GUYANA TIMBER GRADING RULES

REVISION 2016

Document Prepared a part of ITTO Project: ***PD 687/13 Rev.1 (I)***

Prepared for the Guyana Forestry Commission within the framework of the ITTO-project "Strengthening the performance of the Wood Processing Sector in Guyana, through Building Local Capacity and Enhancing National Systems that promote forest product trade and sustainable utilization of forest resources", PD 687/13 Rev.1 (I)

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1 Introduction

Timber grading is fundamentally a marketing and quality control tool that ensures that the buyer knows the characteristics and specifications they can expect and the seller knows what to supply to meet expectations. Grading can be done either by visual assessment – based on certain size characteristics and occurrence of visual defects such as knots – or by machine grading which is used to test timber strength.

For the Guyana Timber Grading rules (GTGR) grades are provided for logs and a range of different wood product groups; for each product group there are usually several product types and grade classes. For the GTGR, both versions 2002 and 2016, grading is purely visual, either for strength or appearance depending on product group (See Exhibit 1-1).

Exhibit 1-1. Generalized structure of the draft 2016 timber grading rules[1]

LOGS	PILES	SAWN TIMBER		
↓	↓	↓		
Structural/Appearance grading	Structural grading	Structural grading	Appearance grading	
↓	↓	↓	↓	
Visual Grades	Visual Grades	Visual Grades	Defect grades/Cutting grades	Fit-for-purpose grades
↓	↓	↓	↓	↓
Structural or non-structural end uses	Structural uses	Load-bearing timber products	Non-structural timber products	

In Guyana grading is normally done for export purposes only – though there is no reason why the system cannot be used locally should a customer request a grade. For Guyana, the standardization should promote international recognition and acceptance of the timber and wood products. Also, it should encourage the use and marketing of lesser-used timber species.

The draft GTGR 2016 have drawn heavily on grading rules used in the main international markets of Guyana timber (especially lumber) in order that grading done in Guyana can be immediately comparable and compatible with grades in buyer countries, thus reducing potential confusion and interpretation between seller and buyer.

2 Rationale to revision

The rationale for a revision of the GTGR covered several points. The most important of these, and the major guiding principles of the revision, were:

1. To include a wide range of opinions – both from Guyana and abroad – in a process of stakeholder involvement to reach consensus on a revised version of the GTGR.
2. To simplify the grading rules to make them easier to follow and apply for graders, exporters and buyers.

[1] Adapted from *Davies I. and Watt G., 2005, Making the Grade – A guide to appearance grading UK grown hardwood timber.* Arcamedia.

3. To dovetail the GTGR with the major international rules, especially those in the US, the EU and the Caribbean.
4. To focus on a few major product groups for grading while retaining as optional grading for a range of minor products.
5. To refocus grading on visual strength grading for structural timbers and appearance grading for non-structural utility and decorative woods.
6. To provide a clear description of the defects most commonly encountered in Guyana timber.
7. To review the inclusion of dimension tolerances in the grades and consider setting ground rules but shifting details towards bi-lateral agreements between buyers and sellers.
8. To address the issue of moisture content in wood as part of the grading.
9. To propose a "fit-for-purpose" grade for certain product groups which could be included in the case that the product does not meet the regular grades but specifications are agreed between seller and buyer.

3 Outline of Guyana Timber Grading Rules

3.1 Fundamentals

The GTGR are based on visual assessment as opposed to machine testing and essentially are founded on the assessment of defects and dimensional verifications. A defect is classed as any feature, whether occurring in the living tree naturally or produced in the process of conversion of lumber, which affects the appearance or utility of sawn timber.

The GTGR permits the sorting of hardwood logs and lumber into groups and grades with intended end uses. The permitted incidence of the several types of defects in the various grades is defined in the rules. Grading for major product types is based on the internationally recognized grades most applicable to export of wood from Guyana (see Exhibit 3-1).

Grading is based on tolerances; if a piece (or a proportion of pieces) fails on one or more tolerances it cannot make the grade. If it fails all grades it could be sold as fit-for-purpose if agreed between buyer and seller, but cannot carry an official grade mark.[2]

The draft 2016 edition of the GTGR recognizes four main product groups which are sub-divided into product types and subsequently individual grade distinctions (Exhibit 3-2). This streamlining of the framework structure may result in cases where a timber product falls under more than one product type. In this case, there is the option for the seller, buyer or grader to select the most appropriate product type category to grade against according to intended end use and particular market requirements.

[2] The Fit-for-Purpose category has been included in response to some stakeholders' request that in certain cases a wood product can be exported even though it does not meet the exact specifications of the grades once it is acceptable to the buyer. This is allowed on the condition that there is a written agreement (contract) between buyer and seller stating the specifications of the order and that it is accepted as fit-for-purpose.

The Fit-for-Purpose category is **not** intended as a catch-all or loop-hole whereby sub-standard or poor pieces of timber are allowed to be exported, thus risking blemishing the international reputation of Guyana's timber products. Therefore, there is still a reject category for all product types that can be utilized at the discretion of the grader which would prevent export of the timber without special written permission from the Commissioner of Forests (as is currently the case).

3.2 Product group reference structure and description

3.2.1 *GY01. Roundwood*

Logs (GY01a) and piles (GY01b) are visually graded according to certain structural aspects and the occurrence and extent of (largely) natural defects. For logs and piles there are four (A-D) and three (A-C) grades, respectively, with a final fit-for-purpose grade for each.

For round logs, an approach to grading based on practice common in the US is adopted. This is to assess and record the relevant defects according to the four nominal faces of a log (see Exhibit 3-3).[3]

Exhibit 3-1. Compatibility between GY sawnwood grades and international grades

Guyana Product Group	GY grade	Compatible standard	Grade
GY02 – Structural timber	A B C	UK/Europe (BS EN 14081-1:2005)	HS N/A N/A
GY03a – Non-structural timber (Utility timber)	A B C	UK/Europe (EN 975-1: 2009)	QFA and QF1a-b QF2 and QF3 N/A
GY03b – Non-structural timber (Decorative timber)	A B C D	US (NHLA Grading Rules for Hardwoods)	FAS F1F/Select No. 1 Common/No. 2A Common No. 3 Common

[3] However, to keep grading in the field simpler and easier to apply, the GTGR 2016 does not encompass the assessment of the estimated lumber output from a log as is typical in other countries such as the US. Note that in cases where there are time or other constraints for grading it is permissible to sample the surface defects on a log on the second-worse face of the log only.

Exhibit 3-2. Summary of draft 2016 GTGR structure

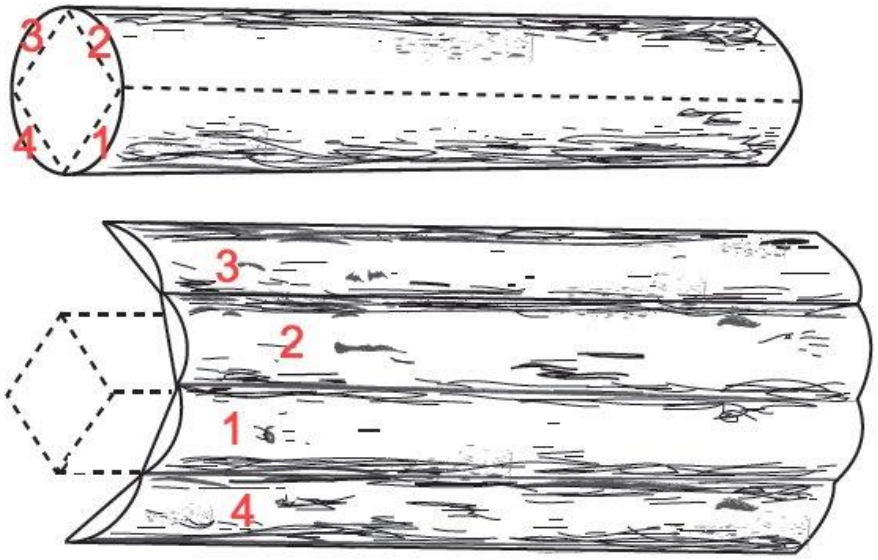
Product group[4]	Product type	Product type description	Grading method	Possible grades
GY01 - Roundwood	a	Logs	Visual strength[5] or appearance	A, B, C, D, (FFP)
	b	Piles		A, B, C, (FFP)
GY02 – Structural timber		All types	Visual strength	A, B, (FFP)
GY03 – Non-structural timber	a	Utility timber	Appearance (defects)	A, B, (FFP)
	b	Decorative timber	Appearance (cutting)	A, B, C, (FFP)
GY04 – General wood products	a	Profiled products	Appearance (defects)	A, B, (FFP)
	b	Railway sleepers and crossings	Visual strength	A, B
	c	Transmission poles (round)	Visual strength	A
	d	Telegraph and electric cross-arms	Visual strength	A
	e	Fencing posts	Visual strength	A, (FFP)
	f	Shingles	Appearance (defects)	A, (FFP)
	g	Fencing staves	Visual strength	A, (FFP)
	h	Hewn squares	Visual strength	A
	i	Non-traditional wood products	N/A	No grade
	j	Plywood and veneer	Appearance	A-D/1-4

[4] Product groups are linked to the 2002 version of the GTGR as follows:

- Roundwood covers raw wood in the round and includes logs and round piles.
- Structural timber covers all timber intended for construction and engineering applications where strength characteristics are of primary importance. The product group covers sawn baulks (large scantlings) and all other sawn timber for building and construction.
- Non-structural timber covers all timber intended for uses where strength characteristics are not paramount and equates to sawn timber for dressing and furniture manufacture. It covers the product type "utility timber" which covers timber such as planks and boards intended for general use where strength characteristics are not of primary importance (such as in utility furniture) though may be a factor such as in decking or flooring (which can be described as "semi-structural). Decorative timbers are intended for uses where appearance and not strength is the primary characteristic (such as interior joinery, doors and windows, high-quality furniture, solid mouldings, panelling, cabinetry and musical instruments).
- The General Wood Products Group covers all categories of specialized products with generally relatively small or niche markets. Plywood and Veneer are included in the 2016 version as well as a category for Non-traditional wood products (without a grade) to cover export of artistic or artisanal wood items that may occasionally be requested such as tree stumps.

[5] "Visual Strength" grading refers to grading by assessing characteristics of a log or piece of lumber by visual characterisation of specifications and defects; it is distinguished from "machine strength" grading which involves mechanical equipment to test for strength characteristics such as bending and hardness.

Exhibit 3-3. Diagram of the nominal "faces (numbered) of a log[6]



3.2.2 *GY02. Structural sawnwood*

Structural sawnwood of all types is visually graded for strength. A number of characteristics of hardwoods which might be considered defects from an appearance grading point of view, such as stain not associated with decay, and pin holes, can be accommodated in structural material with little or no loss in strength. Certain characteristics such as slope of grain, however, require careful limitation. Consequently, specific rules for structural grading are desirable for efficient use.

Grading for this product group in the draft GTGR 2016 is comparable and compatible with the British and EU Grade "HS" for structural tropical hardwoods described in BS 5756:2007 (and BS EN 14081-1:2005). In the draft GTGR 2016 there are three grades recognised (A-B) plus a fit-for-purpose grade.

3.2.3 *GY03. Non-structural sawnwood*

Appearance grading assesses the suitability of a piece of timber for non-structural uses, based on the appearance of its surface characteristics. The two main approaches are the defects system and the cutting system.

3.2.3.1 GY03a. Defects system

Each piece of timber is assessed against rules for the maximum allowable size or degree of each type of feature that is permitted within a grade. The grades describe the whole piece of timber including, in some cases, defects that will have to be removed by re-sawing. This system is appropriate to general non-structural dimensioned utility timber and semi-structural applications such as flooring and decking. The grades in the draft GTGR 2016 are comparable and broadly equivalent to the (oak) grades in EN 975-1.

The grades are primarily determined by the presence, size or frequency of knots and splits on the best face of the plank or board. The characteristics of the worst face are only considered if they affect the performance of the timber in its intended use.

