



SUBJECT

WOOD

chapter 3

material characteristics and fabrication

DATE

FALL 2013

PROFESSOR

MONTGOMERY



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long tradition as building material

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long tradition as building material

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architectural harnessing of natural elements

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richness and warmth of wood

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richness and warmth of wood

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wood as medium of craft and artistry

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this week

objective:

understand the journey of wood from the forest to the wood frame house and the properties of wood that guide its fabrication and use

- * trees
- * forest management
- * lumber
- * wood products



- * wood fasteners
- * manufactured wood components
- * prefabrication



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wide variety of trees and local ecosystems

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characteristics of trees

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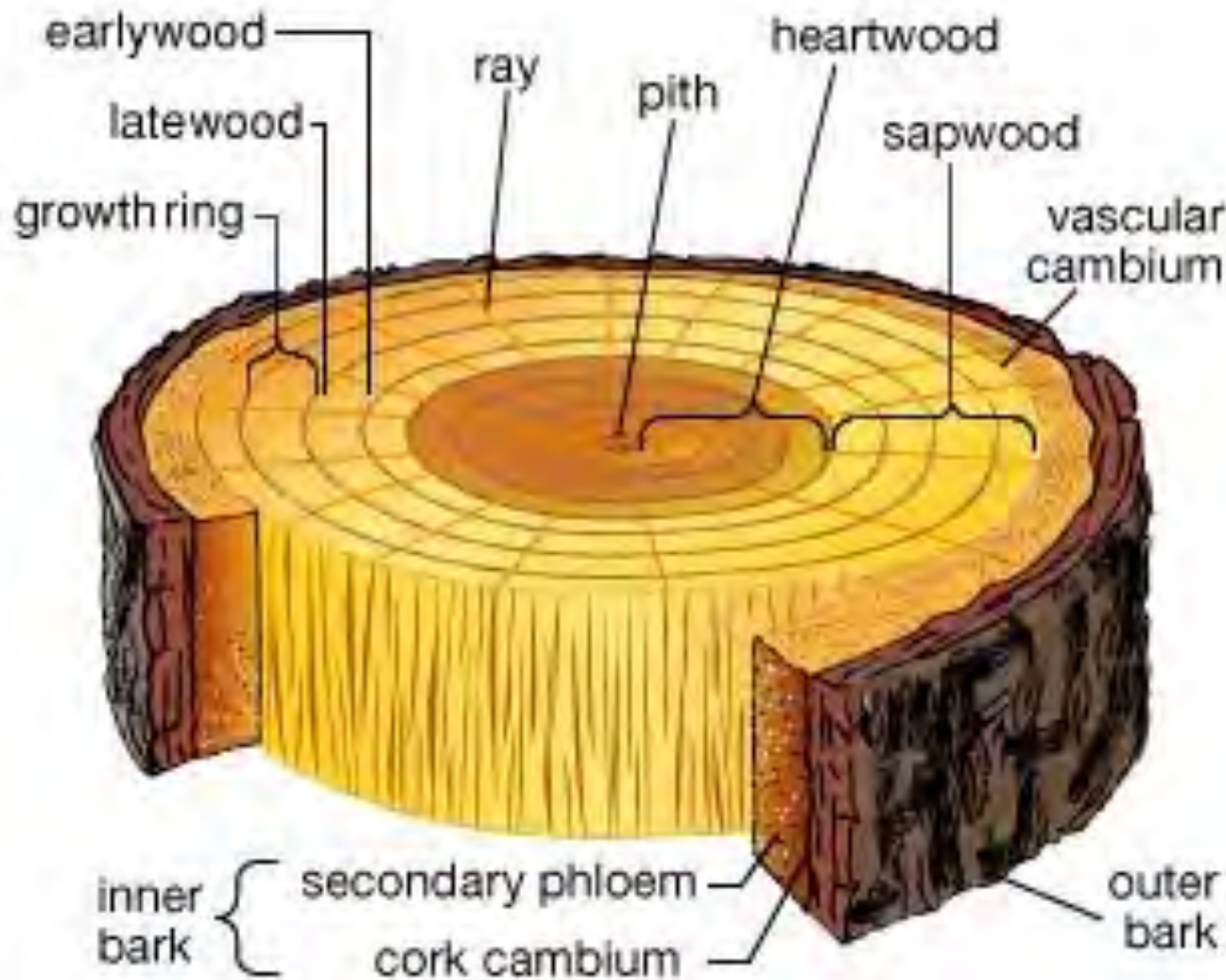


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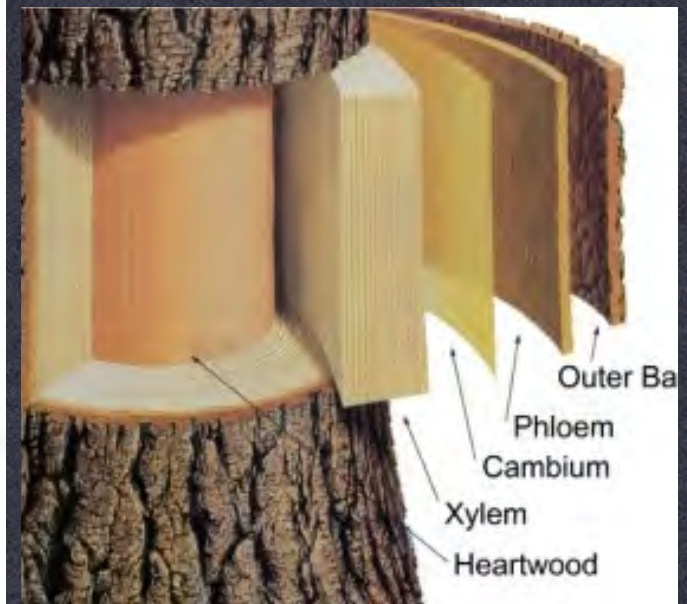
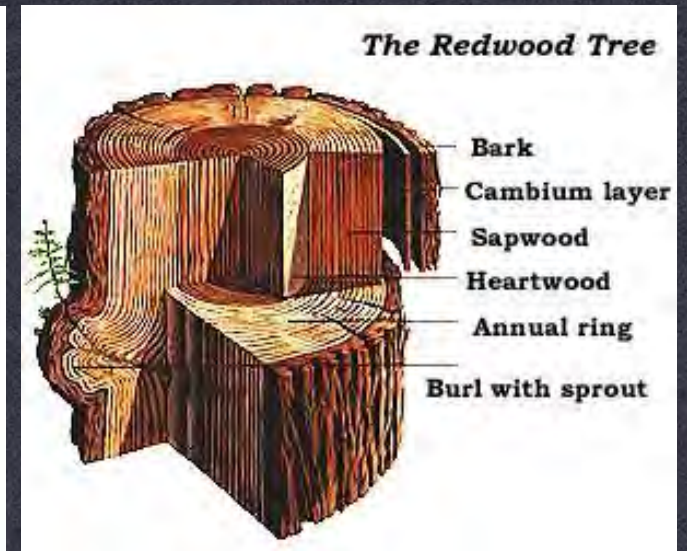
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anatomy of trees

