

Appendix A:

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Figure 1A: General structure of bamboo plant.

Figure 2A: Anatomical structure of bamboo.

Figure 3A: Basic vascular bundle types in bamboo.

Table 1A: Example of bamboo genera, species and adapted English names of bamboo [17,20,23,24,30,41].

Genus	Species	English Name
<i>Arundinaria</i>	<i>alpina, amabilis¹, anceps, angustifolia, auricoma², callosa, elegans, falcata, fastuosa³, fortunei, gigantea, graminea, griffithiana, hindsii, hookeriana, humilis, intermedia, khasiana, mannii, prainii, racemosa, tecta⁴, tessellata⁵, vagans, viridi-striata, wightiana</i>	1.Tonkin cane 2.Golden haired bamboo 3.Narihira bamboo 4.Switch cane 5.Mountain bamboo
<i>Bambusa</i>	<i>arundinacea¹, balcooa, beecheyana, blumeana, burmanica, dissimulator², dolichomerithalla, edulis, glaucescens³, khasiana, laxa, longispiculata, malingensis, multiplex, nutans, oldhami, pachinensis, pallia, pervariabilis, polymorpha, stenostachya, textilis, tulda, tuldoides⁴, ventricosa⁵, vulgaris⁶, wrayi</i>	1.Thorny bamboo 2.Durable thorny bamboo 3.Hedge or Chinese Goddess bamboo 4.Punting pole bamboo 5.Buddha's belly bamboo 6.Painted bamboo
<i>Cephalostachyum</i>	<i>capitatum, pergracile, virgatum</i>	
<i>Chimonobambusa</i>	<i>marmorea¹, quadrangularis</i>	1.Marble bamboo
<i>Chusquea</i>	<i>culeou, coronalis, longipendula, pilgeri, ramosissima, simpliciflora</i>	
<i>Dendrocalamus</i>	<i>asper, giganteus, hamiltonii, hookerii, latiflorus, longispathus, membranaceus, merrillianus, pendulus, sikkimensis, sinuatus, strictus¹</i>	1.Male bamboo or Calcutta bamboo
<i>Dinochloa</i>	<i>Maclellandii, darvelana, obclavata, prunifera, robusta, scabrida, sipitangensis, sublaevigata, trichogona</i>	
<i>Gigantochloa</i>	<i>apus¹, albopilosa, albovestita, hasskarkiana, holtummiana, levis, ligulata, macrostachya, ridleyi, rostrata, scortechinii, thoi, wrayi verticillata,</i>	1.Tabashir bamboo
<i>Guadua</i>	<i>aculeata, amplexifolia, angustifolia, capitata, inermis, latifolia, paniculata, superba, tagoara, tomentosa, virgata, werbertauneri</i>	
<i>Holttumochloa</i>	<i>korbuensis, magica, pubescens</i>	
<i>Indocalamus</i>	<i>latifolius, tessellatus</i>	
<i>Kinabaluchloa</i>	<i>wrayi</i>	
<i>Melocalamus</i>	<i>Compactiflora</i>	

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<i>Melocanna</i>	<i>baccifera</i> ¹	1.Muli bamboo
<i>Ochlandra</i>	<i>capitata, travancorica</i> ¹	1.Elephant grass
<i>Oxytenanthera</i>	<i>abyssinica, albociliata, nigrociliata</i>	
<i>Phyllostachys</i>	<i>angusta</i> ¹ , <i>arcana</i> , <i>aurea</i> ² , <i>aureosulcata</i> ³ , <i>bambusoides</i> ⁴ , <i>bissetii</i> , <i>congesta</i> , <i>decora</i> ⁵ , <i>dulcis</i> ⁶ , <i>elegans</i> ⁷ , <i>flexuosa</i> , <i>glauca</i> , <i>heterocycla</i> , <i>humilis</i> , <i>makinoi</i> ⁸ , <i>meyeri</i> ⁹ , <i>nidularia</i> ¹⁰ , <i>nigra</i> ¹¹ , <i>nuda</i> , <i>propinqua</i> , <i>pubescens</i> ¹² , <i>purpurata</i> , <i>rubromarginata</i> , <i>viridi-glaucescens</i> , <i>viridis</i> , <i>vivax</i>	1.Stone bamboo 2.Pheonix, fish pole or golden bamboo 3.Yellowgrove bamboo 4.Giant timber bamboo 5.Beautiful bamboo 6.Sweetshoot bamboo 7.Elegant bamboo 8.Mikano bamboo 9.Meyer bamboo 10.Big node bamboo 11.Black bamboo 12.Moso bamboo
<i>Pleioblastus</i>	<i>argenteostriatus, chino, pumilus, fortunei, pygmaeus, simonii, viridistriatus</i>	
<i>Pseudosasa</i>	<i>japonica</i> ¹ , <i>disticha</i> ² , <i>pumila</i> , <i>pygmaea</i> , <i>tessellata</i> , <i>variegata</i> ³ ,	1.Arrow bamboo 2.Dwaft fernleaf bamboo 3.Dwaft whitestripe bamboo
<i>Pseudostachyum</i>	<i>polymorphum</i>	
<i>Racemobambos</i>	<i>setifera, gibbsiae, glabrahepburnii, hirsuta, pairinii, rigidifolia</i>	
<i>Sasa</i>	<i>kagamiana, kurilensis, palmata, tsuboiana, veitchii</i> ¹	1.Kumazasa bamboo
<i>Schizostachyum</i>	<i>hainanense, lima, lumampao, aciculare, brachucladum, gracile, grande, iraten, juculans, latifolium, lengguanii, zollingeri</i>	
<i>Semiarundinaria</i>	<i>fastuosa, yashadake</i> ,	
<i>Shibataea</i>	<i>kumasasa</i>	
<i>Sinarundinaria</i>	<i>murielae, nitida</i> ¹	1.Fountain bamboo
<i>Teinostachyum</i>	<i>dulloo</i>	
<i>Thamnocalamus</i>	<i>falconeri, spathaceus</i> ¹ , <i>spathiflora</i>	1.Umbrella bamboo
<i>Thyrsostachys</i>	<i>Oliverii, siamensis</i>	
<i>Yushania</i>	<i>tessellata</i>	