[6] Adapted from: A Log Grading Handbook. University of Tennessee Publication PB 1772-1M-12/09

Three grades are used to describe the main features of a piece of timber:

- **Grade A** describes planks and boards having a uniform appearance with few if any knots, splits or other features that would limit their use in applications where little variation in appearance is permitted. Equivalent to what is often called a 'clear' or 'prime' grade.
- **Grade B** has some knots, splits or other features that limit use where uniformity of appearance is important. Nevertheless the piece will yield areas clear of unacceptable features along with timber suitable for applications where some variation is acceptable.
- **Fit-for-Purpose** timber will include all manner of knots, splits, colour variation, and other features. In most cases a simple assessment of the knots and splits will be sufficient to determine the grade. Occasionally, however, other timber characteristics may affect the grade and the piece may have to be considered for reject (unless agreed between buyer and seller) even though the knot and split characteristics are acceptable (for example where discolouration may be an important limitation in light coloured species).

3.2.3.2 GY03b. Cutting system

This system is based on the amount of timber free of defects, or with acceptable features, assessed as rectangular areas called cuttings. The grades are defined in terms of the minimum area of cuttings (rectangles clear of defects) that are allowed within a single piece. This system is appropriate to timber destined for such uses as high-end furniture, interior joinery and decorative uses. This system is appropriate for timber going into markets that recognize FAS, F1F and common grades and the draft GTGR 2016 grades are compatible and comparable with these grades.

Four grades are identified in the GTGR 2016:

- **Grade A** equates with the US FAS grade, which derives from an original grade "First and Seconds" and will provide the buyer with long, clear cuttings best suited for high quality furniture, interior joinery and solid wood mouldings. Both faces of the board must meet the minimum requirement for FAS.
- **Grade B** is similar to the US FAS One Face (F1F) and Select grades. This grade is often shipped with FAS. The better face must meet all FAS requirements while the poor face must meet all the requirements of the Number 1 Common grade, thus ensuring the buyer with at least one FAS face.
- **Grade C** is a combination of the US grades No. 1 Common and No. 2A Com. Number 1 Common is often seen as a cabinet grade widely used in the manufacture of furniture parts and both faces of the board must meet the minimum requirements. If the poorest face meets the minimum requirements for Number 2A Common, it does not matter what the grade of the better face is.
- **Fit-for-Purpose** is similar to No. 3A Common and other timber that meets the requirements of the buyer.

3.2.4 *GY04. General wood products*

These grades are for general wood products and follow in general the definitions and grade distinctions in the GTGR 2002. They are for specialized products and markets and can be used as desired by producers or on request by buyers.

3.2.4.1 GR04a. Profiled products

This is for grading profiled products from seasoned hardwoods. Grade A is intended for finishing and construction work of the highest quality. Grade B is for general construction and finishing purposes where

sound lumber well milled but of lesser visual quality than Grade A is adequate. A fit-for-purpose grade is also included.

3.2.4.2 GR04b. Railway sleepers and crossings

This is for the grading of sawn or hewn railway sleepers, or bridge or other timbers, on which rail seats are fixed constants determined by the gauge of the railway. The rules also enable grading of hewn or sawn railway crossings or other timbers used at junctions where rail seats are varied. There are two grades recognized.

3.2.4.3 GR04c. Rounds transmission poles

This is for grading round transmission poles cut from sound living trees. It is mainly written for the species Wallaba (*Eperua* spp.) but may be used for other species by arrangement between customer and supplier. There is only one grade recognized and due to the specific and demanding nature of end-use no fit-for-purpose grade is included.

3.2.4.4 GR04d. Telegraph electric power cross-arms

This is for grading of sawn hardwood cross-arms manufactured for carrying telegraph wires or electric power lines. There is only one grade recognized and due to the specific and demanding nature of end-use no fit-for-purpose grade is included.

3.2.4.5 GR04e. Fencing posts

This grade is for grading of machine or hand-shaped fencing posts of Wallaba (*Eperua* spp.). A standard grade is described plus a fit-for-purpose grade.

3.2.4.6 GR04f. Shingles for roofing and panelling

This grade is for grading machine and hand-made shingles made from Wallaba (*Eperua* spp.) for roofing and paneling purposes. A standard grade is described plus a fit-for-purpose grade.

3.2.4.7 GR04g. Fencing staves

This grade is for grading hand and machine-made fencing staves made from Wallaba (*Eperua spp.*) and other species that are intended to be used for fencing. A standard grade is described plus a fit-for-purpose grade.

3.2.4.8 GR04h. Hewn squares

This grade is for hewn squares (shipping timbers) produced from sound live trees.

3.2.4.9 GR04i. Non-traditional wood products

This type covers wood items that may occasionally be requested for artistic or artisanal uses such as tree stumps or branches. There is no grade distinction.

3.2.4.10 GR04j. Plywood and Veneer

This grade is for veneers and finished plywood. The Guyana grades are base on the American National Standard for Hardwood and Decorative Plywood (ANSI/HPVA HP-1-2004).

4 Description of Grades

4.1 GY01a. Roundwood logs

Exhibit 4-1. Roundwood logs grade distinctions

Grade	Length	Mid-d	Taper	Grain	Heart	End shape	Shakes	Knots	Curvature	Hollow/heart rot	Pinholes	End shake
A	6 m+	60 cm+	85%+	≤1 cm deviation per 5 m	Centered within 10% of diameter (both ends)	Circular both ends	≤2 with total length ≤5% log length	None allowed	None allowed	None allowed	None allowed	None allowed
B	6 m+	60 cm+	80%+	≤1 cm deviation per 1 m	Centered within 10% of diameter (both ends)	No restrictions	≤2 with total length ≤5% log length	Sound knots ≤15% diameter per 5 m	Simple ≤20% of diameter	None allowed	≤20 within 144 cm^2	Total length ≤5% log length
C	4.6 m+	60 cm+	75%+	≤1 cm deviation per 0.9 m	Centered within 15% of diameter (both ends)	No restrictions	≤2 with total length ≤5% log length	Sound knots ≤20% diameter per 5 m	Simple ≤30% of diameter	On butt only ≤10% of CSA	≤50 per 3 m (in sapwood only)	Total length ≤15% log length
D	4.6 m+	40 cm+	70%+	≤1 cm deviation per 0.9 m	Centered within 20% of diameter (both ends)	No restrictions	≤2 with total length ≤5% log length	Sound knots ≤20% diameter per 5 m	Simple or compound ≤40%	Either end ≤20% of CSA	≤50 per 3 m (in sapwood only)	Total length ≤40% log length
FFP	Fit-for-purpose											

Notes

1. The minimum radial sound shell must be at least 15 cm or ⅓ of the cross-section diameter of the log whichever is the larger.
2. Logs graded (A-D) shall be fresh cut.[7]

[7] "Fresh cut" generally does not refer to an exact time period after felling for grading purposes as species and ambient conditions will determine the rate of deterioration of a log as far as grading specifications are concerned. As a rule of thumb, if the log ends are dry and splitting and/or (for certain species) fungal stain has appeared, then the log is not considered "fresh cut". In the GTGR 2016, however, in such a case the log can be sold under the fit-for-purpose grade, since the log in most cases will contain marketable timber, once the condition of the log is agreed in a contract between buyer and seller.

4.2 GY01b. Roundwood piles

Exhibit 4-2. Piles grade distinctions

Grade	Species	Taper	Spiral Grain	Ends	Curvature	Heart rot	Sounds Knots	Rotten knots	Fractures/compression failures	End shakes	Tight shakes	Ring shakes
A	GH	75%+	≤ ½ turn per 6 m	Trimmed 1 m above buttress	< 40 mm per 1 m	None	Sound knots ≤ 1/3 diameter; ≤ 40 mm deep	Occasional, ≤ ⅓ diameter	None	None in tip	< 100 mm	< 25mm
B	Any	70%+	≤ ½ turn per 6 m	Trimmed 1 m above buttress	< 40 mm per 1 m	None	Sound ≤15% diameter per 5 m	Occasional, ≤ ⅓ diameter	≤20 within 144 cm^2	No open star shakes in butt	< 300 mm	< 50 mm
C	Any	40%+	≤ ½ turn per 6 m	Trimmed 1 m above buttress	< 40 mm per 1 m	None	Sound ≤20% diameter per 5 m	Occasional, ≤ ⅓ diameter	≤50 per 3 m (in sapwood only)	See tight shakes	< 400 mm	< 75 mm
FFP	Fit-for-purpose											

Notes:

1. Piles shall be cleanly trimmed of all branch stubs and knot overgrowths projecting more than 25 mm beyond the general surface.
2. All piles shall be debarked except that occasional bark in-growth is permitted over sound wood.
3. All piles shall be cleanly cut off at butt and tip at right angles to the general axis of the piles.
4. Severe bruising or damage caused in falling or handling are prohibited.

4.3 GY02. Structural sawnwood

Exhibit 4-3. Structural sawnwood grade distinctions

	Grade A	Grade B	Fit-for-purpose
Features - general		As Grade A for species of strength class up to D60[8]	Not meeting criteria of Grades A or B. Only acceptable if agreed between buyer and seller.
Grading type	Visual strength grading		
Species EN strength class	D70		
Size	Cross-section 20+ cm^2 Thickness 20+ mm		
Moisture content	c. 20%[9]		
Features - defects			
Fissures	Not through the timber: ≤1 m or ¼ of the length (whichever is less)		
	Only at ends and length of fissure ≤ width of piece		
Slope of grain	1:11 maximum (if interlocked ≤ 1:4)		
Shape	Bow: not greater than 10 mm over 2 m		
	Cup: unlimited		
	Spring: not greater than 8 mm over 2 m		
	Twist: not greater than 1 mm per 25 mm over 2 m		
Knots	≤¼ maximum of thickness or width		
Longitudinal separation of knots	Knots accumulative if less than 2x width or when grain does not recover		
Bark pockets	At ends: not greater than the width of the timber Not at ends: ≤1.5 x width or ≤0.2 x width (whichever is less)		
Insect and fungal attack	No active infestation allowed No fungi attack allowed unless no decay No decay unless in unsound knots Worm and pinholes permitted if not active		
Wane	Length unlimited; full edge and face dimensions ≥⅔ of piece		
Boxed heart	Not permitted if thickness is ≤100 mm or width ≤225 mm		

Notes:

[8] Currently only Greenheart has been officially tested and graded as meeting the criteria of EU (EN) strength class D70. Once officially tested other species may prove to be D70 in the future so can be eligible for Grade A; on the other hand, eligibility for Grade B is provisional at the moment pending testing of species for structural strength criteria.

[9] In general in the GTGR 2016 moisture content is left for specification in contracts between buyer and seller; in this grade however the minimum is retained as it is compatible with the "HS" grade of the EU/UK standard BS EN 14081-1:2005.

1. Any piece which contains abnormal defects such as brittle-heart, compression failure, tension wood, damage, combinations of knots, insect damage, fungal decay and/or other characteristics, that might cause a decrease in strength properties to an amount which threatens its serviceability, shall be excluded from the grade.
2. Any piece which contains an abnormal defect/s shall be accepted to the grade if the reduction in strength caused by the abnormal defect or defects is obviously less than that caused by the defects admitted by the grade, as long as these abnormal defects are of a type which does not progress after conversion.

4.4 GY03a. Non-structural sawnwood

Exhibit 4-4. Grade distinctions for GY03a

Features	Main Grades		
	Grade A	**Grade B**	**Fit-for-purpose**
Inter-grown knots	One ≤ 20mm diameter or several smaller up to a combined diameter of 20mm	Three ≤ 40mm diameter or several smaller up to a combined diameter of 120mm	No restrictions providing the appearance and mechanical properties are suitable for intended use. More detailed criteria may be set in the supply contract.
Other and rotten knots	Occasional if measured-out	Occasional	
Checks	Occasional surface	Limits may be set	
Shake	No	Occasional if measured-out	
Colour	Limits may be set	No restrictions	
Grain	Straight or nearly straight	Course grain and minor sloping grain permitted	
Bark	One surface pocket if measured-out	One surface pocket if measured-out	
Rot and insect attack	No	One small area if measured-out	
Warp	Limits may be set	Limits may be set	
Wane	Limits may be set	Limits may be set	
Sapwood	Limits may be set	Limits may be set	

Notes:

1. The grade table gives the maximum size or extent of features permitted per: one metre length in the case of square-edged pieces or two metre length in the case of waney-edged pieces.
2. Measuring-out is a practice whereby planks and boards are measured in a way that excludes wane and some large defects from the volume of timber that is valued for sale. In effect the final dimensions of the piece are quoted as if the area containing any defects had already been removed before measurement. When measuring-out a defect it is normal practice to mark the piece to identify the area that is excluded.
3. For the worst face, all listed characteristics are allowed, providing that they do not interfere with the mechanical properties of the piece, or otherwise limit its performance in use. Where it is essential that both faces are the same grade, this must be specified by the purchaser in the supply agreement. Knots are considered on the edges.
4. Knot sizes are given as the diameter or, for oval knots, the average of the largest and smallest width. Occasional pin knots below 5 mm diameter are not considered.