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structure of trees

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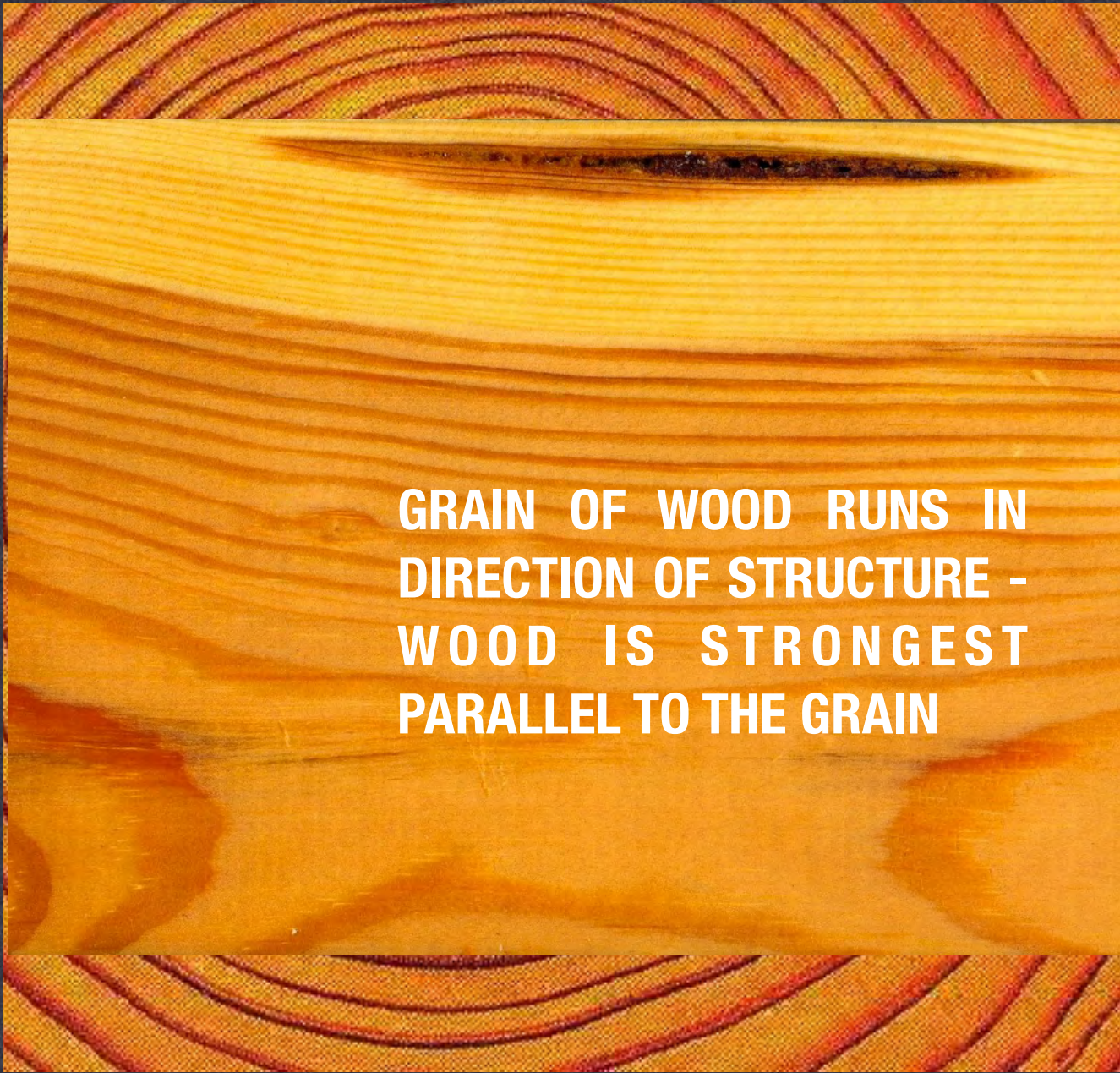


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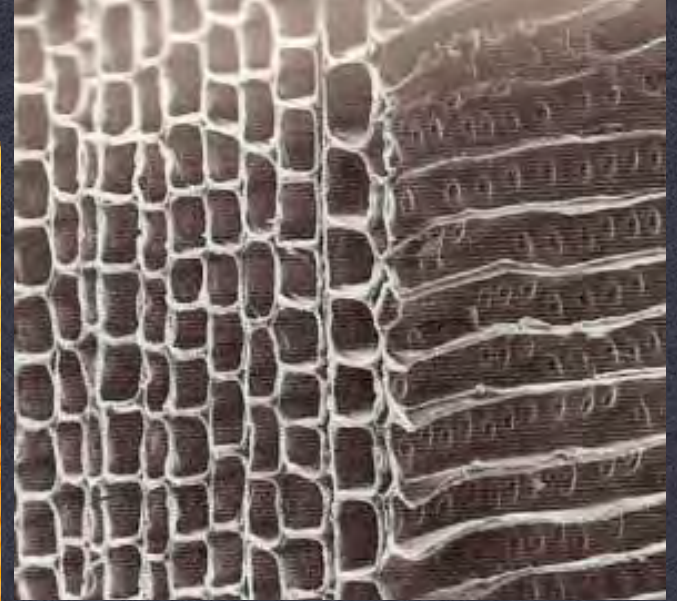
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GRAIN OF WOOD RUNS IN
DIRECTION OF STRUCTURE -
WOOD IS STRONGEST
PARALLEL TO THE GRAIN



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properties of wood

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SOFTWOODS:

✱ **Coniferous Trees**

HARDWOODS:

