture Squares and Selected Constructional Grade* are to be defined contractually.**

### 1.6. TOLERANCES APPLICABLE TO CERTAIN SPECIES

**The tolerances for singularities and defects applicable to certain species are to be defined contractually.** This is particularly the case for the following species: African mahogany (woolly finish, colour variations), Ayous (blue stain, mineral stain, pinholes), Bété (colour variations), Fraké (resin pockets, internal tunnels), Kotibé (pinholes), Padouk (various types of discoloration) and Tola (small knots, interlocked grain).

# 2. AIP (AVIVÉS INDUSTRIELS PARALLÈLES, INDUSTRIAL PARALLEL SAWN TIMBER) AND AINP (AVIVÉS INDUSTRIELS NON PARALLÈLES, INDUSTRIAL NON-PARALLEL SAWN TIMBER) GRADING RULES FOR AFRICAN SAWN TROPICAL TIMBER

### 2.1. INTRODUCTION

These grading rules have been developed to promote trade in African sawn tropical timber when sawn timber production was expanding and log exports were declining under the influence of industrial development in the producing countries. They were drawn up by the industrial producers of tropical timber. As a result, these rules essentially take account of production requirements and relatively little of the constraints linked to the use of wood.

They apply both to timber with parallel edges and a constant width (Avivés Industriels Parallèles = AIP) and to timber with non-parallel edges and variable width (Avivés Industriels Non Parallèles = AINP).

## 2.2. WOOD QUALITY

- The edges of the boards are arrised and perpendicular to the faces. They must be parallel for industrial parallel sawn timber (AIP).
  Wanes are tolerated on one edge for a maximum of 20% of pieces, within the following limits:

  - Maximum width: 10% of the width of the piece
  - Length: 20% of the length of the piece
  - Thickness: one-third of the thickness of the piece

  The ends are cut square.

- Pieces with the following defects are not accepted:

  - Rot and deterioration, brittle heart, discoloration as a result of deterioration or rot.
  - Pith marks, internal fractures (compression failure), splits other than at the ends.
  - Dead or unsound knots, gall, blister grain.
  - Live infestation, internal tunnels.

- Pieces with the following defects are accepted:

  - One or more end splits whose maximum length or combined lengths do not exceed 10% of the length of the piece.
  - Sound, non-discoloured sapwood appearing on a single edge, and within the following limits measured at its widest point:
    - Less than 30% of the width of the piece, if the face is free of defects other than end splits.
    - Less than 15% of the width of the piece in all other cases.
  - One or more sound discolorations or natural stains whose surface area (or combined surface area) does not exceed 20% of the surface area of the piece.
  - Sound knots

- Certain species are known to have specific defects such as dead pinholes, small knots, resin release and resin pockets, black spots, etc. In these specific cases, pieces with such defects are accepted without restriction.

  In a batch of timber, for pieces longer than 3 metres, bow and spring of less than 5 mm per metre, calculated over the total length of the piece, are permitted on up to 5% of the pieces.

## 2.3. DIMENSIONS AND MEASUREMENTS

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* For AIP and AINP grading rules, the dimensions of the pieces are defined in the contract between the parties.
* The contract must specify how the pieces are to be measured: rounded down to the nearest centimetre or developed using a measuring tape for the width.
* Lengths are rounded down to the nearest decimetre, taking into account the 5 cm allowance.
* The contractual thickness is measured more than 20 cm from the ends of the piece.
* For industrial parallel sawn timber (AIP), the width is measured at the narrowest point of the piece and more than 20 cm from the ends.
* For industrial non-parallel sawn timber (AINP), the width is measured at mid-length of the piece. The minimum width of a piece is 15 cm. The taper of the pieces must be less than 3%.

# 3. AIC (AVIVÉS INDUSTRIELS CANTIBAY, INDUSTRIAL CANTIBAY SAWN TIMBER)

## 3.1. TIMBER PREPARATION

Industrial Cantibay sawn timber (AIC) is obtained from logs of all grades (sawmill grade to Loyal and Merchantable grade).

*** Sawing**

The dimensions are uniform throughout the piece. Regular thickness and width.
The actual thickness is always greater than the nominal thickness, and provision must be made for appropriate allowances when sawing. The timber is measured more than 15 cm from the ends.
The edges are parallel to each other and arrised, with a wane tolerance on one edge as follows:

- maximum width not exceeding 10% of the width of the piece,
- maximum length not exceeding 15% of the length of the piece,
- maximum thickness not exceeding one-third of the thickness of the piece.