5. Larger knots are allowed on 25% of boards in a batch if they are measured-out.
6. Maximum knot diameter to be less than ⅓ the width of the piece.
7. Occasional splits in sound knots are permitted.
8. Wavy-grain is accepted providing that it can be regarded as a special decorative feature that will not limit the performance of the piece in its intended use.
9. Surface stains are not generally regarded as a defect providing that they do not penetrate into the timber. Sticker-marks and other penetrating stains are not permitted in grade A pieces and may be excluded in grade B.
10. Where the grade is specific to a customer's intended use it is always the buyer's responsibility to identify the appropriate appearance and mechanical properties for that end use.

4.5 GY03b. Non-structural sawnwood

Exhibit 4-5. Grade distinctions for GY03b

<table>
<tr><th rowspan="2">Features</th><th></th><th colspan="3">Main Grades</th></tr>
<tr><th>Grade A</th><th>Grade B</th><th>Grade C</th><th>Fit-for-purpose</th></tr>
<tr><td>Minimum board size</td><td>6"x8'</td><td>4"x6'</td><td>3"x4'</td><td rowspan="4">No restrictions providing the appearance and mechanical properties are suitable for intended use.
More detailed criteria may be set in the supply contract</td></tr>
<tr><td>Minimum size cuttings</td><td>4"x5'
3"x7'</td><td rowspan="3">Better face must meet Grade A requirements.
Poor face must meet Grade C requirements.</td><td>3"x2'
4"x2'</td></tr>
<tr><td>% Clear</td><td>SM x 10
(83⅓%)</td><td>SM x 8 (66⅔%)</td></tr>
<tr><td># Clear cuttings</td><td>SM/4</td><td>SM +⅓</td></tr>
</table>

Notes:

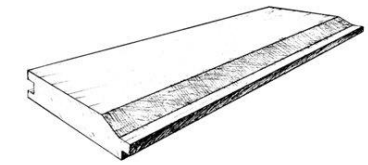
1. Grade A includes a range of boards that yield from 83⅓% (10⁄12^{ths}) to 100% clear-wood cuttings over the entire surface of the board. The clear cuttings must be a minimum size of 3" wide by 7' long or 4" wide by 5' long. The number of these cuttings permitted depends on the size of the board with most boards permitting one to two. The minimum width and length will vary, depending on species and whether the board is green or kiln dried.

4.6 GY04. General wood products

4.6.1 *GR04a. Profiled Products from Seasoned Timber*

Exhibit 4-6. Profiled products covered by the grades

1a Tongue and groove siding

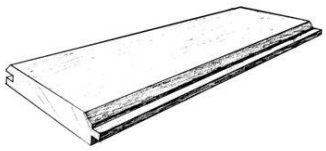


1b Tongue and groove flooring

1c Secret nail flooring

1d Channel lining

1e V-joint lining



1f Spring and rebate siding

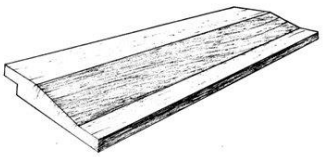


Exhibit 4-7. Grade distinctions for GY04a

Grading factors	Grade A	Grade B	Fit-for-purpose
Knots, sound, tight and inter-grown	¼ face width or 25 mm diameter maximum	½ face width or 50 mm diameter maximum	No restrictions providing the appearance and mechanical properties are suitable for intended use. More detailed criteria may be set in the supply contract
Knots, dead, decayed and knot holes	Not permitted	12mm diameter 1 per 4 m length	
Pin holes (Ambrosia borer)	4 per 5 m of length	Occasional, well scattered	
Unsound heart and pith	Not permitted	Not permitted	
Gum and bark pockets	Not permitted	12 mm wide x 75 mm long and tight 1 in 4 m of length	
Wane	Not permitted	Not permitted	
Bow	1 mm in 1m length	1.5 mm in 1 m length	
Spring	1 mm in 1 m length and evenly distributed	2 mm in 1 m length, evenly distributed	
Shake	Not permitted	Occasional and less than 150mm long	
Compression failure	Slight	Slight	
Sound sapwood not treated by an approved preservation process not immune to *Lyctus*	Not permitted (see note)	25 mm width on face	
Sapwood – sound meaning treated by an approved preservation process or naturally immune to *Lyctus*	Not limited	Not limited	
Seasoning checks	30 mm long not more than 1 in a meter	Slight well scattered	

Grading factors	Grade A	Grade B	Fit-for-purpose
Mismatch	Not permitted	0.5 mm maximum in 10% of parcel	
Skip (hit and miss)	Not permitted	Not greater than 80 mm long and 2 mm deep in 5 m length	
Broken, missing & short tongues	Not permitted	Maximum 110mm long per 1 m in 10% of parcel	
Broken & missing groove	Not permitted	Not permitted	
Kick out	Not permitted	Not permitted	

Notes:

1. The limits of defects affecting appearance and performance of the two grades are given below. Limits refer to defects appearing on the better face. Any imperfections may appear on the back of the piece providing they do not significantly affect the strength or fixing of the products. No defect is allowed at the edges where it would result in fitting problem.
2. Quality of dressing. All products shall be of sound wood, well milled to a smooth surface and free from defects on the face other than those described for the particular product and grade.
3. End trimming. All dressed products shall be trimmed square at the ends. Marking out of defects without trimming is not allowed.
4. Species. Dressed products of any hardwood species may be graded under these rules and may be supplied either as lots comprising a single nominated species or in lots comprising several species by arrangement between customer and supplier.
5. In many Guyana hardwoods the sapwood is similar in color and texture to heartwood and is not *Lyctus* borer susceptible. In these timbers sound sapwood would be admitted without limit under these rules. Where sapwood is distinctly different in color it may be desired for its decorative effect e.g. Wamara, in other cases it may not be desired e.g. Purpleheart.
6. In Grade A a customer may specify by arrangement that the timber be sap free. Where sapwood has been treated by an approved preservation process as defined in the Timber Marketing Act then it will be of natural color and perfectly sound.

4.6.2 *GR04b. Railway Sleepers and Crossings*

Exhibit 4-8. Grade distinctions for sleepers and crossings

Grading factors	Railway sleepers		Railway crossings	
	Grade A	**Grade B**	**Grade A**	**Grade B**
Sapwood	One wide face shall be free from sapwood. The other face may contain sapwood provided it does not exceed ¼ of the width of the sleeper at either the rail seat or ½ the width elsewhere	Sound sapwood is admitted without limit. However the sapwood must be well impregnated	One wide face shall be free from sapwood. The other face may contain sapwood provided it does not exceed in the aggregate 1/3 of the width of the face or edge on which it occurs	Sound sapwood is admitted without limit

Wane	One wide face shall be free from wane. The other side may contain wane provided it does not exceed ¼ of the width of the sleeper at either rail seat or ½ the width elsewhere	Wane is permitted on only one of the wide faces and the width of the rail seat shall not be reduced by more than 25% due to the wane	One wide face shall be free from wane. The other side may contain wane provided it does not exceed in the aggregate 1/3 of the width of the face or edge on which it occurs	Wane shall not be present on both faces or exceed in the aggregate 1/5 of the width of the face
Phloem	No phloem is allowed	Phloem not stretching fully end to end or side to side	No phloem is allowed	Phloem not stretching fully end to end or side to side
Side shakes	Maximum penetration of side shake measured at right angles to the length of the sleeper in any face or edge is 25 mm	Maximum penetration of side shake measured at right angles to the length of the sleeper in any face or edge is 50 mm	Maximum penetration of side shake measured at right angles to the length of the crossing in any face or edge is 25 mm	Maximum penetration of side shake measured at right angles to the length of the crossing in any face or edge is 50 mm

Notes:

1. Sleepers should be reasonably straight. Permissible deviations from straightness are as follows:
    a. **Spring:** A string stretched from the mid-point on one end to the mid-point of the other end of the sleeper on the wide face should be wholly within the sleeper.
    b. **Cup:** A straight edge laid across the wide face of the sleeper should not be more than 6 mm from the deepest part of the cup.
    c. **Twist:** For sleepers, a string stretched diagonally on either wide face should not be more than 10 mm from any point on the face. For crossings, twist is permitted provided it can be removed by adzing.
    d. **Bow:** A string stretched from the mid-point of one end of the sleeper to the mid-point of the other end on the edge (narrow face), should not deviate from the centre line of this face by more than 4 mm per meter length of the sleeper or crossing.
2. All sleepers must be free from decay and such shakes, hollow knots, compression failures, bark or other defects that, in the opinion of the timber grader, would render any piece unsuitable for use as a sleeper. Sleepers must be free from heart (pith) unless otherwise specified in the contract in which case, the heart must be sound.
3. **Knots**: Both rail seats shall be free from knots of 25 mm diameter and wider. One tight sound knot of less than 25 mm diameter may be permitted at the rail seat. Tight sound knots up to 75 mm may be permitted away from the rail seat. For crossings, sound knots are permitted provided that there is no more than one knot of up to 75 mm diameter per each meter of length.
4. **End shake**: The aggregate length of the longest shakes at each end of the sleeper shall not exceed 80 mm per meter length of the piece. Any single shake of length exceeding 160 mm per meter length of the sleeper shall be adequately clamped with an S-hook or other approved device.
5. **Included phloem**. Sleepers containing included phloem which runs from one end of the sleeper to the other or from one face to the other and is less than 30° to the vertical will be rejected. Strands of included phloem should not be numerous or grouped so as to materially affect the strength of the piece.
6. The two most suitable sleeper and crossings timbers in Guyana are *Chlorocardium rodiei* and *Mora gonggrijpii*. The Grade A is naturally durable; Grade B should be treated.

7. Rail seats shall be on the better face. However when wane is present on one face, they shall be on that face. Rail seat is defined as that portion of the sleeper lying on either side of the centre line of each rail, 580 mm wide for wide gauge, 560 mm wide for medium gauge and 150 mm for narrow gauge railways.

4.6.3 *GR04c. Round Transmission Poles*

Exhibit 4-9. Acceptable and prohibited features for transmission poles

Acceptable features	
Shake at butt	up to 380 mm long
Grub holes	slight and occasional
Sound knots	except in clusters and of a diameter not more than 25% of the diameter of the pole at a point where they occur
Spiral grains	half turn (180^{o}) in 9 m
Clean heart shakes	showing on surface of pole, aggregate length not more than 10% of length of pole
Season checks	moderate
Sapwood	occasional short surface streaks of sapwood are allowed, while patches of ingrown sapwood of maximum width or length not exceeding the diameter of the pole where they occur and not more than 6 mm in thickness shall be permitted in 10% of lot
Side spalls	not in excess of 6 mm in depth in 10% of the lot
Prohibited defects	
	Plugged defects and holes larger than 25 mm
	Decay and rotten heart
	Tight shake at tip longer than 75 mm
	Compression failure and cross break

Notes:

1. All poles shall be of first quality with bark and sapwood removed, and shall not show any sign of heart rot. They shall have uniform taper and be reasonably round and straight. The tip of the pole shall be roofed or pointed, while the butt shall be square to the length.
2. A straight line from centre of the butt to centre of the tip shall be at no point less than one-tenth of the diameter of the pole from the near side at point of consideration.

4.6.4 *GR04d. Telegraph and Electric Power Cross-Arms*

Exhibit 4-10. Acceptable and prohibited features for telegraph cross-arms

Sapwood which is not treated by preservation	Not permitted except for Chlorocardium rodiei which only allows 20% perimeter measurement
Sapwood treated by preservation	No limitation
Sloping grain	Generally grain should run parallel to the length; but a maximum of 50 mm deviation from parallel per 1 m of length is permitted

Knots	Sound, tight and inter-grown, not in cluster and up to 25 mm in diameter are permitted
End and surface checks	Moderate
Pin holes	Permitted if scattered
Compression failures	Not permitted
Heart shakes	Not permitted

Notes:

1. All cross-arms shall be free of pith and accurately produced from sound logs. Surface may either be sawn or dressed. All ends shall be cut square and oil painted.
2. Cross-arms may be ordered under these rules as a particular species or by class number and will normally be graded and supplied green but may be supplied seasoned by arrangement between the customer and supplier.