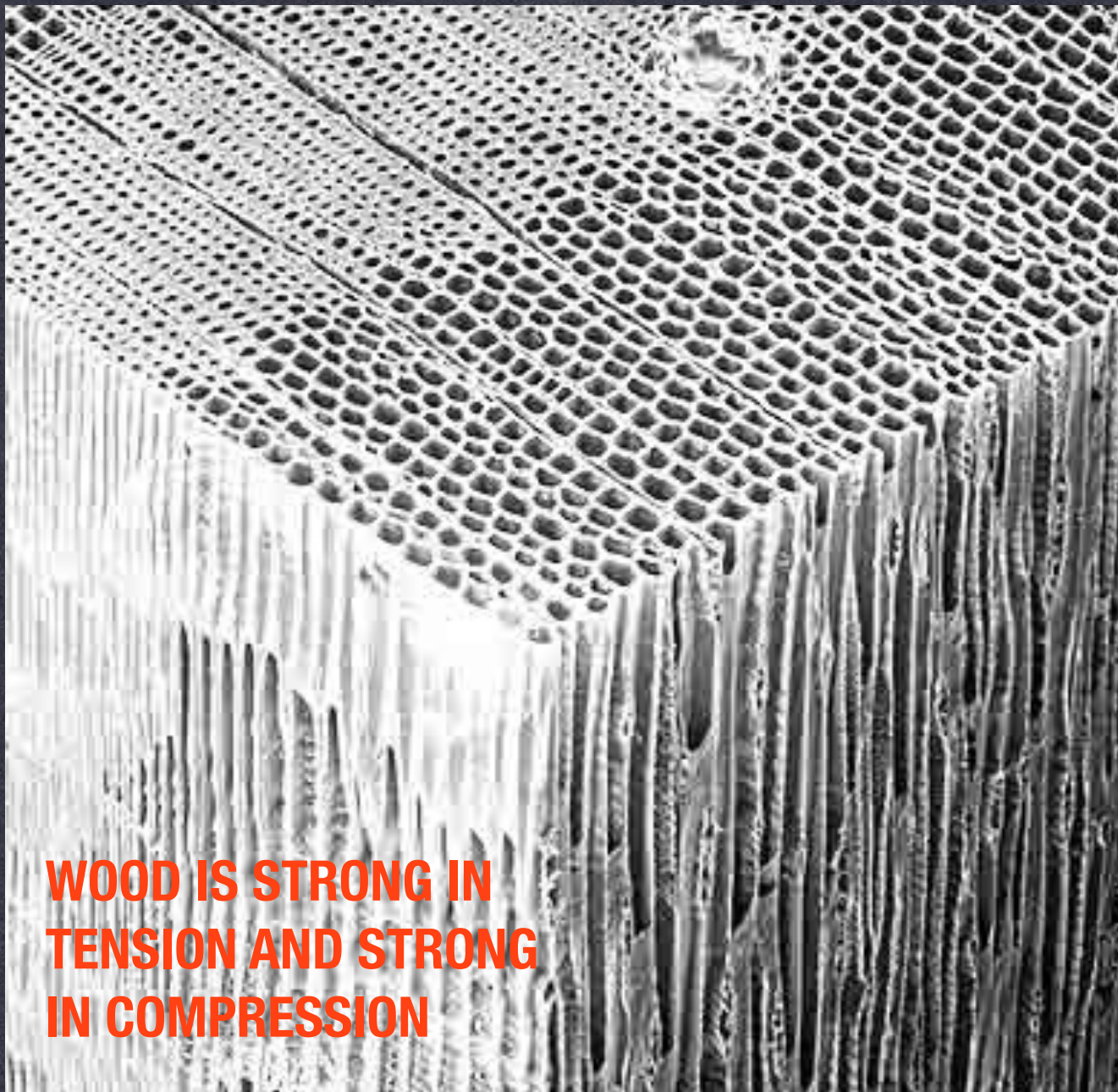
✱ **Broadleaf Trees**

WOOD

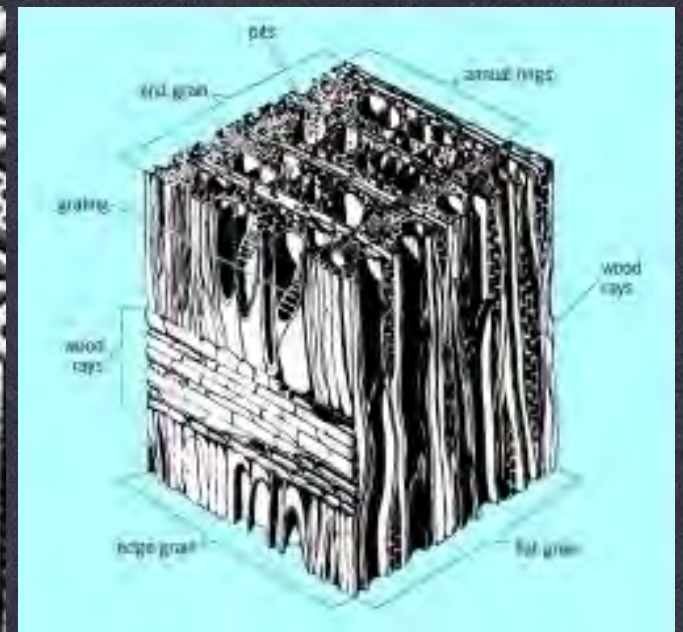
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major categories of types of trees

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**WOOD IS STRONG IN
TENSION AND STRONG
IN COMPRESSION**



SOFTWOODS:

✳ **Simple Structure**

HARDWOODS:

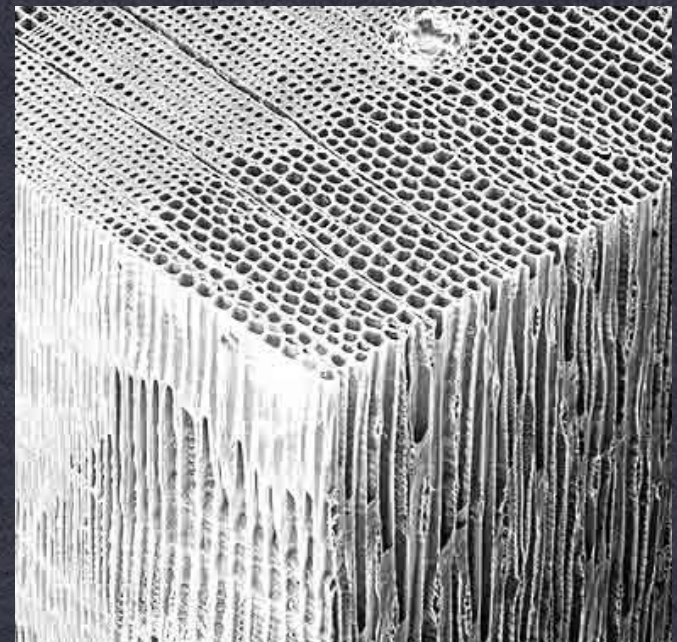
✳ **Complex Structure**

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softwoods and hardwoods

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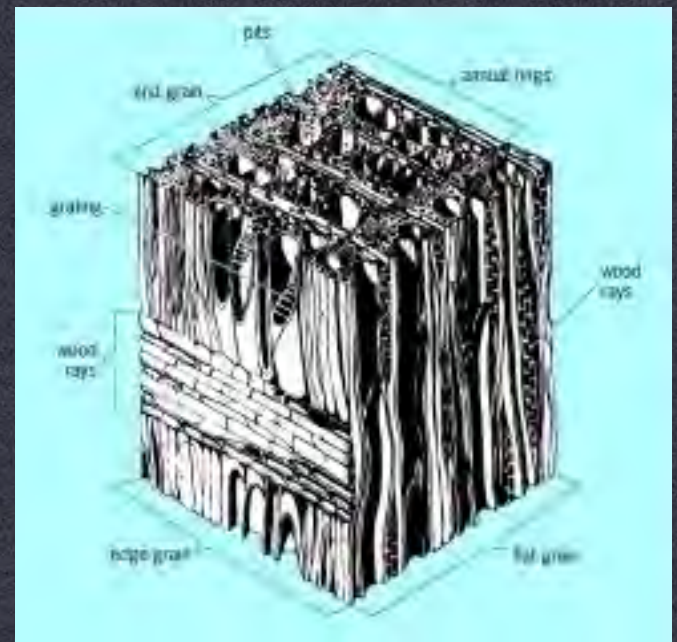