The ends will be cut square, with a 5 cm allowance on the length.

*** Preservation treatment**

Sawn timber from less durable species or containing sapwood is properly treated immediately after sawing.
Insecticide and fungicide treatment must ensure that the wood is well preserved until delivery to the buyer.

## 3.2. QUALITY

The following defects are tolerated:

- end splits with a maximum length or combined length of less than 10% of the length of the piece,
- sound, intergrown knots,
- sound discoloration or stains,
- sound, non-discoloured sapwood on a single edge to the following tolerances:

  - 30% of the width of the piece at its widest point if the face is free of defects, other than end splits,
  - 15% in other cases.

# 4. GRADING RULES FOR SOUTH ASIAN SAWN TROPICAL TIMBER: THE MALAYSIAN GRADING RULES (MGR)

The MGR are the main appearance grading rules used for sawn hardwood timber in Malaysia and other South Asian producer countries.

This appearance classification is based on the identification of defect-free surfaces and the material yield of the timber.

These rules define five reference grades which are often combined: **prime** (top grade), **select**, **standard**, **sound** and **serviceable**.

The specifications of these grades are given in the following summary table[4]:

| Grade | Width | Length | Clear cuttings | Sapwood | Knots | Spring | Warp (other than spring) | Minimum cuttings |
|---|---|---|---|---|---|---|---|---|
| **PRIME** | 6 inches and over | 6 feet and over | 91% of cuttings exempt of defects | Excluded from all clear face cuttings | Average diameter less than 1/3 of the width of the face | Less than one inch per 12 feet of length | Not admitted if sufficient to prevent the piece from being planed on both sides | 4 inches x 5 feet or 5 inches x 4 feet |
| **SELECT** | 5 inches and over | 6 feet and over | 75% of cuttings exempt of defects | Tolerated on less than 1/3 of the width of the piece and on one side only | Same as for PRIME | Same as for PRIME | Same as for PRIME, but warped pieces 10» and wider are tolerated if they can be ripped into 2 SELECT grade pieces that can be planed on both sides to standard thickness | 4 inches x 3 feet or 3 inches x 4 feet |
| **STAN-DARD** | 4 inches and over | 6 feet and over | 66% of cuttings exempt of defects | Sound sapwood tolerated in clear face cuttings | Average diameter less than half the width of the face | Less than one inch per 8 feet of length of the piece | Not admitted if sufficient to prevent the piece from being planed on both sides | 4 inches x 2 feet or 3 inches x 3 feet |
| **Choice of SOUND or PHND** | PHND: Pin Holes No Defect = pinholes tolerated<br>Same as for PRIME, SELECT and STANDARD grades,<br>but pinholes and unstained shot holes are allowed in the cuttings. | | | | | | | |

| Grade | Width | Length | Clear cuttings | Wane | Brittle heart | Spring and warp | Recommended cuttings |
|---|---|---|---|---|---|---|---|
| **SERVI-CEABLE** | 4 inches and over | 6 feet and over | 66% of cuttings exempt of defects | Tolerated on the worst face and one edge only:<br>. in widths of 6 inchs and over, it should not exceed 1/6 of the width of the piece,<br>. in widths less than 6 inchs, it should not exceed 1/8 of the width of the piece | Tolerated on one face and one edge if the strength of the piece is not affected | Same as in STANDARD grade | 4 inches x 2 feet or 3 inches x 2 feet |
| **UTILITY** | 4 inches and over | 6 feet and over | 66% of cuttings exempt of defects | Tolerated on the worst face and one edge only, over less than a quarter of the width of the piece | Tolerated on one face and one edge if the strength of the piece is not affected | Same as in STANDARD grade | 4 inches x 2 feet or 3 inches x 2 feet |

| | |
|---|---|
| **SELECT AND BETTER** | SELECT and PRIME |
| **STANDARD AND BETTER** | STANDARD, SELECT and PRIME |
| **SOUND AND BETTER** | SOUND, STANDARD, SELECT and PRIME |
| **MERCHANTABLE (or SERVICEABLE AND BETTER)** | SERVICEABLE, SOUND, STANDARD, SELECT and PRIME |

**The most common classifications are combined grades:**

* SelBet for Select and Better (*Select + Prime grades*) for factory lumber. For strips (less than 2 inchs thick and less than 6 inchs wide), a sapwood face is tolerated.
* StdBet for Standard and Better *(Standard + Select + Prime)*. This classification is often used for truck decks with the epithet PHND (Pin Holes Non Defect).
* Merchantable: corresponds to a «mill-run « grade *(Utility + Serviceable + Sound + Standard + Select + Prime)*. This grade is used for exports to certain countries, such as the Middle East and the Philippines.