4.6.5 *GR04e. Fencing Posts*

Exhibit 4-11. Acceptable and prohibited features for fencing posts

Knots: loose, decayed or hollow	Permitted if the diameter does not exceed 40 mm
Knots: sound and ingrown	Permitted but only in 1/3 of the circumference of the post
End shakes	Permitted when maximum length at one end does not exceed 100 mm
Shakes	Permitted but not to extend throughout the length of the post
Sapwood	12 mm maximum thickness at both ends but not exceeding ⅓ of the post circumference
Grub Holes	Permitted if scattered
Pinholes	Permitted
Seasoning checks	Permitted

Notes:

1. All fencing posts shall be generally round and shall have approximately the same diameter throughout their length with the ends cut square.
2. Straightness tolerance shall be a maximum deviation of 1.8 to 3.0 m length 20 mm deviation, or 3.0 to 5.5 m length 25 mm deviation.
3. Any pieces not meeting the grade can be sold as fit-for-purpose.

4.6.6 *GR04f. Shingles for Roofing and Panelling*

All shingles meeting the grade shall be quarter-sawn, from sound wood, free of sapwood, generally flat, and free of holes, cracks and fissures which are likely to affect their serviceability. The ends shall be cut square and the sides shall be generally true to the length of the piece and parallel.

Shingles shall be properly packed and securely bundled in sets of fifty. An additional amount of reject shingles shall be placed around the bundle to fully protect the shingles while in transit or under storage.

Any pieces not meeting the grade can be sold as fit-for-purpose.

4.6.7 *GR04g. Fencing Staves*

All staves shall be of sound wood, free of sapwood, generally flat, and free of holes, cracks and fissures which are likely to affect the serviceability of the staves. The ends shall be cut square and the sides shall be generally true to the length of the piece and parallel.

Staves shall be properly packed and securely bundled in sets of not more than twenty-five. The bundle shall be well strapped at three places to fully protect the staves while in transit.

Any pieces not meeting the grade can be sold as fit-for-purpose.

4.6.8 *GR02 Hewn Squares*

All sides must be well hewn, flat, true and free of large through shakes, severe edge shakes and seasoning checks. Ends shall be cut square and oil painted immediately after cross cutting. Finished squares must be straight and true within the tolerances given below. Spiral grained logs are not permitted. Any piece having plugged defects must be rejected.

There is one grade distinction which must meet the following criteria:

- Cross section to be measured by caliper half way along the piece in two directions at right angle to each other and in the centre of each face. Allowance specified in each diameter measurement equals ± 25 mm.
- Taper approximately 25 mm deviation in 6.0 m length shall be allowed.
- Straightness up to 16.0 m length, deviation up to 25mm.
- lengths between 16.0 m and 18.0 m, deviation up to 40 mm; lengths greater than 18.0 m, deviation up to 50 mm.
- Wane up to 16.0 m length, wane of 5 mm per 25 mm of face width is permitted; over 16.0 m length, wane of 5 mm per 20 mm of face width is permitted.
- Generally free of defects, which significantly affect the strength of the piece, but the following shall be permitted.
- Sound knots up to 25% of face width are permitted; unsound knots and knot clusters are not permitted
- Occasional pinhole borer is permitted
- Decay and rotten heart not permitted
- Seasoning checks permitted
- Open star shake and ring shake are permitted only if they do not exceed 75 mm in diameter. Edge shakes extending from one face to opposite or adjacent one. Allowable maximum length of edge shake, if tight, is 1½ times the width of the piece. End shake for sizes up to 350 mm x 350 mm, the maximum end shake penetration, measured at right angles shall be 40 mm for sizes exceeding this cross-section limit, permitted end shake length can reach 50 mm.

4.6.9 *Non-traditional wood products*

There are no grade distinctions for these types of product.

4.6.10 *Plywood & Veneer*

Plywood veneers for general purposes are graded from A grade being the top clear grade to D grade being the bottom or lowest. B grade is slightly lower than A. C grade has any knots, splits, etc filled and is then sanded. D grade can have open knots and splits and can be un-sanded. The face grade of plywood is always the first designated, e.g.:

- **AA** has two A grade faces
- **AD** has an A grade face and a D grade back
- **S** is a Selected grade, equals or betters B grade
- **BB** has two B grade faces
- **CD** has a C grade face and a D grade back
- **DD** has two D grade faces

FACE TYPES

- AA-Grade Face - Highest quality veneer you can specify in any particular species. The veneer will be smooth, tight cut, and full length and free of any visible defects or abnormalities.
- A-Grade Face - an "A" face on hardwood plywood should be matched for both grain and color. All veneer splices should be book-matched for a visually pleasing appearance. There should not be any abrupt changes in color or grain between the splices. An "A" face will not permit sound knots, repaired knots or rough-cut veneer. An A face may allow slight mineral streak and/or vine marks. The number of defects such as pin knots or small burls varies according to the specie of veneer. This is the best face grade on plywood normally stocked and is often used for upper-end cabinetry, architectural millwork, and quality furniture.
- B-Grade Face - a "B" face on hardwood plywood should be matched for a pleasing color, but not necessarily for grain. "B" grade faces are generally very similar to "A" faces, but do allow some sound or repaired knots and some slight rough cut veneer. "B" grade faces will also allow slight mineral streak and vine marks.
- C-Grade Face - a "C" face on hardwood plywood allows for unlimited pin knots and small burls. A "C" face can also contain repaired knots and sound knots. The "C" grade will also allow unlimited mineral and vine marks. A "C" face should be a sound smooth face. A "C" face is used primarily on paint grade type panels, in lower-end case work, and for cabinet interiors in upper-end cabinetry.
- D-Grade Face - a "D" face on hardwood plywood is similar to the "C" face, but will allow some rough cut veneer and a few more repaired and sound knots.

BACK TYPES

- 1 Back - can contain up to 16 sound tight knots not exceeding 3/8" in diameter. Allowed to contain unlimited mineral streaks. A "1" back will not contain any repaired knots.
- 2 Back - can contain up to 16 sound tight knots not exceeding ¾" in diameter. A "2" back can also contain repaired knots, rough cut veneer, and unlimited mineral streak.
- 3 and 4 Back - this is generally referred to as a reject back. A "4" back is to be used in concealed areas where appearance is of no concern. The "4" back is most commonly used on 1/4" plywood. However, it may also be used on thicker panels when the back will play no role in the appearance of the finished product.

5 ANNEXES

5.1 Glossary of grading terms

Bare, dead, exact	Applied to sawn timber that measures, at the time of inspection, the same as the dimensions specified.
Blemish	Any feature that mars the appearance of timber but has no adverse effect on its technical quality. Examples are small knots, shallow sun-created checks, small borer holes, short shakes, slight decay.
Board	A piece of sawn timber 5cm or less in thickness and usually less than 15cm in width.
Clear	Free of all visual defects, sound.
Curvature	Deviation of the longitudinal section of a log from a straight line. Normally expressed as a percentage of the log diameter. Also referred to as bend.
Degrade	Additional defects in timber which would have not been permitted during initial grading. Occurs through poor storage, transport or handling.
Face, better	Is the face having the superior appearance in visual grading
Face, worse	Is the face having the inferior appearance in visual grading
Fresh cut	A log which has sound sapwood, free from large and deep grub or wormholes as well as free from fungi
Full sawn	When timber is cut so that its true measured size is greater than the nominal or ordered size. Usually done to allow for shrinkage of width and thickness during seasoning.
Gradient	When seasoning of timber is not complete, so that different zones of the cross section (surface and core) have different moisture content, the timber is said to have a moisture gradient.
Green timber	Unseasoned or partially seasoned timber. Timber fresh sawn or "green off saw".
Growth stress	The stress which develops in the growing trunk of a tree due to growth processes and which, when released during sawing, may cause the wood to spring and burst. Sawn wood from stressed logs tends to curve so that the sap side becomes concave and the heart side convex. Growth stress is a major cause of degrade in dense tropical hardwoods.
Hardwoods	A term used to describe all timbers of broad-leaved species. Technically, all Guyana's timber species are hardwoods.
Hewn timber	Timber which has been squared from a log by an axe rather than by sawing. Often used for heavy engineering timbers.
Log	A bole or a length of a bole or large branch after felling, trimming and crosscutting
Lumber	Sawn wood usually with a cross-section less than 280 cm^2
Plank	A piece of sawn timber more than 25 mm thick and more than 150 cm long with width not less than twice the thickness.
Scant (sawn)	Timbers which when graded measure less by at least a half of the cutting allowance in the stated direction. Normally such a scant causes rejection by the grading rules unless subject to a special agreement with the customer.
Scantlings	Sawn timber more than 25 mm thick and 75 mm wide of end section and less than about 280 cm^2
Shorts	Pieces of sawn timber less than 2.4 m long
Shrinkage	The reduction in size across the grain, which occurs when timber is seasoned from the green condition. To meet a particular dimension when seasoned, green timber

must be cut oversize by an amount commonly 5-10%, known as the shrinkage allowance. There is virtually no shrinkage in timber along the grain when it is seasoned from the green state.

Sound — Free from decay.

Stain or discoloration — A variation from the natural color of the wood. May be caused by sap stain fungi, by incipient decay, by chemical effect from metals such as iron, or as a result of some abnormal growth process in the tree. Stain which is sound (not related to decay) is permitted in grades where appearance is not a factor, or where it would normally be removed by dressing.

Surface dry — Timber where only the surface of the board has dried and where the interior in cross-section is still green. Such timber is not regarded as shipping dry.

Tally — The measurement of timber in a parcel listed by width, thickness, length, species, grade etc.

Tolerance — A portion of the length, width or thickness of log or timber provided to maintain its nominal length as specified in standard.

There are different ways of indicating tolerance. For example, sawn wood of size 2.5 m ± 25 mm would be acceptable as long as it measures 2.5 m plus or minus the additional allowance of 25 mm. 2.5 m + 25 mm – 5 mm would be acceptable between 5 mm below nominal and 25 mm above. A tolerance of 2.5 m + 25 mm -0 mm indicates no tolerance below nominal but 25 mm above.

In the practical application of the GTGR no tolerance is accepted below the nominal, however indicated. All tolerance is above nominal only.

Undressed timber — Sawn timber which has not been smoothed by planning to a regular dimension.

Weather stain — Surface discoloration produced on timber during seasoning by exposure to sun and rain. It is superficial and not a defect in sawn wood.

5.2 Defects in wood (abnormal defects)

Bark pockets — Patches of bark enclosed within the growing tree (in-bark) and present in the sawnwood as a defect. Often containing gum or resin; c.f. gum vein, gum pocket

Blemish — Any feature that mars the appearance of timber but has no adverse effect on its technical quality. The following blemishes are not considered as defects in grading logs:

- curvature which is less than 10% of the average log diameter
- sound knots which have less than 25 mm diameter provided that their density is not more than two knots within a 2 m interval of the log length along the axis of the log
- surface checks brought about by the sun whose penetration is less than 25 mm
- small borer holes scattered on a surface of a log but in a concentration of less than 15 within 144 cm^2 and not penetrating beyond the depth of the sapwood
- side or surface shakes that are less than 15 cm long along the axis of the log
- any feature such as slight decay, slight shakes

Borer holes — A defect caused by insects which tunnel in the wood. Insect damage may occur in the living tree or shortly after felling while it is green. Usually caused by *Ambrosia* or pinhole borers and *Bostrychid* borers or after seasoning by *Lyctus* borers, termites, etc. In these rules borer attack is graded under three headings:

- pinhole borer: holes up to 3 mm diameter with or without associated staining
- grub holes: holes 6 mm and larger
- *Lyctus* borer: holes about 2 mm diameter and associated with destruction of the sapwood timber by the borer

Unless severely clustered so as to weaken the timber, pinhole and grub hole borer affects appearance only and can be tolerated in some grades, especially structural. *Lyctus* attack usually leads to destruction of the sapwood and is not permitted in any grade except in some framing grades where the amount of *Lyctus* susceptible sapwood is strictly limited

Brittle heart

The wood in the zone adjacent to the pith, usually about 100mm diameter which in an old tree may become brittle and decayed. Wood with brittle heart may often appear normal but will exhibit abrupt failure rather than splintering when broken under load; c.f. heart, heartwood

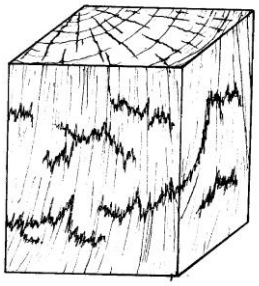
Check

A fissure or crack along the grain of the timber but which does not pass through from one face to the opposite or adjacent one. Most checks are the result of stresses produced at right angles to the grain by moisture gradients during seasoning, and often called seasoning checks. End check is the most obvious.