Figure 1A: General structure of bamboo plant.

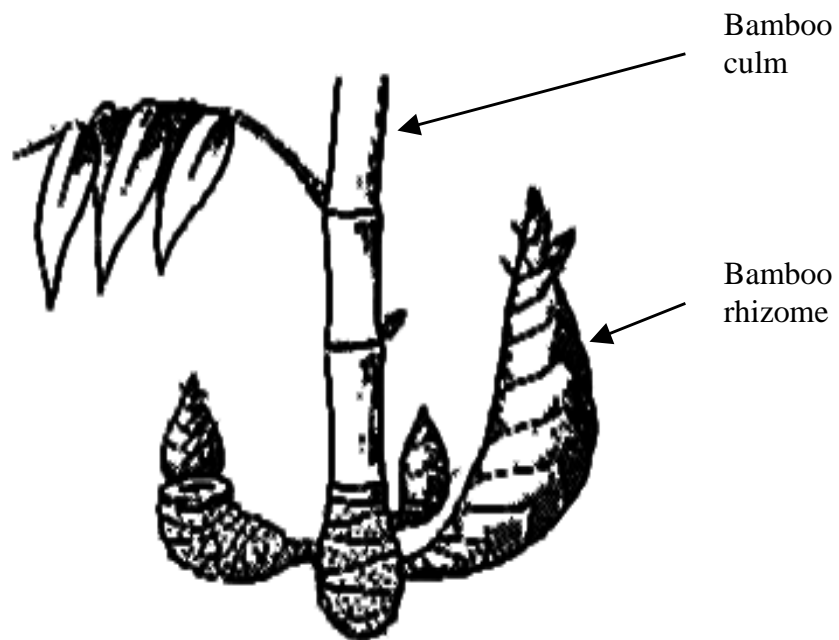


Figure 2A: Anatomical structure of bamboo. Bamboo culm or stem with illustration of the node and internode-(A), cross section of bamboo showing the thickness of the culm wall-(B), section of bamboo is magnified (x10)-(C) to illustrate the vascular bundle (Y) embedded in parenchyma cells (X), one vascular bundle is magnified (x80)-(D) to illustrate the fiber strand (1), metaxylem vessel (2), sclerenchyma sheath (3), intercellular space (4), and phloem (5).