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softwood structure and grain pattern

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hardwood structure and grain pattern



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harvesting wood

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harvesting wood

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- *clear cut forest
- *destruction of habitat
- *erosion problems
- *recovery takes time

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forest management

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SUSTAINABLE
FORESTRY
INITIATIVE

Good for you. Good for our forests.™



- *maintain biodiversity and habitat
- *selective harvesting
- *confirm origin of wood products used in projects

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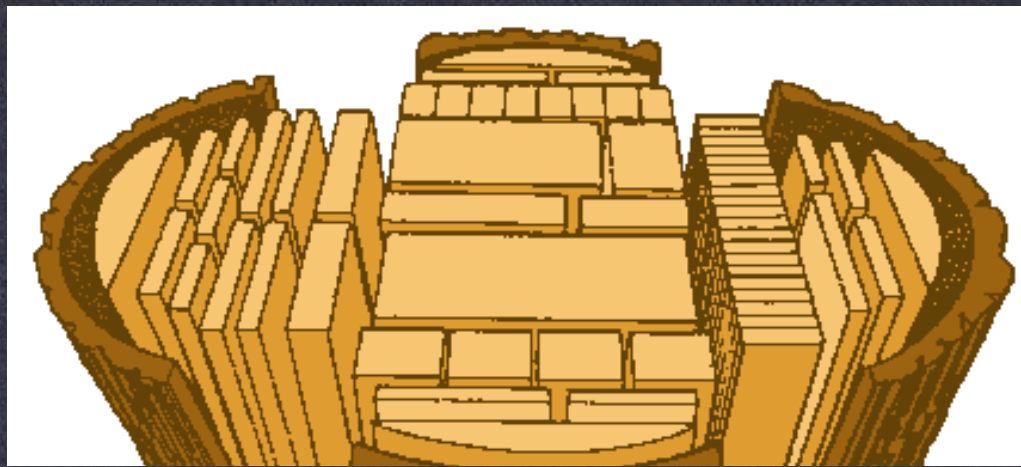
FSC = forest stewardship council

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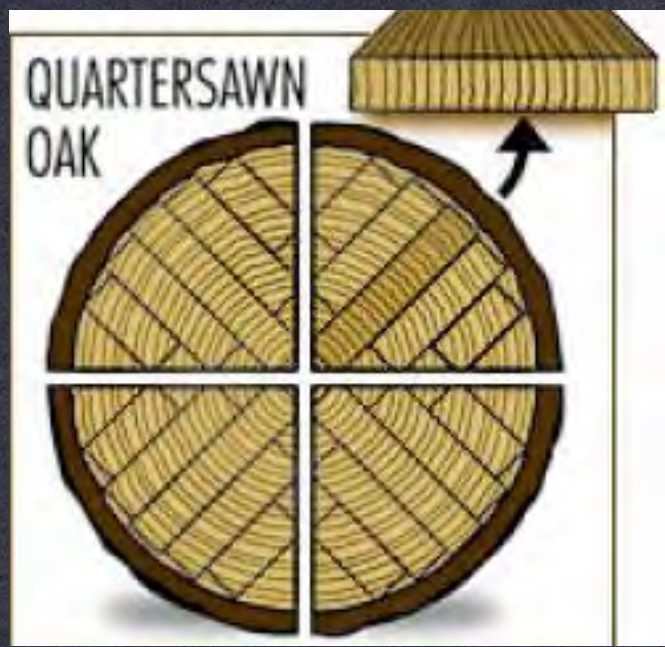
Plan
S