Compression failures

Fractures in the grain of timber running transversely to the grain, often at approximately 45 degrees. They are the result of failure of the timber under severe compression stresses. These compression stresses may result from growth stresses induced in the living tree that place the centre of the tree under severe compression and the outer zone under tension. This type of failure may be found towards the pith in older trees. Compression failure may also be the result of severe stresses caused by wind or when the falling tree hits the ground. These failures are found in the outer zones of the tree. Compression failures may be only visible when the timber is dressed. This defect is not permitted in structural grades

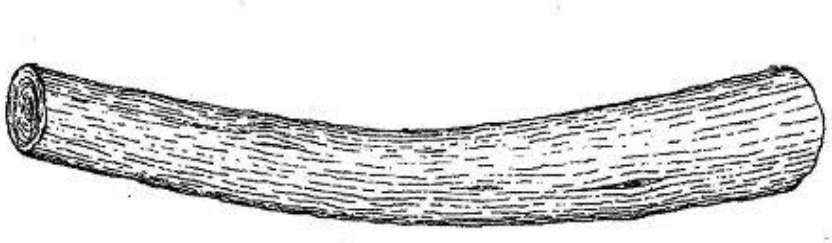
Compression failures



Curvature

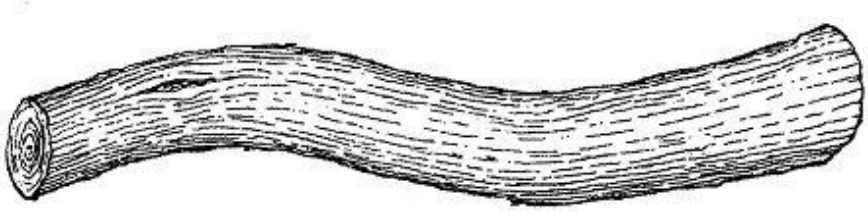
Deviation of the longitudinal section of the log from a straight line. Also referred to as bend. Simple curvature is the bend of the log characterized by one crook only. Measured as the deviation of the longitudinal axis from a straight line

Simple curvature

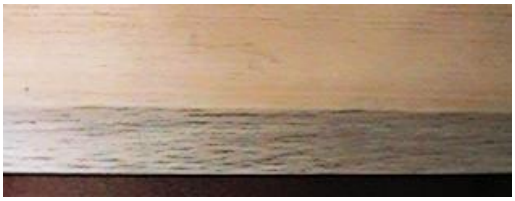


Compound curvature is the bend of the log characterized by two or more crooks in one or several planes. Each bend or curvature is assessed separately.

Compound curvature



Decay Destruction of the cell wall structure of wood caused by fungi including dry rot and wet rot. It is usually accompanied by discoloration of the wood and strength is seriously reduced



Staining fungi (such as blue stain) do not reduce the strength of the wood but merely discolor it. For decay to take place the moisture content of the wood must be above 20%. Many of the timbers of Guyana have a high degree of natural resistance to attack by wood decaying fungi. Generally the resistance of the sapwood of all species to attack by both wood destroying and staining fungi is lower than of the heartwood.

Degrade Occurs through poor storage, transport or handling when additional defects are developed in timber which would not have been permitted during initial grading

Flat crack A simple form of star shake consisting of a single shake lying along a diameter of the log. See shake

Growth stress The stress, which develops in the growing trunk of a tree due to growth processes and which when released during sawing, may cause the sawn wood to spring and burst. The stress in the trunk is always tensile in the sapwood and compressive in the heart. Sawn wood from stressed logs tends to curve so that the sap side becomes concave and the heart side convex. Growth stresses are the major cause of shakes and compression failures in growing trees and of spring, bow and end shakes in sawn wood, and hence the major cause of degrade in dense tropical hardwoods

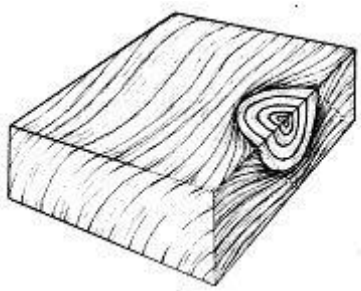
Gum vein, gum pocket Gum is a resin-like substance produced as a normal growth process by most trees, and may be dispersed through the wood or accumulated in veins, pockets or cavities. In some species this may become noticeable after seasoning

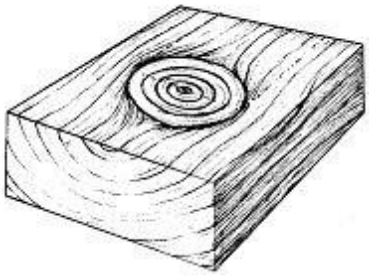
Heart The central portion of the cross-section of a log immediately surrounding the pith. In older trees this area may be defective due to decay or excessive brittleness. See brittle heart, heartwood, boxed heart, sound heart

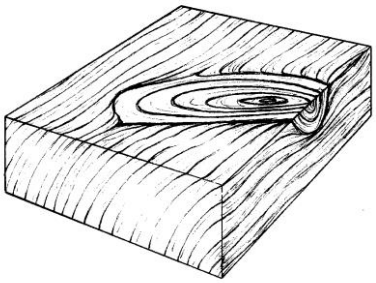
Honey-combing Internal fissures or checks running in a radial direction produced in timbers of large section by attempting to season them too rapidly during kiln drying. Not usually visible until the timber is crosscut. This defect is not common among species from Guyana

Knot Portions of branches embedded in the wood. Knots are categorized by their position in the piece, mutual position, and degree of inter-growth or condition of the wood. When the log is sawn the knots appear as transverse round or oval sections (round knots) in the wide face of flat sawn timber or as longitudinal sections (spike knots) in the wide face of quarter sawn timber. Knots covering the edge (arris) of the piece are called arris knots.

Arris knot *Round knot* *Spike knot*







Knots that are located separately so that the distance between them in longitudinal direction of the piece is greater than their width (or in cases where the width exceeds 150 mm, are greater than 150 mm apart) are known as scattered knots.

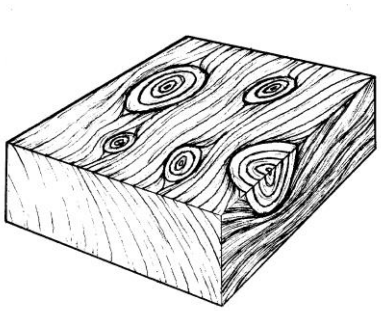
Knots forming a group of two or more knots in an area where the length is equal to the width (or in case where the width exceeds 150 mm, in an area 150 mm long) are called group or cluster knots.

Dead knot

Knots with their annual rings not inter-grown with the surrounding wood, or inter-grown with it only to a length ¼ or less of the cross-sectional perimeter of the knot, are dead knots. Where the knot has fallen out a hollow knot or knothole is left.

Knots in which more than ⅓ of the cross-section is rotten are rotten knots, those with less than ⅓ rotten are unsound knots and those showing no indication of decay are sound knots

Group knots



Pipe Hollowness in a log or timber along the centre of the heart following the pith and caused usually by attack of subterranean termites on the standing tree

Resin pocket See gum vein

Rot See decay

Sapwood The outer layer of wood in a tree stem adjacent to the bark and playing an active part in the growth process of the tree. Sound sapwood is as strong as heartwood and is normally included in sawn wood. The sapwood of some species is subject to *Lyctus* borer attack and may become discolored due to staining fungi. Under the GTGR sound sapwood, not *Lyctus* susceptible is admitted in all grades unless excluded by special arrangement.

Simple preservation by diffusion of salts of boron and fluorine are used for the treatment of *Lyctus* susceptible sapwood.

Since sapwood is not normally as durable as heartwood, under severe conditions of exposure i.e. in ground contact or a marine environment, sapwood, unless treated with a non-leachable preservative, is usually excluded or limited in engineering timbers

Scale Closely spaced small shakes giving the face of sawn or dressed lumber a scaly appearance (see shake)

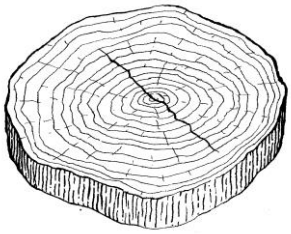
Seasoning checks Separations of wood cells along the grain as a result of uneven shrinkage, most common on end-grain surfaces of timber

Shake

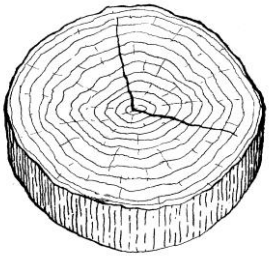
Separation of the wood fibers along the grain. In the case of a log, shakes are broadly divided by their position in the log (end shake or side shake).

In the case of sawn lumber, shakes are divided by their type, their position in the piece, and their depth.

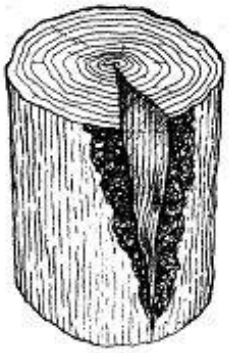
Single heart shake



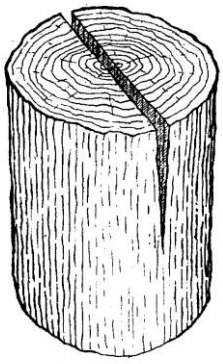
Compound heart shake (star shake)



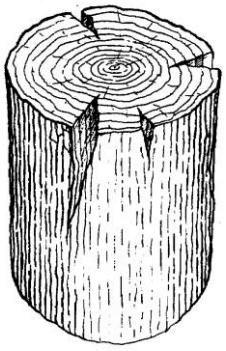
Side shake



Through shake

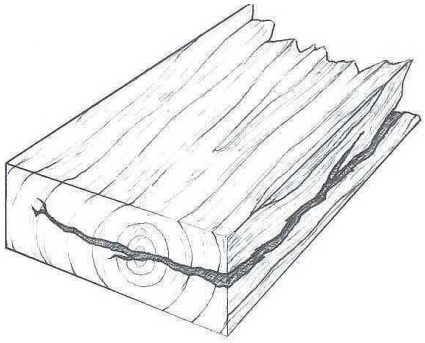


Drying shake

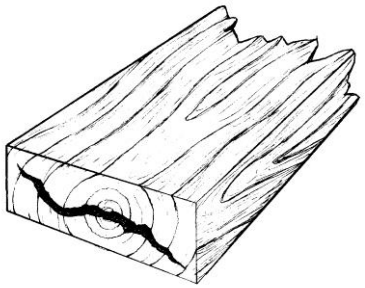


Shakes appearing on an edge (but which may also appear on the ends) are edge shakes. Those appearing on the end only are end shakes.

Edge shake



End shake

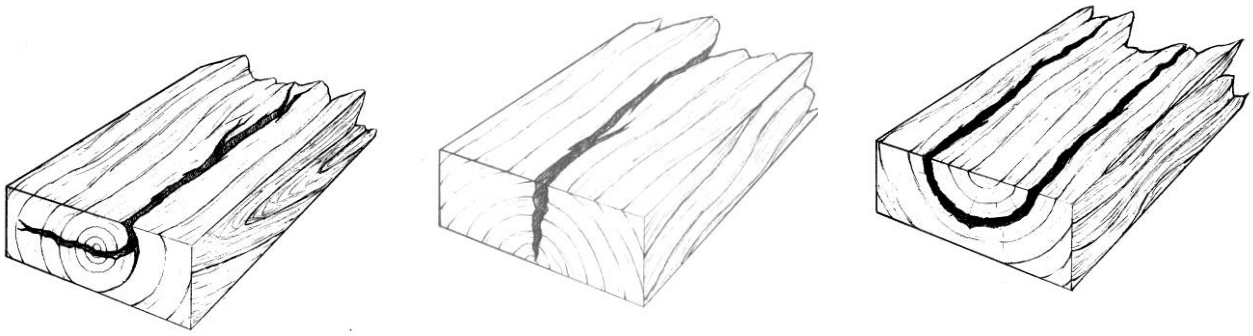


Shakes appearing on a face but which may also appear on the ends are face shakes.