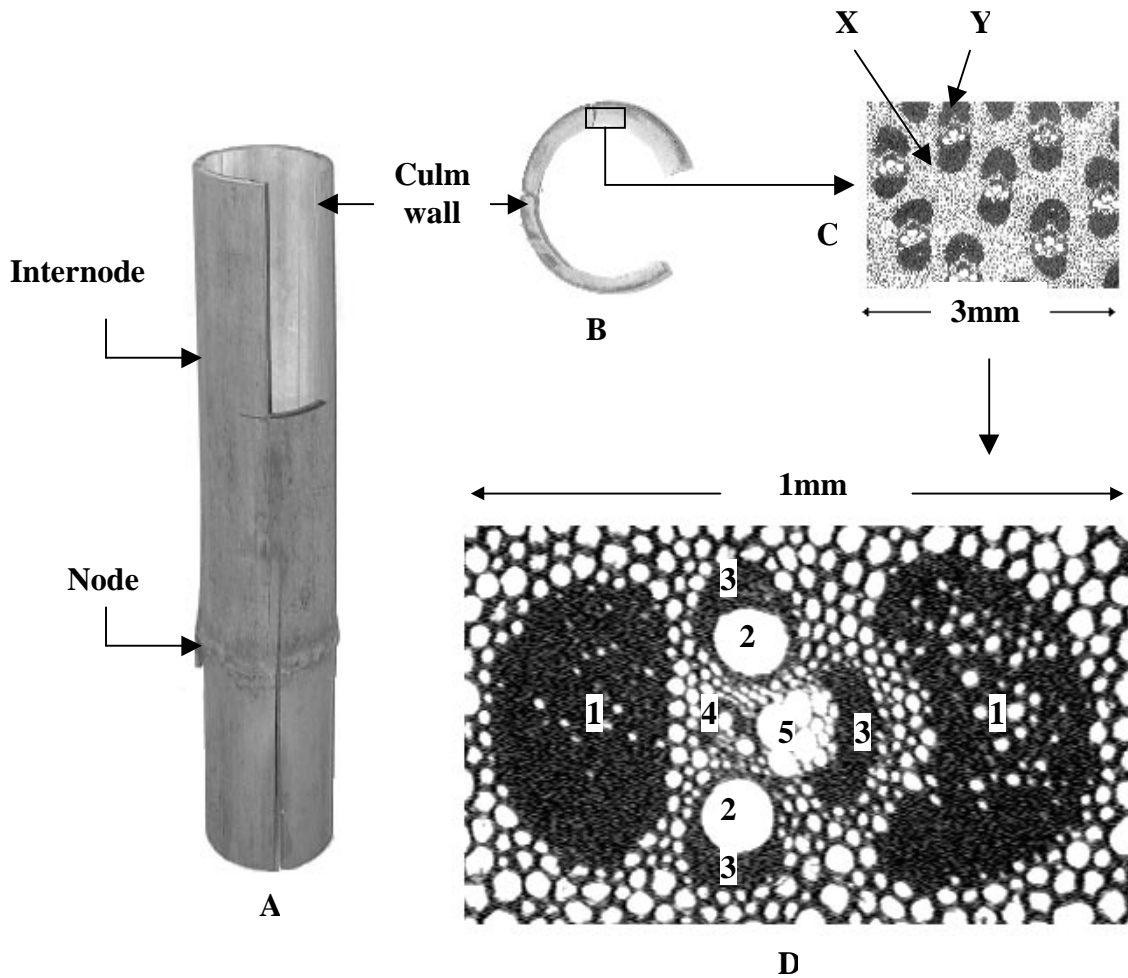


Table 2A: Physical properties of some bamboo species and Calcutta bamboo.

Common and botanical names	Re*	Condition and Relative Density		Based of Shrinkage Value measurement (Moisture Content)	Radial Shrinkage (%)	Tangential Shrinkage (%)	Longitudinal Shrinkage (%)	Diameter Shrinkage (%)
		green dry	0.48 -					
Giant Timber Bamboo <i>Phyllostachys bambusoides</i>	14	green dry	0.48 -	Green to air-dry (170.9% to 12.1%)	18.21	9.25	0.02	
Thorny Bamboo <i>Bambusa arundinacea</i>	39 ^{††}	green dry	0.690 0.790	Green to oven-dry (70.0% to 0.0%)	17.76	-	-	3.76
Mitenga <i>Bambusa longispiculata</i>	39 ^{††}	green dry	0.650 0.910	Green to oven-dry (82.0% to 0.0%)	18.77	-	-	6.64
Buloh Gading <i>Bambusa vulgaris</i>	39 ^{††}	green dry	0.580 0.790	Green to oven-dry (94.0% to 0.0%)	22.45	-	-	4.94
Giant Bamboo <i>Dendrocalamus giganteus</i>	39 ^{††}	green dry	0.620 0.730	Green to oven-dry (79.0% to 0.0%)	7.87	-	-	2.98
Buloh Duri <i>Bambusa blumeana</i>	40 ^{††}	green dry	0.537 -	Green to oven-dry (114.0% to 0.0%)	13.30	6.2	-	-
Bolo <i>Gigantochloa levis</i>	40 ^{††}	green dry	0.539 -	Green to oven-dry (115.1% to 0.0%)	11.30	6.5	-	-
Thorny Bamboo <i>Bambusa arundinacea</i> (India)	37	-	-	Green to 12% Green to oven-dry	13.39 16.41	-	-	9.88 13.40
Calcutta bamboo <i>Dendrocalamaus strictus</i>	37	-	-	Green to 12% Green to oven-dry	11.46 14.83	-	-	11.87 15.98
Calcutta bamboo <i>Dendrocalamaus strictus</i>	38 ^{††}	green dry	0.661 0.757	Green to oven-dry (58.0% to 0.0%)	8.80	-	0.1	6.70

* - Reference

†† - Strength value from middle portion of bamboo.

Table 3A: Mechanical properties of several bamboo species.

