



# Timber

Timber is a natural product when extracted for utility purpose it comes out in

1. Various lengths
2. Sizes
3. Form
4. Taper
5. Fluting
6. Defects (split, check, borer holes and fungi)

Defect in timber

- 1. Natural defect
- 2. Seasoning defects
- 3. Defect caused by fungi
- 4. Defects caused by insect
- 5. Felling defects
- 6. Defects in preparation or manufacture of logs.
- *Attachment :*

# Timber grading

## • How much is a log worth ?

- Three main factors determine the value of a log
  - (i) **Grade** : quality of the log and the lumber
  - (ii) **Scale** : quantity of lumber within a log
  - (iii) **Species**.

Sale price of both logs and sawn timber ,where grading is not done is based on classification of species and sizes only.

## How log price varies with species and girth classes

### Teak log price (Rs/m<sup>3</sup>)

Mid Girth classes (meter)	Rs:per m <sup>3</sup>
1.50 above	88450.00
1.22 -1.48	62150.00
1.00 -1.20	43945.00
0.82 -0.98	31130.00
Below 0.8	18655.00

### Hora log price (Rs/m<sup>3</sup>)

Mid Girth classes (m)	Rs: per m <sup>3</sup>
1.50 above	17600.00
1.22 -1.48	17160.00
1.00 -1.20	11880.00
0.82 -0.98	96100.00
Below 0.8	6600.00

Prices paid for logs of different species and grade, all values are in rupees per cubic meters of 1m mid girth log in 2013

Grade	Teak	Hora	Lunumidella
High grade (prime:A/90)	65,620.00	22,572.00	6,555.00
Medium grade (B grade)	34,540.00	11,880.00	3,450.00
Low grade (C /50 grade)	17,270.00	5,940.00	1,725

## Timber grading

- **Classification for quality is known as grading in timber trade.**
- **There is a recognized set of standards needed to group logs and sawn timber into quality classes.**
- **Grading rules: inspection and assessment of anomalies with penalty points of log shape, defects, deterioration**

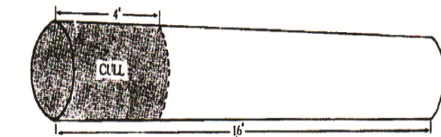
## System of grading

- 1.The Yield system**
- 2.The Cutting System**
- 3.The Defect System**
- 4.Combination System**
- 5.Stress Grading System.**

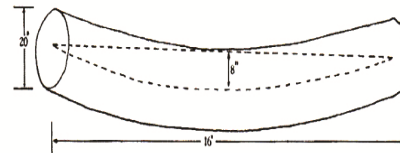
# 1.The Yield system:

- **Sound clear volume of a log as an indicator to determine the quality. ( % of sound volume from the log volume ).**

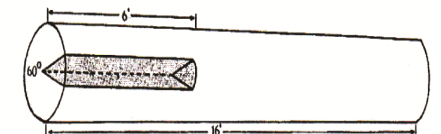
## Scaling deduction of 16 foot log with 20 inch scaling diameter



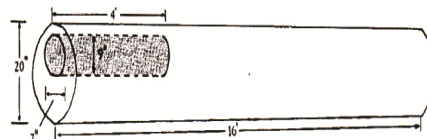
Defect section (rule 1):  
 Percent deduction =  $\frac{4}{16} = 25\%$



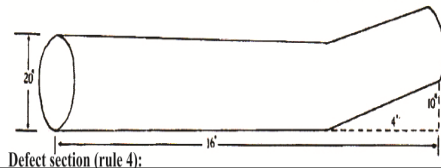
Defect section (rule 3):  
 Percent deduction =  $\frac{8 - 2}{20} = 30\%$



Defect section (rule 2):  
 Percent deduction =  $\left(\frac{6}{16}\right)\left(\frac{60}{360}\right) = 6.1/4\%$



Defect section (rule 5):  
 Percent deduction =  $\frac{(8) - (10)}{(20 - 1)^2} \times \frac{4}{16} = 5.5/9\%$



Percent deduction =  $\left(\frac{10}{20}\right)\left(\frac{4}{16}\right) = 12.1/2\%$

## 2.The cutting system

- **This system is applied for grading of sawn timber usually re-sawn to smaller sizes before use.**
- **The grade shall be determined from the worse face of the piece by determining the % of the total surface sound face cutting.**