ches



Plainsawn Log

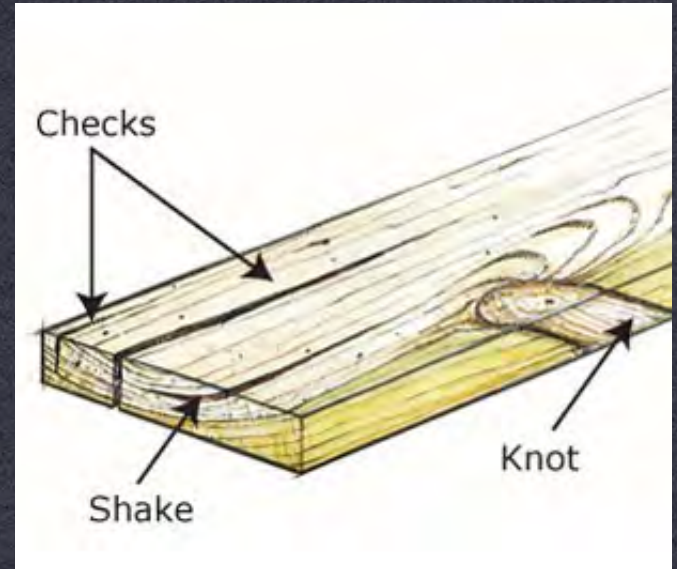
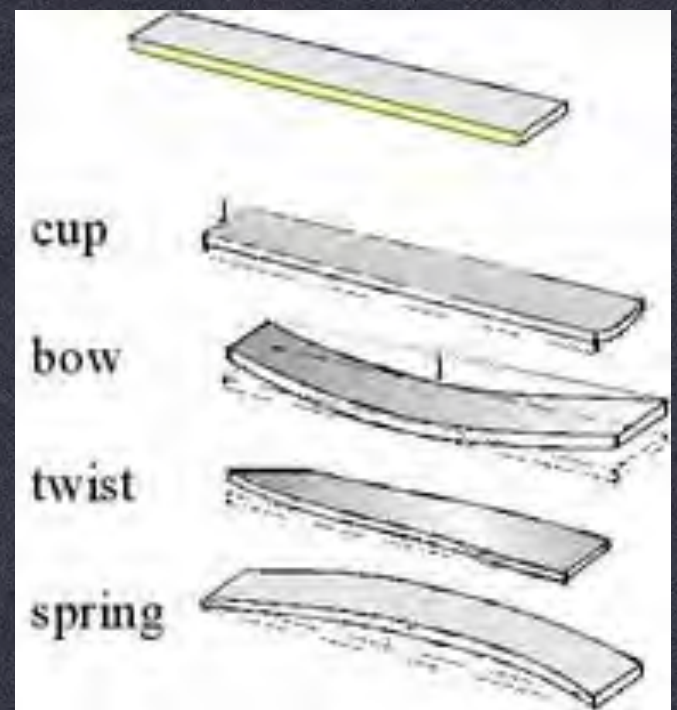
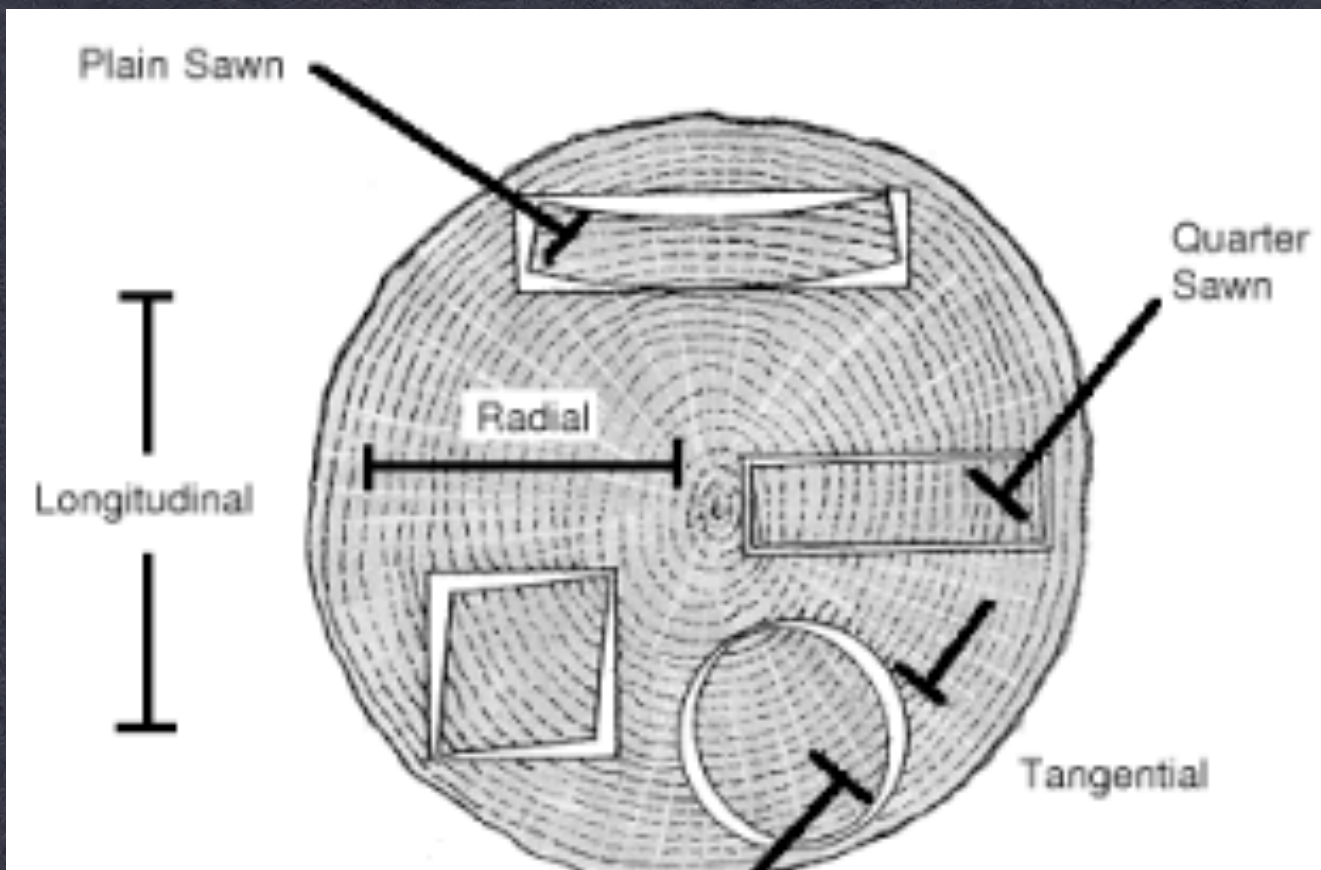


LUMBER

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sawing logs

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LUMBER

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defects

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dimensional lumber

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(1) Moisture Content – Heat Treatment

"KD" and "S-Dry" = 19% or less moisture content.
 "MC-15" or KD 15" = 15% or less moisture content.
 "S-GRN" = a moisture content greater than 19%.
 "HT" = meets the Heat Treatment Requirements.
 Note: Air Dried Lumber may not be stamped "KD".
 (Moisture Content details are provided in Section 2 of the "Standard Grading Rules for Northeastern Lumber.")

(2) Product Grade

The grade of lumber is shown by number, name, or official abbreviation. (Refer to the "Standard Grading Rules for Northeastern Lumber" for a complete list of product grades.)

(3) Species or Species Grouping

The species or species group of the product is indicated by its officially recognized name or abbreviation. In this example, SPF = Spruce-Pine-Fir (south). (See the full list of Northeastern Species and Species Groups in Section 1 of the "Standard Grading Rules for Northeastern Lumber.")

(5) Mill Number or Name

A unique number assigned by the Grading Agency. May also be the Mill Name. (Use the online "Member Locator" to identify a manufacturer by mill number)

KD-HT
Stud
 SPF

000



(4) ALS Supervisory Agency

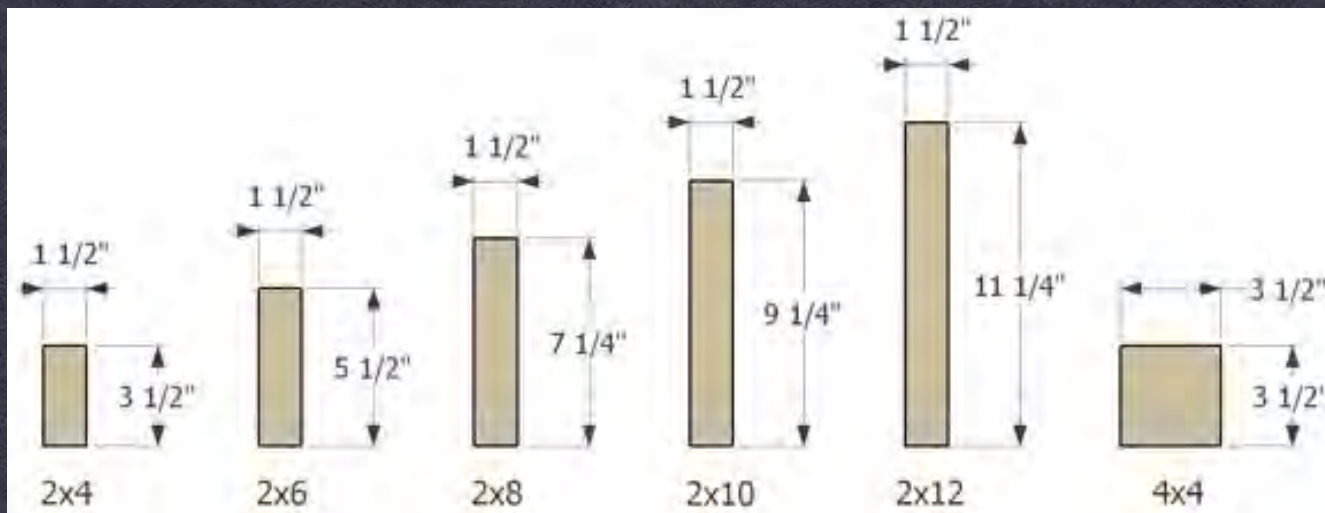
Indicates that the product has been graded under the supervision of an accredited ALSC agency, such as NELMA.