Common† and botanical names of species (source)	Re*	Condition	Relative Density	Static bending			Compression parallel to grain (psi)	Tension parallel to grain (psi)	Shear parallel to grain (psi)
				Modulus of rupture (psi)	Modulus of Elasticity (X 10 ⁶ psi)	Stress at proportional limit (psi)			
Giant Timber Bamboo <i>Phyllostachys bambusoides</i> (Japan, widely planted in U.S)	14	green dry	0.48 -	10,084 14,894	1.04 1.55	- -	4,452 6,126	14,580 17,413	- -
Thorny Bamboo <i>Bambusa arundinacea</i> (India)	36	green dry	0.583 0.649	10,656 13,834	1.34 1.76	6,584 8,925	4,895 9,251	- -	- -
Terai Bamboo <i>Melocanna beccifera</i> (Pakistan, Burma, India)	36	green dry	0.751 0.817	7,549 8,173	1.62 1.84	4,682 6,158	5,080 9,918	- -	- -
Thanawa <i>Thyrsostachys oliverii</i> (Thailand, Burma, India)	36	green dry	0.733 0.758	8,783 12,770	1.38 1.72	4,725 7,180	6,655 8,230	- -	- -
Buloh Duri <i>Bambusa blumeana</i> (Malaysia, Indonesia, India, Philippines)	7	green dry	- -	16,088 -	0.60 -	4,192 -	3,928 -	- -	698 -
Buloh Gading <i>Bambusa vulgaris</i> (Malaysia, Indonesia, Sudan, S. America, Thailand, Philippines, Bangladesh)	7	green dry	- 0.700	8,833 -	1.01 -	5,890 -	4,086 -	- -	657 -
Buloh Semantan <i>Gigantochloa scortechinii</i> (Malaysia)	7	green dry	- -	8,620 -	0.72 -	5,965 -	4,176 -	- -	656 -
Moso Bamboo <i>Phyllostachys pubescens</i> (China, Japan, successfully planted in U.S)	21	green dry	0.666 -	14,118 -	1.15 -	6,953 -	6,016 -	1,745 -	1,632 -
Balku Bans** <i>Bambusa balcooa</i> (India)	21	green dry	0.785 -	9,237 -	1.06 -	- -	6,612 -	- -	- -
Pichle** <i>Bambusa nutans</i> (India)	21	green dry	0.631 0.693	8,840 12,330	1.39 1.76	4,739 6,981	6,428 10,201	- -	- -
Tulda <i>Bambusa tulda</i> (India, Pakistan, Burma, Thailand, S.America)	21	green dry	- 0.640	- 17,438	- 1.83	- 10,528	- 9,223	- -	- -
Punting Pole Bamboo** <i>Bambusa tuldoidea</i> (China, Malaysia, Brazil, El Salvador)	21	green dry	- 0.830	- 21,950	- 2.30	- 11,976	- -	- -	- -
Guadua** <i>Guadua angustifolia</i> (Ecuador, Columbia, Peru, Argentina to Panama)	21	green dry	- 0.820	- 20,546	- 2.50	- 11,961	- -	- -	- -

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Buloh Aur Bukit** <i>Bambusa burmanica</i> (Burma, Thailand, India, Malaysia)	37	green dry	0.570 0.672	8,471 14,898	1.56 2.53	5,846 7,719	5,151 9,436	- -	- -
Phai Songkham** <i>Bambusa pallida</i> (India, Thailand)	37	green dry	0.731 -	7,832 -	1.83 -	4,768 -	6,995 -	- -	- -
Buddha's Belly Bamboo** <i>Bambusa ventricosa</i> (China)	37	green dry	0.626 -	4,838 -	0.48 -	2,426 -	5,009 -	- -	- -
Tinwa** <i>Cephalostachyum pergracile</i> (India, Burma, Thailand)	37	green dry	0.601 0.640	7,463 10,117	1.58 2.73	4,540 6,442	5,009 7,123	- -	- -
Wabo-myetsangye** <i>Dendrocalamus hamiltomii</i> (India, Burma, Thailand, Laos, Vietnam, Bangladesh)	37	green dry	0.515 -	5,676 -	0.35 -	2,497 -	5,931 -	- -	- -
Savannah Bamboo** <i>Oxytenanthera abyssinica</i> (Ethiopia, Angola, Ghana)	37	green dry	0.688 -	11,862 -	2.12 -	6,584 -	7,107 -	- -	- -
Thorny Bamboo** <i>Bambusa arundinacea</i> (Bangladesh, India)	39 ^{††}	green dry	0.690 0.790	11,380 13,196	1.93 2.53	7,648 8,513	6,045 6,825	- -	- -
Mitenga** <i>Bambusa longispiculata</i> (Bangladesh, India, Thailand)	39 ^{††}	green dry	0.650 0.910	5,874 7,180	1.15 1.46	3,973 4,867	6,371 7,903	- -	- -
Buloh Gading** <i>Bambusa vulgaris</i> (Malaysia, Indonesia, Sudan, S. America, Thailand, Philippines, Bangladesh)	39 ^{††}	green dry	0.580 0.790	9,010 10,968	1.62 1.70	6,853 7,875	5,193 6,782	- -	- -
Giant Bamboo** <i>Dendrocalamus giganteus</i> (Burma, Bangladesh, India, Sri Langka, Thailand, Madagascar)	39 ^{††}	green dry	0.620 0.730	2,171 7,350	0.21 1.39	1,632 1,745	4,455 7,151	- -	- -
Buloh Duri** <i>Bambusa blumeana</i> (Malaysia, Indonesia, India, Philippines)	40 ^{††}	green dry	0.537 -	4,119 -	1.28 -	2,930 -	5,730 -	- -	- -
Bolo** <i>Gigantochloa levis</i> (Philippines, Malaysia)	40 ^{††}	green dry	0.539 -	2,843 -	1.51 -	2,161 -	6,048 -	- -	- -