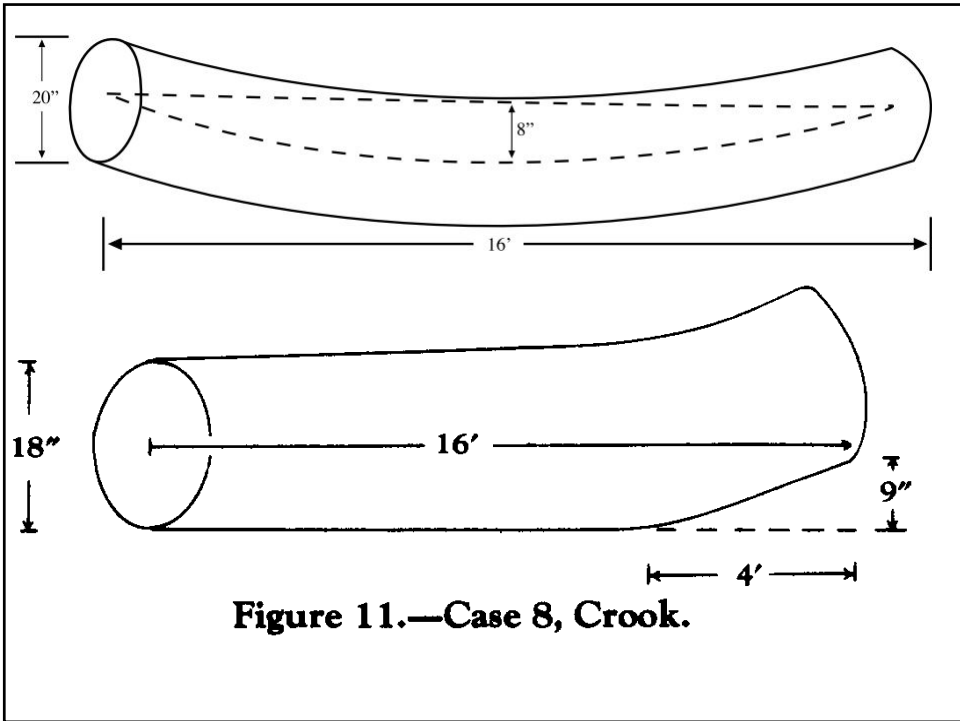
## 3.The Defect system

- **Quantitative valuation of defects is done by using units of defects which is a quantitative representation of the approximate degrade of the utilizable material for each defect. See example in table.**

Standard defects	Equivalent units
1. Two sound knots of 2-6 cm diameter for every 2 m log length with interval between knots not less than 1.5m	2 units
2. One or two splits with a total length of upto 10% of the log length	1 unit
3. One or two bends with a total deviation over 20% upto 30% shortest log end diameter.	3 units
4. Radial shakes not reaching the longitudinal surface of the log more than 10% of the diameter and 5% of the length of the log but not more than 8% of the length of the log for one shake	1 unit
Total units	7 units.

Bend fraction=Deviation or deflection of bend/the shortest diameter of top end of log

Bend Fraction Ratio	Defect Value in Percent	Defect Value in Units
One bend of 1/12 One bend of 1/10 One bend of 1/8	5 7 8	One unit
One bend of 1/6 One bend of 1/5 One bend of 1/4	12 14 17	Two unit
Two bents or one of 1/3 Two bents or one of 1/2	23 34	Three unit
One or Two bend of over 1/2	Reject or re- buck log into two (2) standard length logs with reduced bend defects.	



## 4. Combination System

- Defect and cutting systems should be applied for grading of sawn timber
- Defect and Yield systems should be applied for grading of logs.
- Eg: Proposed STC grading System

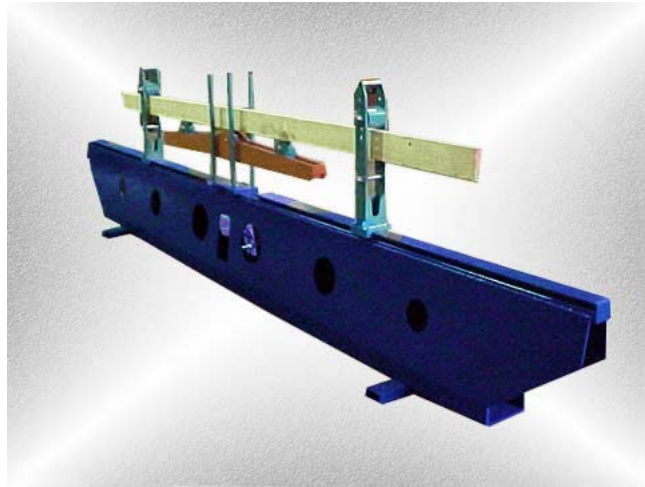
## 5. Stress Grading System

this system designed by engineering calculations for timber construction (Scantlings)