4. The most recent version (2009) of the full Malaysian Grading Rules document is available on the ATIBT website.

# 5. OTHER SPECIFIC APPEARANCE, PRODUCT AND LUMBER GRADING RULES

Other rules for grading sawn tropical timber are used specifically for certain species or certain origins of wood. They are not included in this document but can be consulted on the ATIBT website or directly at the ATIBT:

* Sawn teak timber
* Ghana Standards Board - Furniture - Specifications for furniture components
* Rules for the Measurement & Inspection of Hardwood & Cypress ("NHLA grading rules", National Hardwood Lumber Association, 2015).

Certain formats of sawn timber for specific uses are subject to their own specifications, in particular:

* Railway sleepers and bearers: detailed specifications in the ATIBT technical data sheet *Timber under rails and related uses*[5] and in several international standards, including EN 13145+A1 (2011)[6].
* Wood for hydraulic structures: detailed specifications in the ATIBT technical data sheet *Les bois pour ouvrages hydrauliques* (in French only)[7].

# 6. VISUAL GRADING FOR STRUCTURAL APPLICATIONS USED IN EUROPE FOR SAWN TROPICAL TIMBER

The use of wood in structures requires knowledge of its mechanical properties.

The aim of structure grading is to propose different classes of mechanical strength for sawn timber, to optimise its use in construction.

Two methods are used for this classification: the visual method and the machine method.

The visual method uses criteria linked to the appearance of the wood, its defects and its singularities.

The table below shows the mechanical strength classes of sawn timber from the main tropical hardwoods as given in the current European standard EN 1912 (June 2012)[8] and those given in the more recent French standard NF B 52-001-1 (2018)[9].

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5. https://www.atibt.org/files/upload/news/TECHNIQUE/Technical_sheets/16-LES-BOIS-SOUS-RAILS-ET-USAGES-APPARENTES.pdf
6. AFNOR, 2011. Standard NF EN 13145+A1 (December 2011), Railway applications. Track. Wood sleepers and bearers, 21 pages.
7. https://www.atibt.org/files/upload/14-LES-BOIS-POUR-OUVRAGES-HYDRAULIQUES.pdf
8. NF EN 1912 (June 2012). Structural timber - Strength classes - Assignment of visual classes and species. 26 pages. *This standard is currently being revised at the date of publication of this booklet* (2023).
9. NF B 52-001-1 (April 2018). *Règles d'utilisation du bois dans la construction - Classement visuel pour l'emploi en structures des bois sciés résineux et feuillus - Partie 1 : Bois massif* (in French only).