† - Some common names have been translated and passed to English usage. Other common names used could be found in Anon (21), Wong (23) and Farrelly(30).

* - Reference

** - Full size test (round bamboo)

†† - Strength value from middle portion of bamboo.

Table 4A: Mechanical properties of Calcutta bamboo from several growing site.

Source	Re [*]	Condition	Moisture Content (%)	Relative Density	Tension Parallel to grain (psi)	Static bending			Compression parallel to grain (psi)
						Modulus of rupture (psi)	Modulus of Elasticity (X 10 ⁶ psi)	Stress at proportional limit (psi)	
Gorakhpur, India	36	green dry	92.1	0.540	-	10,684	0.92	6,030	4,881
			9.9	0.630	-	13,352	1.24	9,436	8,925
Dehra Dun, India	36	green dry	154.0	0.430	-	6,073	0.62	3,065	3,718
			7.9	0.500	-	7,364	0.65	4,555	7,776
Mananur, India	36	green dry	34.3	0.640	-	13,990	2.60	7,932	6,399
			10.9	0.850	-	22,248	2.91	15,452	10,131
Bhadrachalam, India	36	green dry	28.9	0.710	-	9,209	1.73	5,122	4,867
			8.5	0.800	-	18,134	2.41	13,238	10,626
Puerto Rico	21	green dry	-	-	-	-	-	-	-
			10.1	0.570	-	12,061	1.16	6,343	5,988
Madhya Pradesh, India	25	green dry	-	-	-	-	-	-	-
			12.0	0.720	-	13,300	2.20	8,122	7,890
New Forest, Dehra Dun, India**	38 ^{††}	green dry	58	0.661	-	13,600	2.22	-	6,000
			12.0	0.757	-	18,600	2.56	-	8,850
Dehra Dun, India**	38 ^{††}	green dry	-	-	-	-	-	-	
			13.0	0.757	-	17,000	2.62	-	-

* - Reference

** - Full size test (round bamboo). *D.strictus* from Dehra Dun tested at different time.

†† - Strength value from middle portion of bamboo.

Figure 3A: Basic vascular bundle types in bamboo [22].