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dimensional lumber: grading

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Nominal Dimension	Actual Dimension
1" x 2"	3/4" x 1-1/2"
1" x 3"	3/4" x 2-1/2"
1" x 4"	3/4" x 3-1/2"
1" x 5"	3/4" x 4-1/2"
1" x 6"	3/4" x 5-1/2"
1" x 7"	3/4" x 6-1/4"
1" x 8"	3/4" x 7-1/4"
1" x 10"	3/4" x 9-1/4"
1" x 12"	3/4" x 11-1/4"
2" x 4"	1-1/2" x 3-1/2"
2" x 6"	1-1/2" x 5-1/2"
2" x 8"	1-1/2" x 7-1/4"
2" x 10"	1-1/2" x 9-1/4"
2" x 12"	1-1/2" x 11-1/4"
3" x 6"	2-1/2" x 5-1/2"
4" x 4"	3-1/2" x 3-1/2"
4" x 6"	3-1/2" x 5-1/2"



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dimensional lumber



GLUE LAMINATED WOOD

STRUCTURAL

COMPOSITE LUMBER

LVL

- LAMINATED STRAND LUMBER
- ORIENTED STRAND LUMBER
- LAMINATED VENEER LUMBER

LUMBER

manufactured wood products

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GLUE LAMINATED BEAM



GLUE LAMINATED BEAM



LVL

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GLUE LAMINATED WOOD

**COMPOSITE
PANEL**

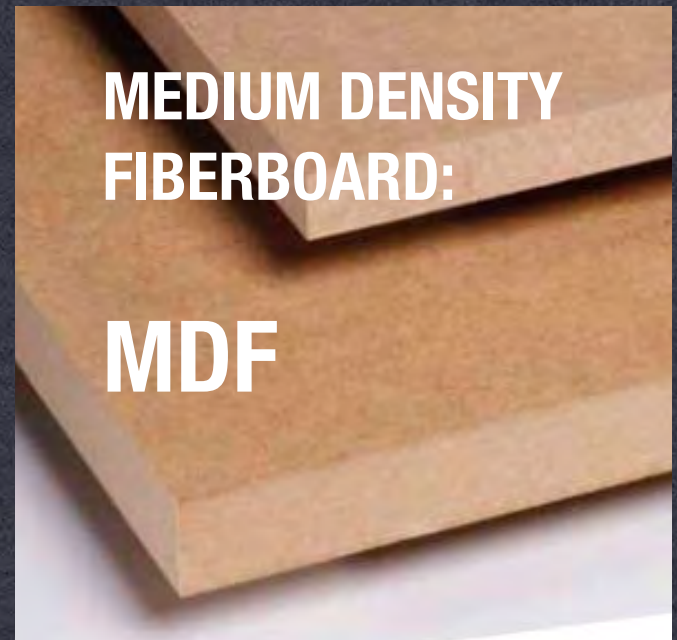
**ORIENTED
STRAND BOARD**

**veneER
PLYWOOD**

I JOIST



PARTICLE BOARD



**MEDIUM DENSITY
FIBERBOARD:**

MDF

LUMBER

structural wood panel products

APA THE ENGINEERED WOOD ASSOCIATION			APA THE ENGINEERED WOOD ASSOCIATION			APA THE ENGINEERED WOOD ASSOCIATION		
1	RATED STURD-I-FLOOR		1	RATED SHEATHING		1	RATED SIDING	
2	24 oc 23/32 INCH	6	2	48/24 23/32 INCH	6	2	303-18-S/W	9
3	SIZED FOR SPACING		3	SIZED FOR SPACING		3	11/32 INCH	10
4	T&G NET WIDTH AT 1/2		4	EXPOSURE 1		4	GROUP 1	10
5	000	7	5	000	7	5	SIZED FOR SPACING	8
6	PS 1-01 UNDERLAYMENT	8	6	PS 2-04 SHEATHING	11	6	EXTERIOR	7
			7	FRP-108 HUD-UM-40	11	7	000	7
			8			8	PS 1-01 FRP-108	11
							HUD-UM-40	11
				CONSTRUCTION SHEATHING	12			
			13	2R48/2F24				
			14	18mm				
			15	CSA 0325				
				STRENGTH AXIS				
				THIS DIRECTION				
1	Panel grade	7	Mill number		13	Panel mark - Rating and		
2	Span Rating	8	APA's performance rated panel			end-use designation per		
3	Bond classification		standard			the Canadian standard		
4	Tongue-and-groove	9	Siding face grade		14	Canadian performance		
5	Product Standard	10	Species group number			rated panel standard		
6	Thickness	11	HUD recognition		15	Panel face orientation		
		12	Panel grade, Canadian standard			indicator		