- **Visual Stress Grading**  
A piece will satisfy the requirements of the grade if the defects do not exceed limits specified.
- **Machine Stress Grading**  
A piece will satisfy the machine requirements if it has been passed through an approved grading machine and the whole piece has been classified as complying with the grade



## Machine Stress Grading



- **Veneer log** : very high quality log with few if any visible defects. Color, growth rate and amount of sapwood versus heartwood.
- **Sawlog (factory log):** that are sawn into lumber.
- **Other log classes:** that are sawn into pallet (appearance is not important)

## Principles of timber grading

- Grade represent the size, quality, and quantity available for potential manufacture of specific end products (Lumber, veneer, or chip.)

### Eg. STC prime teak saw log (SPS)

Grading requirement	description
Size	Length 3m or above, mid girth 90cm or over
Quality	Fresh cut, cylindrical, well trimmed, bend (2 units), knots (2units), Borer hole (2 units), checks/splits (1 units) , shakes is not allowed, surface defect is not applicable, center hole is confined to pith, Heart displacement is not applicable, etc.
Quantity	75% sound wood or over.

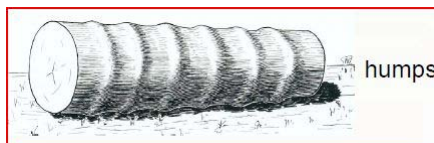
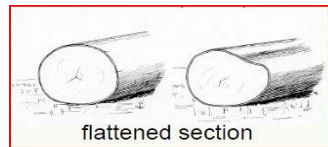
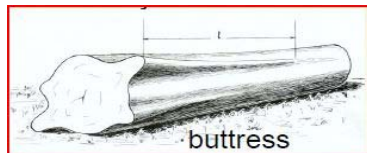
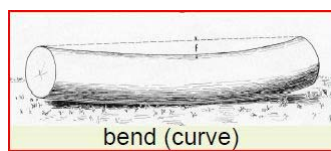
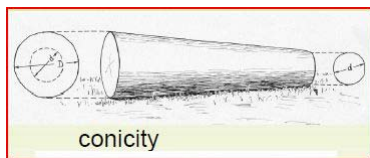
# Grading Rules

**Principle:** Inspection and assessment of anomalies with penalty points. (1) Shape (2) Defects (3) Deteriorations (4) Maximum global penalties allowed.

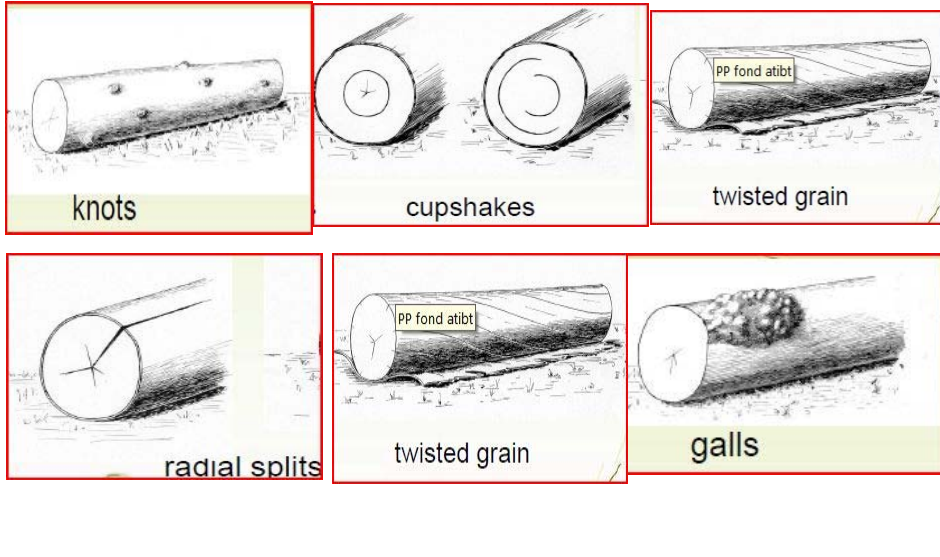
3 different kinds of rules

Logs	Sawn timber for joinery	Sawn timber for structure
<p>Pictures?</p> 		

# Logs shape



## Logs defects



## Log deterioration



Maximum number of penalties allowed in each grade for each type of defect for logs