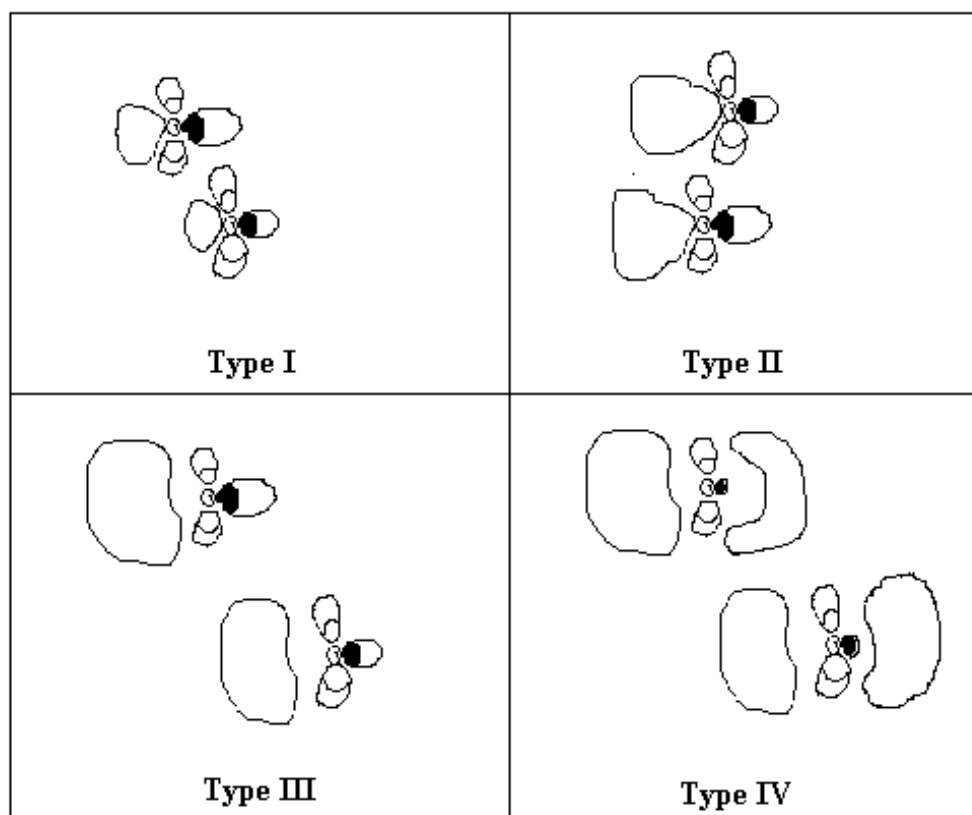


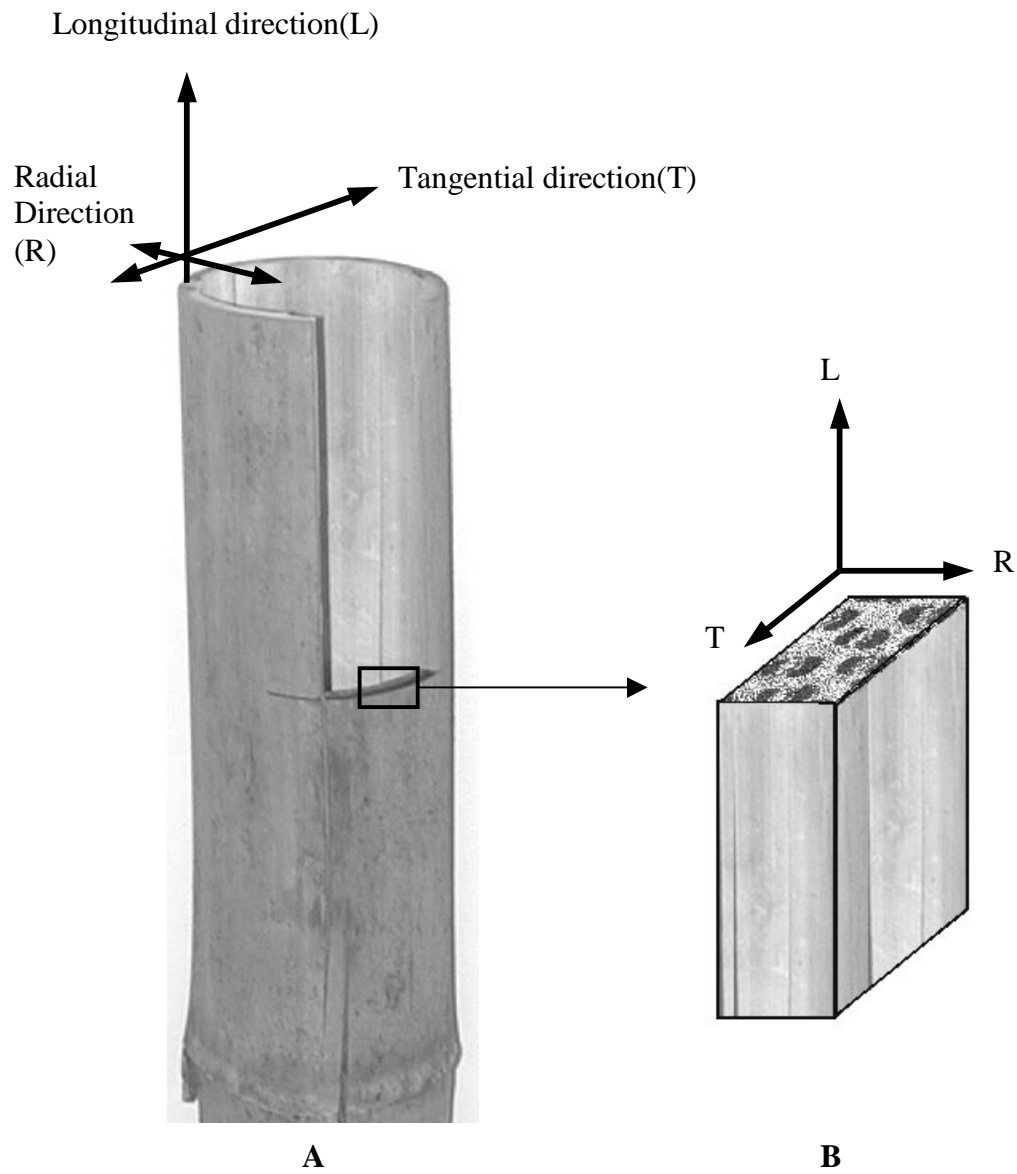
Table 5A: Description of vascular bundle types[22].