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wood panel products

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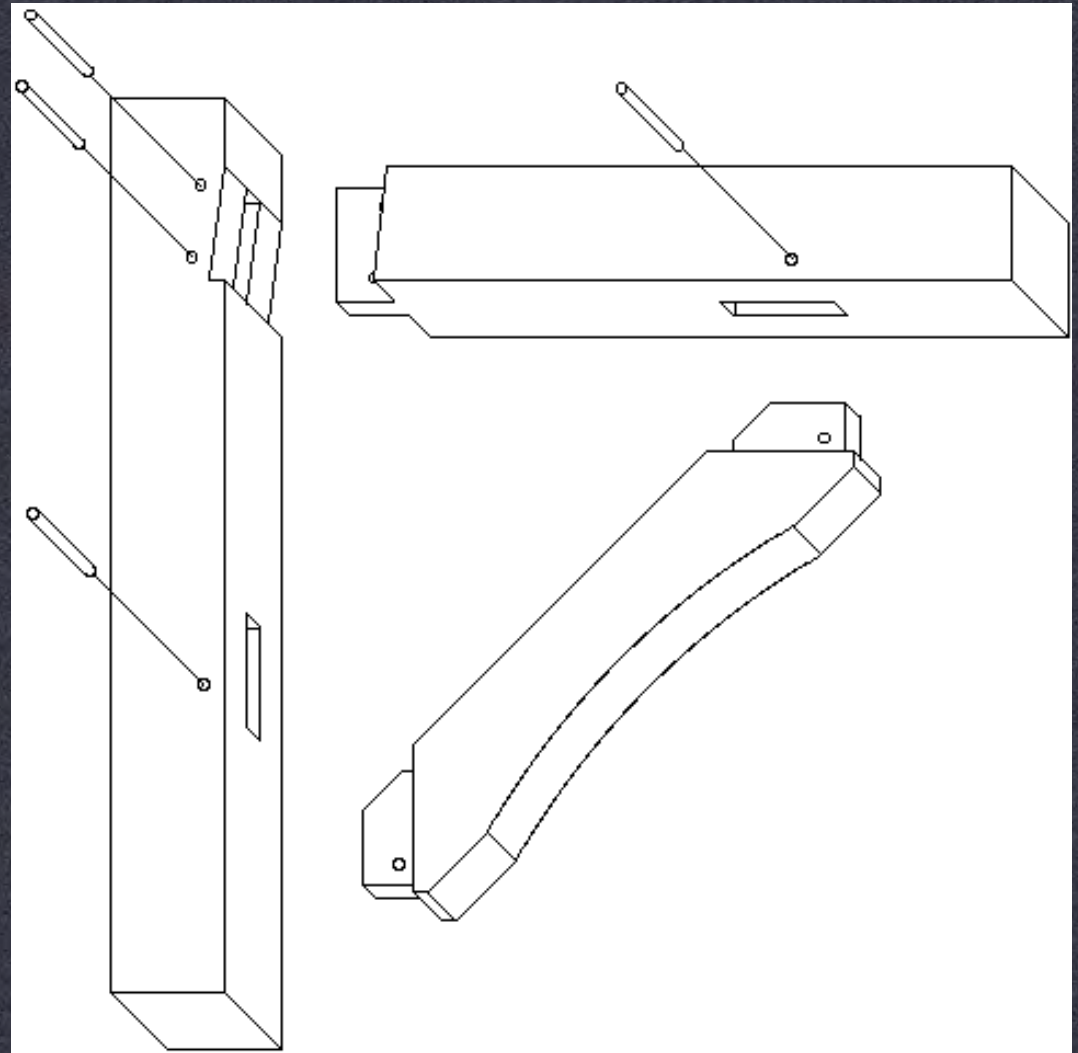
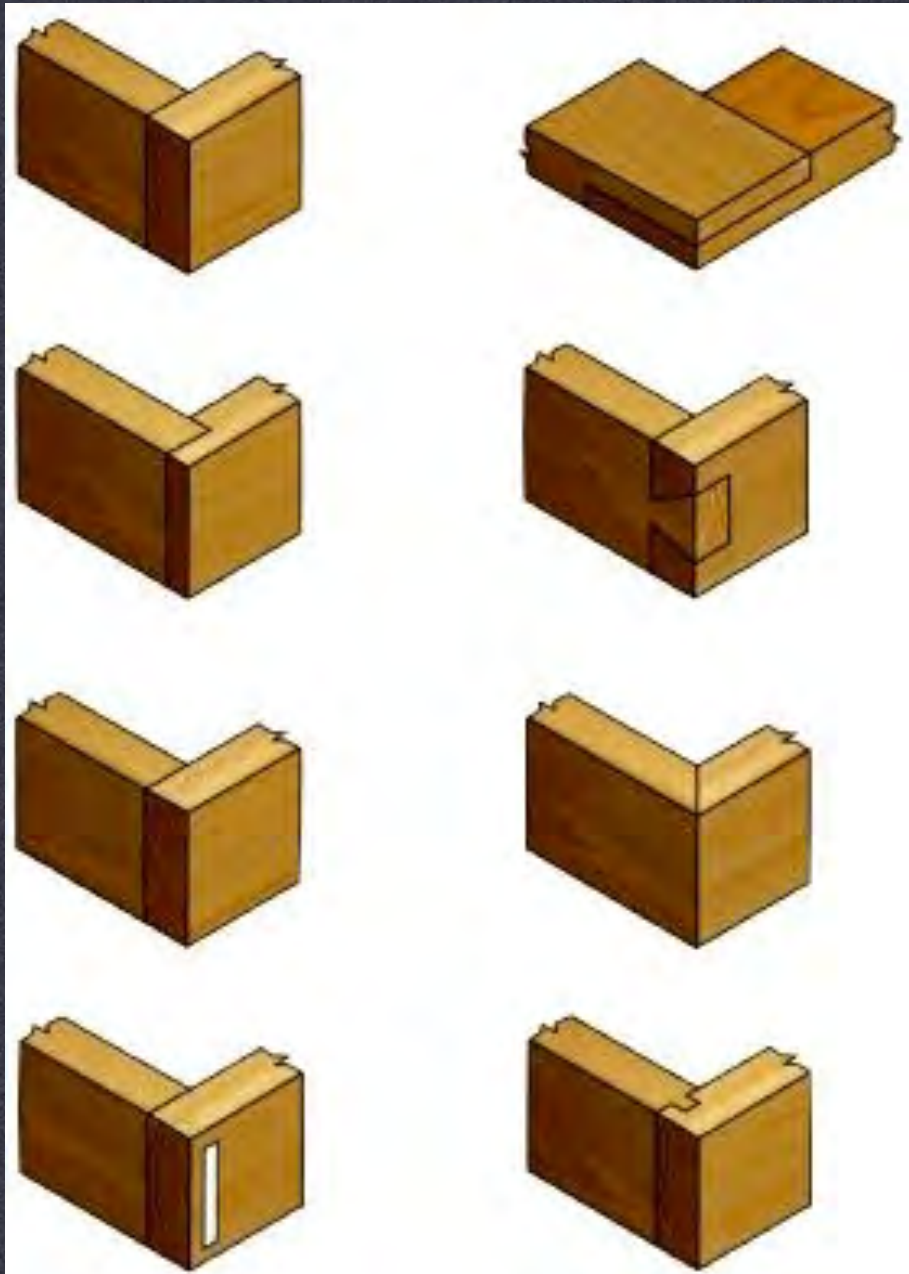


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traditional joinery

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traditional joinery

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WOOD

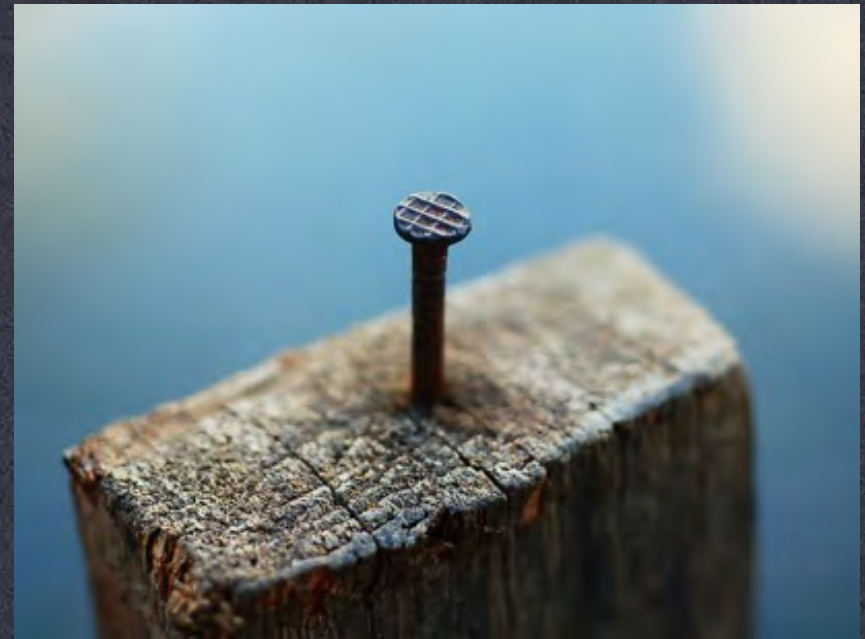
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wood fasteners + tools

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Various types of nails: (left to right) bright smooth wire nail, cement coated, zinc-coated, annularly threaded, helically threaded, helically threaded and barbed, and barbed.