	Grade	Maximum number of penalties allowed in each grade for each type of defect					
		I	I/II	II	II/III	III	IV
<b>SHAPE</b>							
- Conicity		0	1	2	2	2	2
- Bend (curve)		1	1	2	2	3	3
- Flattened section		0	0	1	2	2	2
- Buttress		0	1	2	4	5	6
- Humps		0	0	2	4	5	6
<b>DEFAULTS</b>							
- Knots and knobs		2	2	4	6	8	9
- Inbarks, galls, blister grain, thorns, etc.		0	1	2	3	5	6
- Splits, cracks, breaks		2	4	6	8	10	14
- Cupshakes		0	2	3	4	5	5
- Abnormal heart		0	1	2	3	3	3
- Spiral grain, entangled grain, etc.		0	1	2	3	6	9
<b>DETERIORATIONS</b>							
- Pin holes, discoloration		1	2	4	6	10	15
- Grub holes, teredo holes		0	0	2	3	4	5
- Heart decay		0	1	2	4	6	6
- Off the heart rot		0	1	2	4	6	6
<b>MAXIMUM GLOBAL PENALTIES ALLOWED:</b>							
For logs up to 6 m		4	6	8	10	12	16

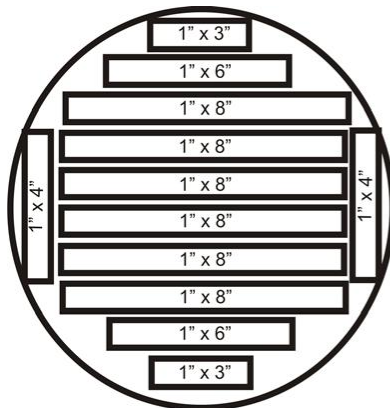
## Grade reduction

- The process of visualizing and quantifying the portions of the log not suitable for the production of lumber (or other product), is known as grade reduction.
- In addition to grade reduction, application of the grading rules requires the scaler to assess the quality of the products that could be produced from the log. This requires an assessment of the size, frequency and distribution of knots, and an assessment of any visible spiral grain or twist of the log.
- These defect include firmwood defects such as **rot, hole, char and missing wood** and non-firmwood defects such as shake, checks, frost cracks, shatter, splits, forks, catface, deadside, lighting scar, bark seams, sweep and crook).

## Grade deduction

- The volume of the log not available for the manufacture of lumber or the other products is the grade reduction volume.
  - In applying the grading rules, the scaler must deduct this volume from the gross log volume and express the remaining volume as a percentage of the gross volume. This percentage represents the percentage of the log that can be manufactured.
- **Gross Volume – Defect Volume x 100 = % Suitable for  
Manufacture  
Gross Volume**

## Methods of determining scaling deduction



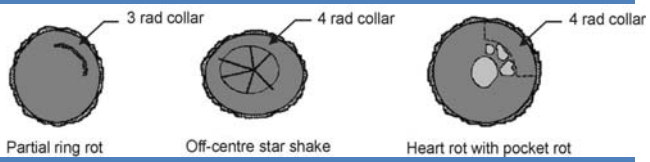
Lumber is a manufactured product derived from a log in a sawmill, or in a sawmill and planing mill, which when rough, shall have been sawed, edged and trimmed at least to the extent of showing saw marks or other marks made in the conversion of logs to lumber on the four longitudinal surfaces of each piece for its overall length, and which has not been further manufactured other than by cross-cutting, ripping, resawing, joining crosswise and/or endwise in a flat plane surfacing with or without end matching and working. (Source - the National Lumber Grades Authority)

## Defect Deduction method

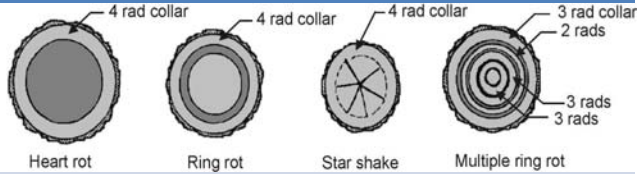
- 1. Squared defect method
- 2. Pie-cut method
- 3. Length-deduction method
- 4. Diameter-deducton method.