Those radial shakes extending from the heart and characterized by a considerable extension lengthwise along the piece are heart shakes.

A separation of wood structure parallel to the growth rings, often in the first layer(s) of early wood, usually occurring in the standing tree and characterized by a considerable extension lengthwise along the piece is a ring shake.

Face shake *Heart shake* *Ring shake*



Ring shake extending for less than half a diameter is known as a cup shake

Shakes deeper than 5 mm for pieces of not more than 50 mm in thickness, and those deeper than 1/10 of the thickness in the thicker pieces, but not appearing on the other side of the piece are deep shakes.

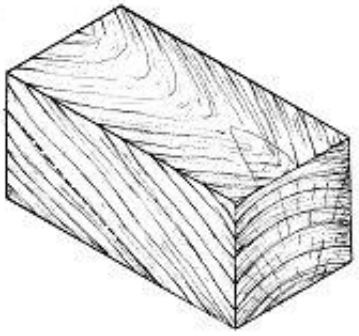
Shakes no deeper than 5 mm for pieces of not less than 50 mm in thickness or not deeper than 1/10 of the thickness in the thicker pieces but not appearing on the other side of the piece are shallow shakes.

Shakes appearing on two sides, or twice on one side of the piece in the case of ring shakes are through shakes.

Sloping grain

Divergence of grain from the direction of the longitudinal axis of the piece.

Sloping grain



Sloping grain affects the strength of a piece of timber and must be limited in timber intended for engineering use.

Interlocking grain is the repeated alternation of left and right-hand spiral grain, each reversal usually distributed over several growth rings. Interlocked grain has no serious effect on strength but makes the timber difficult to split and may produce an attractive ribbon stripe figure in the timber on quarter sawn faces. It should not be confused with sloping grain

Stain or discoloration

A variation from the natural color of the wood. May be caused by sap stain fungi, by incipient decay, by chemical effect from metals such as iron or as a result of some abnormal growth process in the tree. Stain which is sound (not related to decay), is permitted in grades where appearance is not a factor, or where it would normally be removed by dressing

Weather stain

Surface discoloration produced on timber during seasoning by exposure to sun and rain. It is superficial and is not a defect in sawnwood

Worm holes

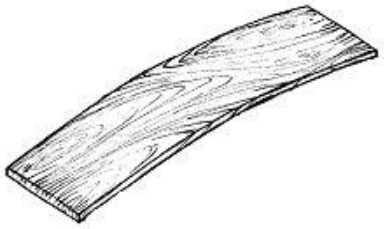
A term used in the timber trade loosely to describe borer holes and feeding/nesting chambers in wood

5.3 Sawing and seasoning defects

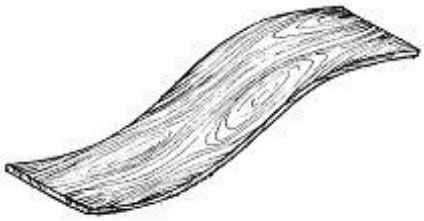
Bow

Curvature along the length on the wide face of lumber usually resulting from stress in the log.

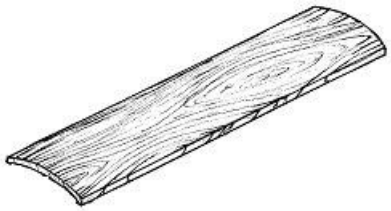
Simple bow



Compound bow



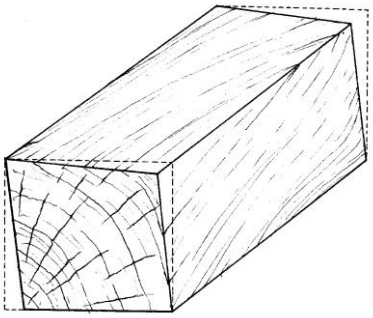
Cup, cupping



Curvature in a piece of timber across the grain after sawing. Usually caused by drying stresses and most common in plain-sawn lumber.

Diamonding

A form of warp resulting from greater tangential than radial shrinkage that may cause a piece of green timber cut square or rectangular in cross-section to become diamond shaped. Occurs when the rays of the timber are not parallel to the face or edge of the piece and is severe when the rays are at 45° to these faces and the timber species has a high differential between its radial and tangential shrinkage. In most species this ratio is about 1.5 to 2.0



Growth stress

The stress, which develops in the growing trunk of a tree due to growth processes and which when released during sawing, may cause the sawn wood to spring and burst. The stress in the trunk is always tensile in the sapwood and compressive in the heart. Sawn wood from stressed logs tends to curve so that the sap side becomes concave and the heart side convex. Growth stresses are the major cause of shakes and compression failures in growing trees and of spring, bow and end shakes in sawn wood, and hence the major cause of degrade in dense tropical hardwoods

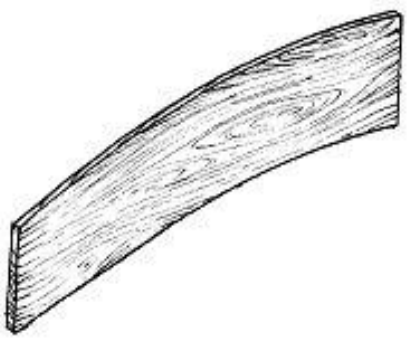
Honey-combing

Internal fissures or checks running in a radial direction produced in timbers of large section by attempting to season them too rapidly during kiln drying. Not usually visible until the timber is crosscut. This defect is not common among species from Guyana

Seasoning checks

Separations of wood cells along the grain as a result of uneven shrinkage, most common on end-grain surfaces of timber

Spring



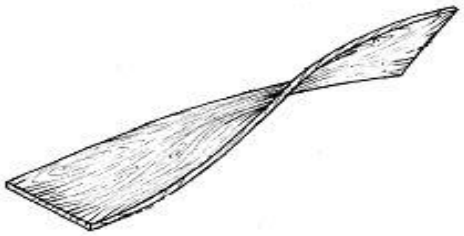
Curvature along the length of the edge of a board. Also called crook and side-bend. Limits for spring are given in the grading rules as millimeters of offset per meter of length.

As for bow, allowable offset increases as the square of the length. Thus 25mm deviation from the flat plain in a 3.5m length becomes equivalent to 100mm deviation in a 7m length.

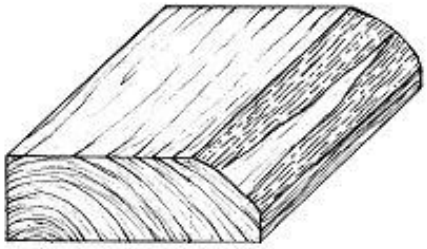
Twist

A form of warp in which the four corners of a flat surface (board) are no longer in the same plane.

Twist is measured as the greatest deviation of the surface of a piece from the plane surface in millimeters or as fractions of the length of the piece



Wane



The lack of wood on any face or edge of sawn wood due to it being sawn too close to the surface of the log. Also known as Fall Edge. Bark may or may not be present. Incidence of wane is limited in the GTGR.

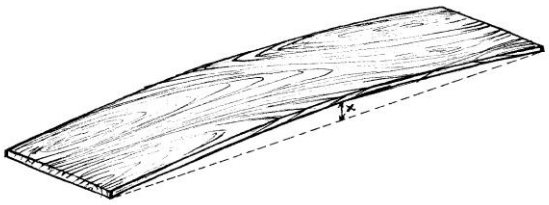
Want

When through bad sawing a portion of the timber usually at an end is below tolerance on size. It is not a permitted defect under GTGR. Also called run off

5.4 Measurement of defects

Bow

Measured as the greatest deviation of the surface of a piece from a projection of the flat surface. Allowable limits for bow are expressed as millimeters of offset per meter of length.

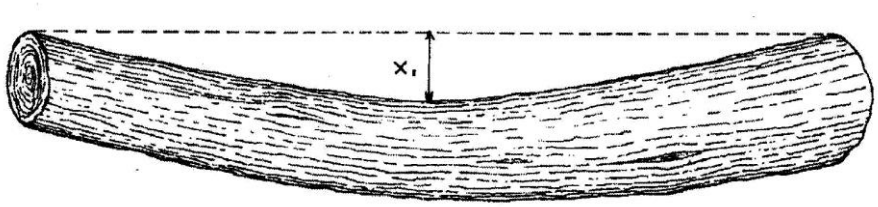


Cup

Cup is measured as the greatest deviation from a straight line across the width of the piece, expressed in millimeters or as fractions of the width.

Curvature

Measured as the deviation of the longitudinal axis from a straight line (i.e. millimeters per meter). Compound curvature is measured by each crook separately.



Cylindrical log

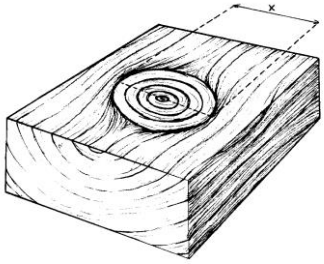
Perfect round log where both ends represent a true circle. Roundness is determined by measuring the largest diameter and the diameter at right angles to it and is expressed by the lesser diameter as a percentage of the greater diameter

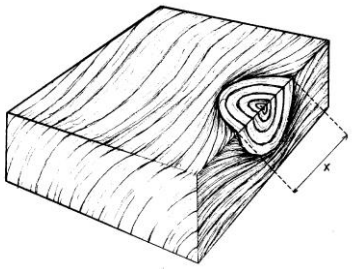
Knots

Knots as defects are measured as their width across the face on which they occur whether round or spike. The size of a knot is measured from the point where the fibers of the wood forming the knot terminate, often at a fine line of bark tissue.

Any area of dark heartwood surrounding the knot is ignored, as it is not part of the knot itself.

Group knots are measured by the sum of the sizes of all knots. Each round or oval knot is measured by the minimum diameter of the knot cross-section while arris knots are measured by the extension of the knot on the arris.





Shakes

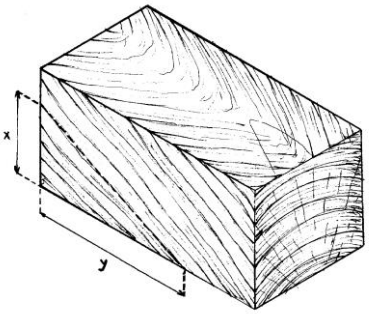
Edge shakes are measured by their maximum penetration (in millimeters or as fractions of the thickness or width of the piece) and by their length (in centimeters or as fractions of the length of the piece).

Log shakes are measured by the length in centimeters along the longitudinal axis of the log.

Sloping grain

Sloping grains are measured in the most characteristic place of the grain over a length of not less than double the width of the piece.

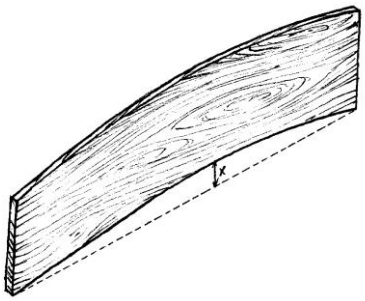
The value of the deviation of grain (without taking into consideration local deviations) is measured and expressed as a percentage.



Spring

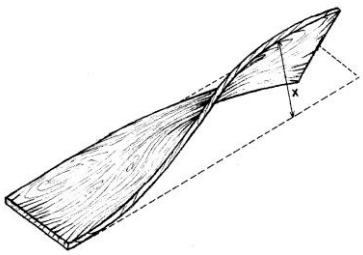
Curvature along the length of the edge of a board. Also called crook and side-bend. Limits for spring are given in the grading rules as millimeters of offset per meter of length.

As for bow, allowable offset increases as the square of the length. Thus 25 mm deviation from the flat plain in a 3.5 m length becomes equivalent to 100 mm deviation in a 7m length

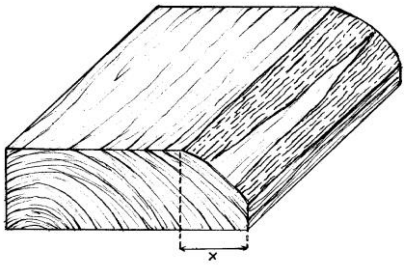


Twist

Twist is measured as the greatest deviation of the surface of a piece from the plane surface in millimeters or as fractions of the length of the piece



Wane



Wane is measured by the maximum difference between the width of the corresponding sides of the piece in millimeters or as fraction of the width of the corresponding sides.