Type	Characteristics
I	Consisting of one part(central vascular bundle strand) with supporting tissues only as sclerenchyma sheaths, with intercellular space with tyloses
II	Consisting of one part(central vascular bundle strand), supporting tissues only as sclerenchyma sheaths, with sheaths at the intercellular space (protoxylem) strikingly larger than the other ones and intercellular space without tyloses
III	Consisting of two parts (central vascular strand and one fiber strand with fiber strand inside the central strand. Sheath at the intercellular space (Protoxylem) generally smaller than the other ones.
IV	Consisting of three parts (central vascular strand and two fiber strands), with fiber strands outside and inside the central strand.

Table 6A. Anatomical classification groups [22].

Group	Vascular Bundle Type	Genera
A	Genera having type I alone	<i>Arundinacea, Phyllostachys, Tetragonocalamus</i>
B1	Genera having type II alone	<i>Cephalostachyum</i>
B2	Genera having type II and III	<i>Melocanna, Schizostachyum, Teinostachyum</i>
C	Genera having type III alone	<i>Oxytenanthera</i>
D	Genera having type III and IV	<i>Bambusa, Dendrocalamus, Gigantochloa, Thyrsostachys</i>

Figure 4A: Orthogonal direction of bamboo. Bamboo culm (A) and a section cut from bamboo culm (B).



Appendix B:

Table 1B: Mechanical properties and relative density relationship for softwood and hardwood based on average values.

Table 2B: Bending properties of some timber species that are used in composite products.

Table 3B: Relative density and shrinkage of several timber species.

Table 4B: Equilibrium moisture content (EMC) of typical wood products.

Table 5B: pH and buffer capacity of several timber species.

Table 6B: Contact angle of several species of timber.

Figure 1B: Finite contact angle (θ) of a sessile drop resting on a solid surface.

Table 1B: Mechanical properties and relative density relationship for softwood and hardwood, based on average values [44].

Properties (psi)	Strength Prediction from Relative Density			
	Green Wood		12% Moisture Content	
	Softwood	Hardwood	Softwood	Hardwood
Bending MOR MOE (10^6)	$15,890G^{1.01}$ $2.33G^{0.76}$	$17,210G^{1.16}$ $2.02G^{0.72}$	$24,760G^{1.01}$ $2.97G^{0.84}$	$24,850G^{0.13}$ $2.39G^{0.7}$
Compression Parallel Compression Perpendicular	$7,210G^{0.94}$ $1,270G^{1.53}$	$7,110G^{1.11}$ $2,680G^{2.48}$	$13,590^{0.97}$ $2,390G^{1.57}$	$11,030G^{0.89}$ $3,130G^{2.09}$
Shear parallel Tension Perpendicular	$1,590G^{0.73}$ $550G^{0.78}$	$2,580G^{1.24}$ $1,520G^{1.37}$	$2,410G^{0.85}$ $870G^{1.11}$	$3,170G^{1.13}$ $1,460G^{1.3}$

Table 2B: Bending properties of some timber species that are used in composite products [44].

Wood Species	Moisture content	Relative Density	Static Bending	
			σ_{ult} (N/mm ²)	E (N/mm ²)
<i>Liriodendron tulipifera</i> (yellow poplar)	Green	0.40	41.00	8,400
	12%	0.42	70.00	10,900
<i>Populus tremuloides</i> (quaking aspen)	Green	0.35	35.00	5,900
	12%	0.38	58.00	8,100
<i>Pinus resinosa</i> (red pine)	Green	0.41	40.00	8,800
	12%	0.46	76.00	11,200
<i>Pinus monticola</i> (western white pine)	Green	0.35	32.00	8,200
	12%	0.38	67.00	10,100
<i>Pinus strobus</i> (eastern white pine)	Green	0.34	34.00	6,800
	12%	0.35	59.00	8,500
<i>Pseudotsuga menziesii</i> (douglas fir-coast)	Green	0.45	53.00	10,800
	12%	0.48	85.00	13,400
<i>Tsuga canadensis</i> (eastern hemlock)	Green	0.38	44.00	7,400
			61.00	8,300

Table 3B: Relative density and shrinkage of several timber species [44].

Wood Species	Relative Density		Shrinkage (%) from green to oven-dry moisture content		
			Volumetric	Radial	Tangential
<i>Liriodendron tulipifera</i> (yellow poplar)	Green	0.40	12.7	4.6	8.2
	12%	0.42			
<i>Populus tremuloides</i> (quaking aspen)	Green	0.35	11.5	3.5	6.7
	12%	0.38			
<i>Pinus resinosa</i> (red pine)	Green	0.41	11.3	3.8	7.2
	12%	0.46			
<i>Pinus monticola</i> (western white pine)	Green	0.35	11.8	4.1	7.4
	12%	0.38			
<i>Pinus strobus</i> (eastern white pine)	Green	0.34	8.2	2.1	6.1
	12%	0.35			
<i>Pseudotsuga menziesii</i> (douglas fir-coast)	Green	0.45	12.4	4.8	7.6
	12%	0.48			
<i>Tsuga canadensis</i> (eastern hemlock)	Green	0.38	9.7	3.0	6.8
	12%	0.40			
<i>Shorea spp.</i> (light red meranti)	Green	0.34	14.3	4.6	8.5
	12%	-			

Table 4B: Equilibrium moisture content (EMC) of typical wood products evaluated at 70°F(21°C) [31].