## Determining Grade Reduction for Collars (shells)

*Examples of Logs with a Portion of the Collar Too Thin to Produce Lumber.*



*Examples of Logs with Entire Collar Too Thin to Produce Lumber.*



*Examples of Logs with Sufficient Collar to Produce Lumber.*



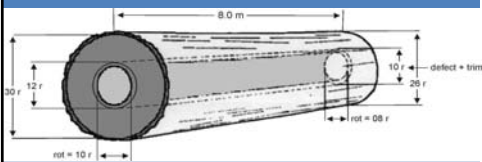


## Determining Grade Reduction for Sound Hearts (Residual cores)

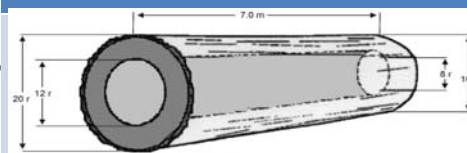
Sap Rot	Advanced Sap Rot	Residual Core is a Grade Reduction

## Determining of Trim Allowance

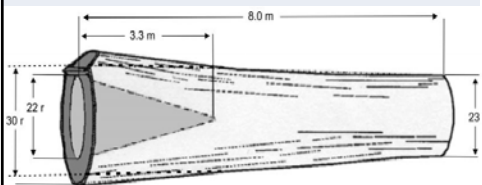
*The Application of Trim Allowance Around Heart Rot and Hole.*



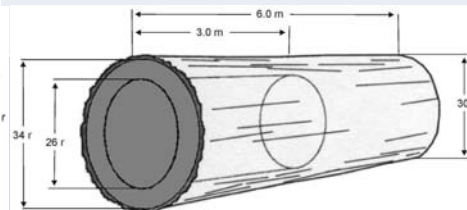
*Collar Too Thin to Cut Lumber*



*Application of Trim Allowance for Butt Rots*



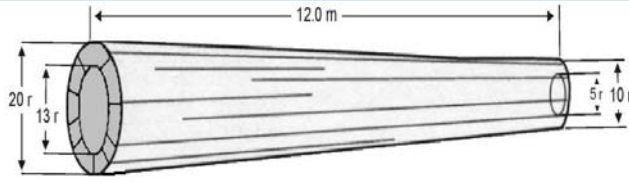
*Ring Shake and Only the Core is Thick Enough to Produce Lumber.*



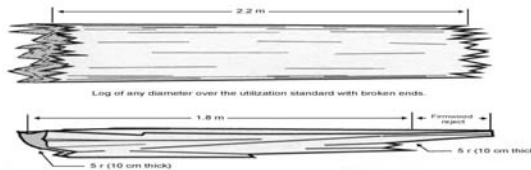
A log with simple butt rot estimated to penetrate 3.3 metres into the log (22 x 0.15 = 3.3m)



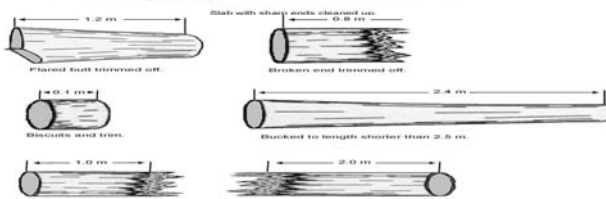
## Application of trim allowance to checks, shake and determining length for grading



**Short Breakage Pieces Contained in a Conventional Load.**

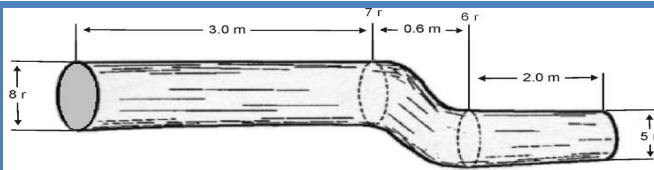


**Examples of Short Logs Left After Bucking at the Scale Site and Deemed to be 2.5 m Long (Interior) and 5.2 m Long**

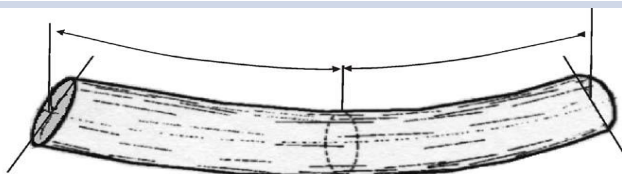


## Assessing Grade in Logs with Crook, Sweep and Pistol Grip

**Visually Bucking a Log with Crook to Assess Lumber Recovery.**



**Visually Bucking a Log with Sweep to Assess Lumber Recovery.**



**Visually Bucking a Log with Pistol Grip to Assess Lumber Recovery.**