5.5 Pests and fungi of wood

5.5.1 *Pests*

There are many species of insect that can bore into sawn wood either in storage or in use. The general term for such damage in timber is known as worm (though a distinction is made between the bore holes caused by entering and exiting wood and the excavated feeding and nesting chambers). Worm holes spoil the appearance of timber and, if they are numerous enough, affect the strength properties. The most common types of wood-boring insects in Guyana are the powder-post beetles, dry-wood termites and pin-hole borers.

Powder-post beetles (*Lyctus spp*. and *Bostrychids*)

Both adults and larvae mine in dried wood products. Circular exit holes and associated boring dust are usually the first signs of attack.

Adult beetles tunnel into wood and lay eggs.

The emerging larvae will also eat the wood until eventually emerging as adults to look for further nesting sites.

Dry-wood termites (*Cryptotermes spp*.)

Colonies of all drywood termite species infest sound, solid hardwoods and softwoods, including all common building lumbers used in structural framing. Numerous colonies may inhabit a single structure. Termites excavate galleries in sapwood in preference to heartwood and because drywood termites seek protection from external predation, galleries are concealed beneath the wood surface. Sounding with a hard implement can locate hollowed-out wood. A very thin wood surface in late stages of attack may have a blistered appearance. External signs of infestations, however, most often consist of fecal pellets extruded from 1-2 mm diameter "kick-out" holes.

Ambrosia or pin-hole borers (many species)

Ambrosia beetles have earned their name from the yeast-like ambrosia fungi which they cultivate for food. They make tiny tunnels into the heartwood of dead or dying trees, lining the tunnel walls with the fungi. They even carry it with them when they move from tree to tree. Some ambrosia beetles also build colonies with societies not unlike those of termites or bees.

5.5.2 *Fungi*

Most forms of decay and sap-stain in timber are caused by fungi that feed either on the wall tissue or cell contents of wood. Fungi that cause decay consume constituents of the cell wall – and lead to the disintegration of wood – while staining fungi remove only stored plant food material in the cell cavities, leaving the cellular structure intact. This, decay fungi seriously weaken timber while staining fungi affect only the appearance but not other properties.

Fungi may attack wood in the living tree, as logs, sawn wood in storage or when in service (e.g. in construction). For the GTGR, the first three are important. Most fungi show optimal growth when the woos has an m.c. of between 35% and 50% and none can survive in wood below 20% m.c. Sapwood is often more susceptible than heartwood in sawn wood – it may contain more moisture and fewer extractives that deter fungal attack.

5.6 Timber structural properties

5.6.1 *Durability*

Durability, or natural durability (i.e. without preservatives), refers to the ability of wood to withstand decay and insect attack when exposed to the elements. In the GTGR species are divided into four natural durability classes namely 1A, 1, 2A and 2 (see Exhibit 5-1).

Class 1A timbers are highly durable under all conditions of exposure including ground contact. Under tropical conditions ground contact life in service may exceed 10 years, under temperate conditions, this may exceed 40 years. In addition, class 1A timber species are highly resistant to attack by insects though full control of tropical subterranean termite attack may require soil poisoning with a contact insecticide. Service life above ground with minimum protection is indefinite in all climates.

Class 1 timbers are very durable in protected exterior situations, e.g. construction, buildings, cladding etc., but are not durable in ground contact. They are highly resistant to attack by dry-wood termites *(Cryptotermes spp.)*. When utilised for non-ground contact applications, these timbers may require further protection from subterranean termite attack such as soil poisoning and/or the inclusion of termite shields in the substructure.

Class 2A timbers are not durable under exterior exposed conditions but suitable for internal finishing and furniture where *Cryptotermes* (dry wood termite) is not a hazard. Only two of the thirty commercial species of Guyana are in this class.

Class 2 timbers are low-density hardwoods that would normally require treatment for external work though they are very satisfactory timbers for general construction and some are excellent for high-class joinery work.

5.6.2 *Strength*

Strength is a compound factor determined by several variables concerning the mechanical properties of wood. Exhibit 5-1 provides typical data (from a range of published sources) on common strength factors as well as Strength Groups (from the Guyana Building Code) and **tentative** Strength Class based on characteristic values provided in the European Standard EN 338.

Exhibit 5-1. Common commercial species of Guyana: Strength and Durability[10]

Botanical Name	Common Name	Strength Group[11]	Strength Class[12]	Durability Class	Density (kg/m^3)	MoR[13] (N/mm^2)	MoE[14] (N/mm^2)	CS[15] (N/mm^2)
Chlorocardium rodiei	Greenheart	F5	**D70**	1A	1,005	240	24,500	98
Swartzia leiocalycina	Wamara	F5	D70	1A	1,200	213	23,630	110
Eschweilera spp.	Kakaralli	F5	D70	1A	1,120	182	21,635	77
Mora gonggrijpii	Morabukea	F5	D70	1A	1,005	176	21,910	94
Peltogyne venosa	Purpleheart	F3	D70	1	960	155	16,860	79
Mora excelsa	Mora	F4	D70	1A	880	149	21,020	81
Aspidosperma spp.	Shibadan	F3	D70	1	913	175	22,185	91
Hymenaea courbaril	Locust	F4	D60	1	880	172	18,500	84
Humiria balsamifera	Tauroniro	F4	D60	1A	880	168	18,800	86
Moronobea coccinea	Manniballi	F4	D70	1	1,005	161	22,650	66
Diplotropis purpurea	Tatabu	F3	D70	1	1,005	156	18,000	88
Eperua falcata	Soft Wallaba	F3	D60	1A	960	128	14,400	69
Goupia glabra	Kabukalli	F3	D60	1	800	122	14,700	62
Terminalia amazonia	Fukadi	F2	D60	2A	720	138	15,800	65
Symphonia globulifera	Manni	F3	D60	1	720	113	12,630	58
Carapa guianensis	Crabwood	F2	D50	1	560	111	11,800	59

[10] Table compiled from data provided by Tropenbos Series 15, CIRAD Tropix 7; USDA Forest Service Forest Products Lab.
[11] Strength group from the Guyana Standard: Building Code - Section 7.
[12] Strength class is **tentative** (apart from greenheart which is officially classified as D70) based on key mechanical data and table of characteristic values provided in EN 338.
[13] Modulus of Rupture (also known as Bending).
[14] Modulus of Elasticity.
[15] Crushing strength (also known as Compression Parallel to the Grain).

Nectandra (Sextonia) rubra	Determa	F2	D40	1	625	90	11,400	51
Catostemma commune	Baromalli	F1	D35	2	560	77	12,540	46
Protium decandrum	Kurokai	F2	D35	2A	560	110	12,890	61
Inga alba	Maporokon	F2	D35	2	560	95	11,800	53
Loxopterygium sagotii	Hububalli	F3	D40	1A	640	94	12,060	51
Parahancornia fasciculata	Dukali	F1	-	2	480	89	10,600	44
Alexa imperatricis	Haiariballi	-	D40	2	560	73	10,890	39
Ocotea oblonga	Kereti	F2	-	1	640	72	9,167	39
Trattanikia demerarea	Ulu	-	-	2	480	68	9,340	37
Quassia simarouba	Simarupa	F1	-	2	480	66	8,100	34
Virola surinamensis	Dalli	-	-	2	560	64	8,730	33
Jacaranda copaia	Futui	F1	-	2	480	60	8,900	31

5.7 Moisture in wood

5.7.1 *Basic facts*

One of the most important factors influencing the performance of wood is its moisture content (it has been said that 90% of problems with wood involve moisture). The amount of water present affects its strength, stiffness, mode of failure, dimensions, shrinkage, susceptibility to fungi attack, its workability and its ability to accept adhesives and finishes.

Freshly-felled wood is very wet and around half the weight of the log will be water. When a tree is felled, water is present in two ways:

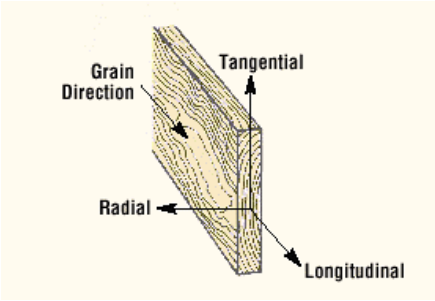
- Water within the cell cavities (known as **free water**)
- Water bonded to the cell walls (known as **bound water**)

The amount of water in wood is known as its **moisture content** (m.c.). This is measured as the weight of the water in the wood divided by the oven-dry weight of the wood (i.e. if the wood was completely dry). For example, if the weight of water was the same as the weight of (dry) wood in a board, the m.c. would be 100%. In practice, it is not necessary to dry the wood to oven-dry to estimate m.c. There are a range of moisture meters that can read moisture content directly from a piece of wood.

As wood dries – wither naturally in the air or in a kiln – the free water will evaporate first. In theory, the wood will reach a point where all the free water has evaporated and only bound water remains. This point is known as **fiber saturation point**. The fiber saturation point varies in different species, but it is usually around 30% m.c. Up to this point the wood doesn't change much in size or dimensions.

If drying continues, the bound water begins to evaporate and the wood will begin to shrink and undergo changes in its physical and mechanical properties. Shrinkage occurs differently in the three primary axes (see diagram below). Shrinkage in the tangential direction is around twice as high in the radial direction while shrinkage in the longitudinal direction is almost negligible (i.e. very little).

Shrinkage varies considerably from species to species, but as a rough **rule-of-thumb**, wood undergoes about 8% tangential shrinkage, 4% radial shrinkage, and 0.1% longitudinal shrinkage from the green to oven-dry condition. As a general rule, heavier (denser) woods generally shrink more than lighter woods.



The practical implication of this is to make provisions for wood movement, especially across the widths of boards. Most boards are flat-sawn which results in the board faces running tangentially to the growth rings of the tree. Quarter sawn boards are much more dimensionally stable across their width because the growth rings are oriented at right angles to the board faces. They will experience greater moisture-related movement in thickness than flat-sawn boards, but this movement is often negligible because boards are generally much wider than they are thick.

Wood will seek **equilibrium moisture content** (EMC) in relation to the relative humidity (RH) and temperature of its surroundings. That is, as wood is dried below its Fiber Saturation Point (FSP), the amount of moisture leaving the wood will be determined by the relative humidity of the atmosphere surrounding the wood. Lumber drying is usually accomplished by evaporating the moisture from the surface of the wood. Wood dries "from the outside in"; that is, the surface of the wood must be drier than the interior if moisture is to be removed. Moisture will move from an area of higher moisture content to an area of lower moisture content within the wood. When the surface moisture evaporates from the sides or ends, moisture moves from the interior toward these locations. This process continues until the wood reaches its Equilibrium Moisture Content (EMC). At this point the moisture content is equal throughout the piece of wood. Thicker lumber exposed to the same drying conditions will take longer to reach its EMC than thinner lumber.

Wood is **hygroscopic** which means that it will absorb moisture as well as lose it. If the RH increases then eventually so will the m.c. of the wood (which may mean that the wood expands again). This is why the end use of the timber is very important in determining what is an acceptable m.c.

5.7.2 *Seasoning of wood*

Seasoning is the drying of wood to s specific m.c. Some important reasons to dry wood include:

- Better usability. Wood shrinks as it loses moisture and swells as it gains moisture. It should be dried to the % m.c. it will have during use.
- Reduced shipping costs. Dry wood weighs less (drying may reduce its weight by one-half or more). It is more profitable to transport wood than water (though note that shipping cost is normally based on volume, while trucking cost is usually based on weight).
- Less likelihood of stain or decay during transit, storage, and use.
- Reduced susceptibility to insect damage.
- Increased strength. As wood dries below 30% MC, most strength properties increase.
- Better "hold." Nails, screws, and glue hold better in seasoned wood.
- Better finishing. Paints and finishes adhere better to seasoned wood.
- Better heat insulation. Dry wood is a better thermal insulator than wet wood.
- Better preservation. Dry wood must be used when treating with most wood preservatives.
- Added value. Drying the wood products before shipment adds value to the product.