Relative Humidity (%)	Moisture Content (%)		
	Wood	Softwood Plywood	Particleboard
30	6.0	6.0	6.6
42	8.0	7.0	7.5
65	12.0	11.0	9.3
80	16.1	15.0	11.6
90	20.6	19.0	16.6

Table 5B: pH and buffer capacity of several timber species [48, 68].

Wood Species	pH Value	Buffer Capacity (Mili-equivalent)
<i>Populus spp.</i> (aspen, cottonwood)	5.8	0.230-0.308
<i>Pinus resinosa</i> (red pine)	6.0	-
<i>Pinus sylvestris</i> (scots pine)	5.1	-
<i>Pinus strobus</i> (eastern white pine)	4.9	-
<i>Pseudotsuga menziesii</i> (douglas fir)	3.3	0.03-0.09
<i>Tsuga canadensis</i> (eastern hemlock)	5.5	0.17-0.23
<i>Shorea spp.</i> (meranti or lauan)	4.7	-
<i>Liriodendron tulipifera</i> (Yellow poplar)	5.0	-
<i>Quercus alba</i> (White oak)	3.5	0.1
<i>Quercus rubra</i> (Red oak)	3.5	-

Figure 1B: Finite contact angle (θ) of a sessile drop resting on a solid surface. High degree of wetting (A), low degree of wetting (B).

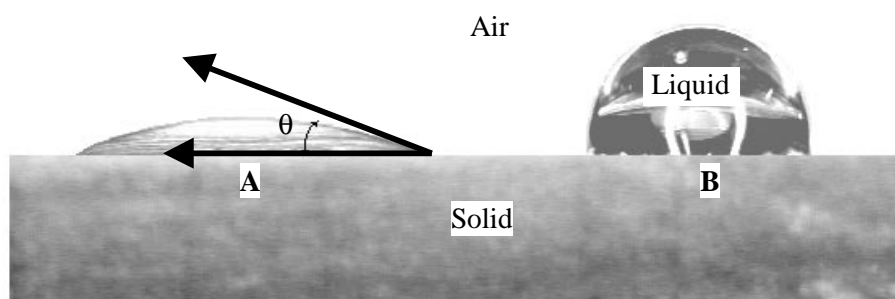


Table 6B: Contact angle of several species of timber [68].

Wood Species	Relative Density	Wettability (cosine θ)
<i>Populus tremuloides</i> (aspen)	0.44	0.785
<i>Liriodendron tulipifera</i> (Yellow poplar)	0.46	0.624
<i>Quercus alba</i> (White oak)	0.62	0.640
<i>Quercus rubra</i> (Red oak)	0.62	0.643
<i>Bombacopsis quinata</i> (Cedro espino)	0.40	0.321
<i>Juglans cinerea</i> (Butternut)	0.42	0.616
<i>Tabebuia donell-smithii</i> (Primavera)	0.43	0.700
<i>Ocotea schomburgkiana</i> (Yekoro)	0.44	0.532
<i>Ocotea rubra</i> (Determa)	0.49	0.367
<i>Magnolia sororim</i> (Vaco)	0.56	0.654
<i>Vitex gaumeri</i> (Fiddlewood)	0.63	0.859
<i>Bertholletia excelsa</i> (Brazil nut)	0.65	0.389
<i>Peltogyne renosa</i> (Purpleheart)	0.78	0.648
<i>Apuleia molaris</i> (Muirá-juba)	0.84	0.386
<i>Enterolabium schomburgkii</i> (Timbauba)	0.93	0.456
<i>Ocotea rodiaei</i> (Greenheart)	1.02	0.358

Appendix C:

Table 1C: Classification of wood composite.

Figure 1C: Manufacturing processes of parallel strand lumber.

Table 1C: Classification of Wood Composite [59].

I. Solid Wood
II. Modified Wood a. Wood treated with preservatives b. Fire retardant-treated wood c. Resin-impregnated wood d. Chemically treated wood e. Irradiated wood
III. Layered Composites a. Parallel laminated 1. Glued-laminated timber 2. Laminated veneer lumber 3. Parallel strand lumber b. Cross laminates 1. Plywood 2. Veneer-overlaid oriented particleboard or oriented strand lumber c. Reinforced wood d. Sandwich panels 1. Blockboard 2. Com-Ply e. Mechanically connected laminates
IV. Particle Composites a. Particleboard 1. Chipboard 2. Flakeboard 3. Waferboard 4. Cementboard b. Fiberboard 1. Insulation board 2. Medium-density board 3. Hardboard
V. Fiber Composites a. Paper b. Fiber-reinforced plastics
VI. Flour Composites a. Molded wood flour

Figure 1C: Manufacturing Processes of Parallel Strand Lumber.