| Pilot name[10] | Strength class | Country publishing the grading standard (associated visual grading)[11] | Pilot name[10] | Strength class | Country publishing the grading standard (associated visual grading)[11] |
|---|---|---|---|---|---|
| Acajou cailcedrat | D24 | France (HSR) | Karri | D50 | United Kingdom (HS) |
| Akossika | D30 | France (HSR) | Kedondong | D18 | France (HSR) |
| Andiroba | D35 | France (HSR) | Kelat | D35 | France (HSR) |
| Andoung | D30 | France (HSR) | Kempas | D60 | United Kingdom (HS) |
| Angelim | D40 | France (HSR) | Keruing | D50 | United Kingdom (HS) |
| Angelim vermelho | D50 | Netherlands (C3STH) | | D40 | France (HSR) |
| | D50 | France (HSR) | Lauan red | D30 | France (HSR) |
| Araracanga | D50 | France (HSR) | Limba | D24 | France (HSR) |
| Awoura | D40 | France (HSR) | Limbali | D40 | France (HSR) |
| Ayous | D18 | France (HSR) | Longhi | D40 | France (HSR) |
| Azobé | D70 | Netherlands (C3 STH) | Louro vermelho | D24 | France (HSR) |
| | D70 | United Kingdom (HS) | Maçaranduba | D50 | Netherlands (C3STH) |
| | D50 | France (HSR) | | D60 | France (HSR) |
| Balau Yellow / Bangkirai | D50 | United Kingdom (HS) | Maçaranduba / Balata franc* | D70 | France (HS ST1) |
| | D50 | Netherlands (C3STH) | Mahogany | D18 | France (HSR) |
| Basralocus | D24 | Netherlands (C3STH) | Makoré | D30 | France (HSR) |
| Basralocus / Angélique* | D50 | France (HS ST1) | Mandioqueira / Gonfolo * | D40 | France (HS ST1) |
| Bété | D35 | France (HSR) | Manil | D35 | France (HSR) |
| Bilinga | D50 | United Kingdom (HS) | Marupa | D18 | France (HSR) |
| | D35 | France (HSR) | Mengkulang | D35 | France (HSR) |
| Bintangor | D35 | France (HSR) | Merbau | D50 | United Kingdom (HS) |
| Bomanga | D24 | France (HSR) | | D40 | France (HSR) |
| Bossé | D30 | France (HSR) | Mora | D40 | France (HSR) |
| Bubinga | D40 | France (HSR) | Mukulungu | D40 | France (HSR) |
| Cambara / Jaboty* | D35 | France (HS ST1) | Naga | D30 | France (HSR) |
| Cardeiro | D35 | France (HSR) | Niangon | D35 | France (HSR) |
| Cedro | D18 | France (HSR) | Niové | D50 | France (HSR) |
| Cerejeira | D18 | France (HSR) | Oboto | D40 | France (HSR) |
| Copaiba | D24 | France (HSR) | Okan | D40 | Netherlands (C3STH) |
| Cumaru | D60 | Netherlands (C3STH) | | D40 | France (HSR) |
| | D50 | France (HSR) | Okoumé | D18 | France (HSR) |
| Cupiuba / Goupi* | D45 | France (HS ST1) | Ovèngkol | D40 | France (HSR) |
| Dabéma | D30 | France (HSR) | Ozigo | D30 | France (HSR) |
| Diania | D35 | France (HSR) | Padouk | D40 | France (HSR) |
| Doussié | D40 | France (HSR) | Para-para | D18 | France (HSR) |

10. According to the *General Nomenclature of Tropical Timbers* (ATIBT, 2016).
11. The classes listed in this table are defined in the classification standards of the corresponding countries cited in Annex A of standard EN 1912.

| | | | | | |
|---|---|---|---|---|---|
| Ekoune | D24 | France (HSR) | Pau roxo / Amarante* | D55 | France (HS ST1) |
| Faro | D18 | France (HSR) | Piquiarana | D35 | France (HSR) |
| Greenheart | D70 | United Kingdom (HS) | Quaruba | D24 | France (HSR) |
| | D50 | Netherlands (C3STH) | Sapelli | D40 | United Kingdom (HS) |
| Guariùba | D35 | France (HSR) | | D35 | France (HSR) |
| Iatandza | D24 | France (HSR) | Sorro | D24 | France (HSR) |
| Ilomba | D18 | France (HSR) | Tachi | D35 | France (HSR) |
| Ipê | D50 | France (HSR) | Tali | D40 | Netherlands (C3STH) |
| Ipê / Ébène verte * | D70 | France (HS ST1) | | D40 | France (HSR) |
| Iroko | D40 | United Kingdom (HS) | Teck | D40 | United Kingdom (HS) |
| | D30 | France (HSR) | | D30 | France (HSR) |
| Itauba | D40 | France (HSR) | Tiama | D18 | France (HSR) |
| Jarrah | D40 | United Kingdom (HS) | Timborana / Alimiao* | D40 | France (HS ST1) |
| Jatobá | D50 | France (HSR) | Tornillo | D18 | France (HSR) |
| Kanda | D35 | France (HSR) | Wallaba | D40 | France (HSR) |
| Kapur | D60 | United Kingdom (HS) | * From French Guian | | |

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**Document produced by ATIBT's Timber-Material-Standardisation Commission by Jean Gérard / CIRAD (Secretary) and Emmanuel Groutel / WALE (President). November 2023 - funded by ITTO**