There are some negative aspects to drying wood which include the possibility of drying defects. As wood dries, it shrinks in several dimensions. If wood is not correctly dried, the dimensional changes will cause drying defects, including **checks, splits, warp, casehardening,** and **honeycomb**.

5.7.3 *Air Drying*

Air-drying refers to stacking lumber and exposing it to the outdoors. Certain controls can be used in this stage of drying to make it more efficient. These include proper stacking, orientation and layout of the stack, and covering the stack.

5.7.4 *Kiln Drying*

Drying wood in an insulated chamber and circulating air over it is called kiln drying. For most end uses of wood, all of the free water and much of the bound water should be removed. To accomplish this in a shorter period of time, or in more humid environments, a dry kiln must be used to dry the wood. Almost all commercially produced lumber (with the exception of all structural timber) is dried in a kiln before it is finally put in use.

5.7.5 *Acceptable moisture content*

For all product groups in this version of the GTGR moisture content is not a factor in the grading (though nominally grade distinctions for structural wood are applied at a nominal 20% MC). The exception is the product type GY04a which specifies that products are seasoned and as such should have a moisture content not less than 10% and not more than 15% at the time of dressing (and MC should be determined by the oven drying method).

Nevertheless, it is strongly recommended that the moisture content of batches of all products with a thickness of 2" or less should be tested (**estimated** with a probed moisture meter) and recorded in all relevant sales documents.

5.8 Method of determining grades and grading practice

5.8.1 *Method of determining the grade*

The GTGR are based on the quality and quantity of "defects" in a piece or parcel. Grading is carried out according to the type of forest produce intended for a certain use. The system used in Guyana is a visual assessment only as no machine testing of strength is carried out.

Permissible defects are defined for each grade. A piece of timber is rejected if it has more defects than are allowed for the product. For example, if a railway sleeper is found to contain sapwood in more than half of the width of the sleeper at either of the rail seats, the sleeper will not meet the required grade and will therefore be rejected.

5.8.2 *Grading practice*

The grading authority and rules exist to independently confirm and assess a predefined objective quality standard so that customers can purchase Guyanese timber with confidence. This function is adequately fulfilled by the provision of advice to customers on timber quality assurance, by general supervision of the preparation of timber, by training of graders and by undertaking routine monitoring of competence and performance. Only authorized timber graders may carry out timber grading.

Under certain circumstances the grading authority may approve grading by quality control inspectors, such as when requested by customers and producers. Otherwise the inspector carries out "check-grading" only. The grading authority will not accept liability in respect of timber received in an unsatisfactory condition.

Timber graded under these rules by timber graders is subject to supervision by the grading authority and check grading of not less than 10% by quality control inspectors. The work of certified dry kiln operators is also subject to supervision.

The inspector's duties are to exercise a general supervision over timber grading and kiln drying as directed by the grading authority. Texture, percentage moisture content and densities may not be taken into account when check grading.

If any customer wishes to have the timber inspected by a quality control inspector to confirm freedom from live borer infestation, species identification or any other fact approved by the grading authority, they must submit a written request giving full details of requirements. The quality control inspector will inspect as large a proportion of the timber as possible and the customer will submit a schedule of timber to be shipped to the grading authority who will issue an export certificate. All timber check-graded in excess of 60 days before it is finally shipped must be re-inspected by a quality control inspector who may order the timber to be re-graded if it appears to him that degrade has occurred since the original grading.

Re-inspection is compulsory for kiln-dried graded timber that has been stored for more than 4 months from the date of check grading to the last date of kiln drying or if shipped later than 2 months after the last kiln drying date. For timber received in an unsatisfactory condition, complaints from customers should be lodged immediately with the grading authority. Fees and other charges in respect of timber graded, or check graded, or otherwise inspected by quality control inspectors shall be notified from time to time by the grading authority, and shall be payable by the person or firm requesting the grading or inspection.

5.8.3 *Specifications*

Before any grading can be undertaken by a timber grader, a true copy, or true extract from the specifications of timber to be graded and the contract made between the customer and the supplier must be forwarded to the grading authority with an application for grading.

Specifications must include the type of timber, quantity, sizes, grades, average widths and lengths, multiple lengths, seasoning period, railway gauge for sleepers and any other special conditions. The type of timber supplied shall be as specified in the contract.

5.8.4 *Sampling*

For the GTGR 2016 all pieces in a parcel should be assessed for grade.[16] However, for a parcel of graded hardwood, the parcel shall be deemed as conforming to a particular grade provided that not more than 10% of the pieces exceed the permissible limits of the grade and that not more than 3% of the pieces in the sample exceed the permissible limits by more than one third. Where the parcel contains less than 10 pieces, the permissible limits shall not be exceeded.[17]

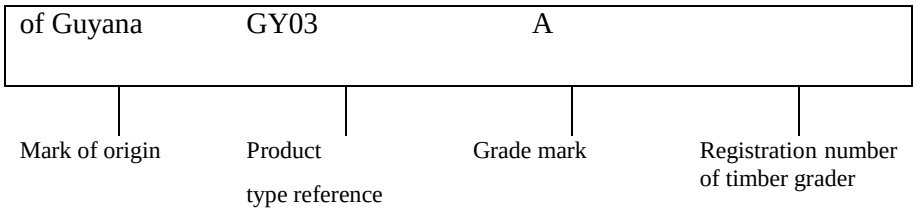
For sampling for moisture content it is recommended that 1% of the batch is sampled with a minimum of 3 pieces sampled per batch.

5.8.5 *Grading and grade marks*

Unless otherwise stated in these rules, graded timber should be stenciled as follows:

[16] Refer to the Guyana Code of Practice for Wood Processing Facilities v2.

[17] In accordance with BS 5756:2007.



The full stencil marks shall be placed on two sides of each bundle. All lettering or numbering should be 25 mm in height. The registered number of the timber grader should always be in a circle; no other number may be in a circle.

The use of any of the grade marks shall be restricted to timber graded by a timber grader or quality control inspector and covered by a marketing certificate. The approved grade marks that are valid are indicated for each of the forest product types referenced as GY01 to GY04.

The mark of origin "Produce of Guyana" should not be placed on timber sawn outside Guyana.

The customer's own marks such as destination or trade mark may be added.

5.9 Measurement tolerances

In contrast to the 2002 Edition of the GTGR, this edition has removed tolerances from the grades themselves since they do not directly affect the strength or appearance of products. Nevertheless, tolerances should be agreed between buyer and seller and must be included in contracts and sales documents.[18]

As a guide the following indicative dimensions and tolerances for different product types are provided as a guide:

5.9.1 *Sawn baulks*

Length: ± 150 mm

Width: ± 6 mm

5.9.2 *Hewn squares*

Length: (≤ 9.0 m) ± 150 mm; (> 9.0 m) ± 300 mm

5.9.3 *Round piles*

Length: (≤ 12.0 m) ± 300 mm; (> 12.0 m) ± 600 mm

5.9.4 *Structural timber*

Thickness and width: (≤ 75 mm) ± 5 mm; (> 75 mm) ± 10 mm

5.9.5 *Non-structural timber*

Thickness: (≤ 75 mm) ± 5 mm; (> 75 mm) ± 10 mm

Length: - 0 mm + 100 mm

Width: (≤ 75 mm) ± 10 mm

[18] Refer to the Guyana Code of Practice for Wood Processing Facilities v2 (p. 36 and p. 47) for acceptable tolerances on sawnwood and dressed wood according to nominal and actual sizes.

5.9.6 *Profiled products*

All dimensions: 0 mm + 1 mm

5.9.7 *Shingles*

Length: 450 mm with a tolerance of + 25 mm, - 0 mm.

Width: 100, 125, 150 or 175 mm with a cutting allowance of ± 5 mm.

Thickness: 5 to 8 mm at the butt and 3 to 5 mm at the tip.

5.9.8 *Sleepers*

Type of gauge	**Cross section in mm**	**Tolerances in mm**		**Length in cm**	**Tolerances in mm**
		Width	**Thickness**		
Wide gauge	250 x 125	+ 13	+ 13	275, 260, 240	± 75
Medium gauge	225 x 112	+ 13	+ 13	215, 200, 185	± 50
Narrow gauge	200 x 100	+ 13	+ 13	150, 120	± 25

5.9.9 *Transmission poles*

Length in m	**Diameter 1.5 m from butt (cm)**	**Diameter at tip (cm)**	**Length tolerance**
9 - 12	180 – 300	140 – 240	+150 mm
12 – 15	220 – 360	180 – 260	+ 250 mm
15 – 18	300 – 400	220 – 300	+ 250 mm
over 18	340 – 420	220 – 300	+ 250 mm

5.9.10 *Telegraph cross arms*

Dimensional	< 75 mm nominal, + 6 mm, - 0 mm
	≥ 75 mm nominal, + 9 mm, - 3 mm
Length	+ 25 mm, - 0 mm
Dressed	< 25 mm, - 6 mm
	> 25 mm, - 9 mm

A planing tolerance of ± 3 mm shall be allowed on these dimensions

5.9.11 *Fencing posts*

1.8 to 3.0 m length and 80 to 120 mm diameter

+ 75 mm, - 0 mm allowance

3.0 to 5.5 m length and 120 to 150 mm diameter

+ 150 mm, - 0 mm allowance

5.9.12 *Fencing staves*

1.5 m with a tolerance of + 50 mm, - 0 mm.

Widths of staves: 75, 100, 125, 150, 175, 200 mm with a tolerance of ± 5 mm.

The thickness of each stave ≥5 mm and ≤15 mm.

5.9.13 *Profiled products*

Tolerance in thickness and width at the time of milling: + 1 mm - 0 mm.

5.10 Link to existing grading rules

5.10.1 *International Standards Organisation (ISO)*

There are very many international standards that deal with grading of timber and wood products. Some of these are:

- Solid timber in structural sizes - Determination of some physical and mechanical properties (ISO 8375:1985)
- Solid timber - Grading - Requirements for visual strength grading standards (ISO/CD 9709)
- Durability of wood and wood-based products - Definition of hazard classes of biological attack - Application to solid wood (ISO/DIS 12583-2)
- Timber structures - Determination of characteristic values of mechanical properties and densities (ISO/CD 13910)
- Structural timber - Grading -- Requirements for machine-graded timber (ISO/CD 13912)
- Timber poles - Test methods -- Determination of structural properties (ISO/AWI 15206)
- Timber poles - Determination of characteristic strength values (ISO/AWI 15207)
- Durability of wood and wood-based products - Preservative-treated solid wood (ISO/CD15385-1)

5.10.2 *EU/UK, US, Caribbean, Guyana*

Region	Grading/Building rules
UK/EU	BS/EN 338:2003. Structural timber – strength classes BS 5756:2007. Visual grading of hardwood EN 975-1:2009. Appearance grading of hardwood EN 14081-1:2005. Strength graded structural timbers: general requirements
US	Grading Rules for North American Hardwoods (NHLA) Rules for the inspection and measurement of hardwoods and cypress (NHLA)
Caribbean	Caribbean Uniform Building Code (CUBiC)
Guyana	Guyana Standard: Building Code - Section 7 : Use of Guyanese hardwood in construction (GCP 9-7:1999)

5.11 The role of Guyana National Bureau of Standards

The Guyana National Bureau of Standards (GNBS) was established in 1984. This Act was further amended on May 22, 1997 by Act No. 2 of 1997 in order to enable the Bureau to monitor the quality of imports.

The GNBS is a semi-autonomous body which is governed by a Board, the National Standards Council, with the day to day activities being carried out by the Management and staff of the Bureau.

The objectives of the GNBS, particularly relevant to the timber industry, are:

- to promote standardization in industry and commerce
- to prepare, frame, modify or amend specifications and codes of practice;
- to make arrangements or provide facilities for the examination and testing of commodities and any material or substance from or with which, and the manner in which commodities may be manufactured, produced, processed or treated;
- to control, in accordance with the provisions of this Act, the use of standardization marks and distinctive marks;
- to assist in the rationalization of industry by coordinating the efforts of producers and consumers for the improvement of appliances, processes, raw materials and products;
- to provide for the testing, at the request of the Minister and on behalf of the Government, of locally manufactured and imported commodities with a view to determining whether such commodities comply with the provisions of this Act or any other law dealing with standards of quality;

Standards Development

This programme focuses on the development of national standards, codes of practice and other related guidelines on various products such as food, consumer products and agriculture, among others. The work of standards development is carried out through various technical committees.