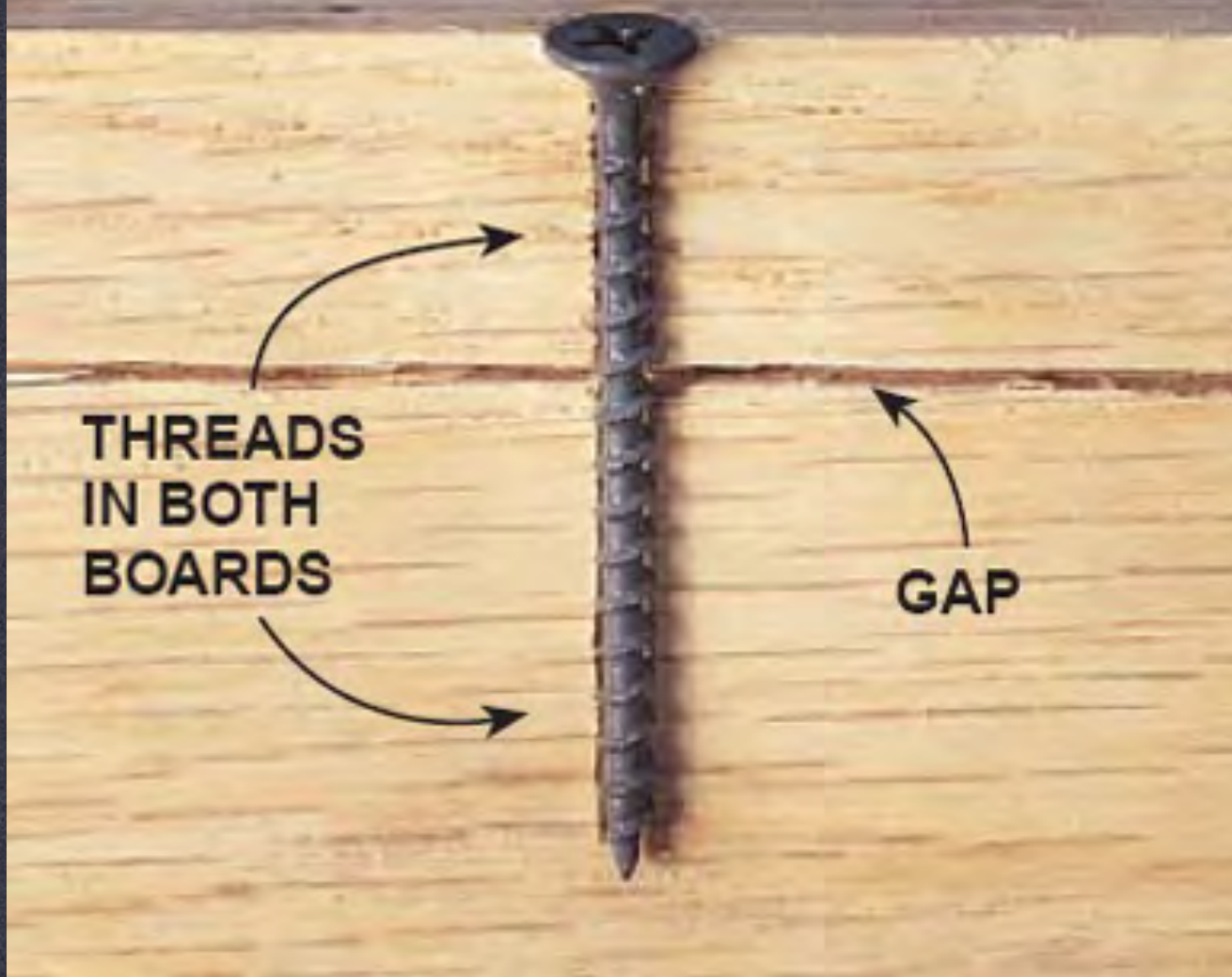
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wood fasteners - nails

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DRYWALL SCREW

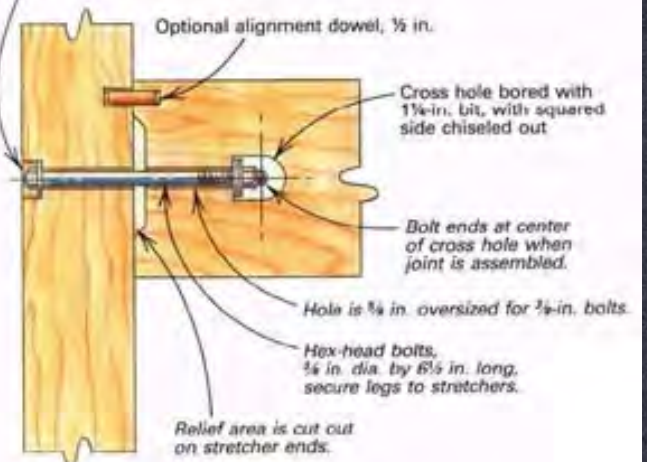


WOOD SCREW



Joinery detail

Countersunk hole,
1 in. dia. by $\frac{1}{2}$ in. deep,
for bolt head and washer

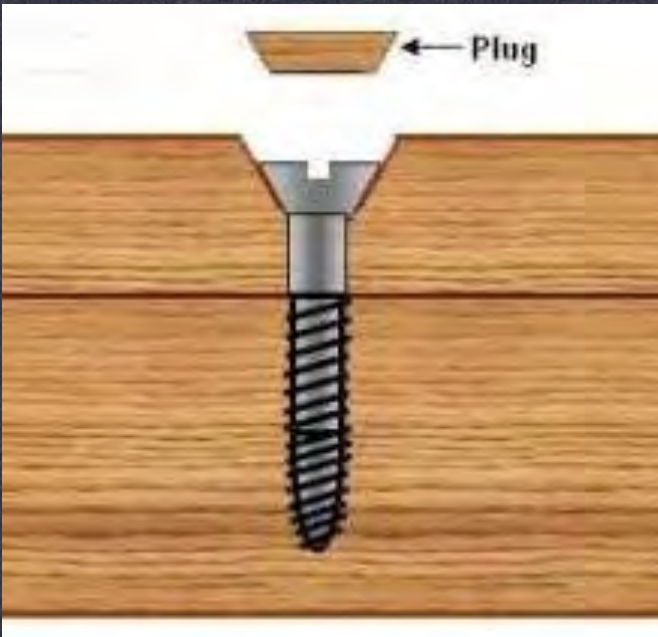


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wood fasteners - screws + bolts

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COMPARISON B/W NAILS AND SCREWS

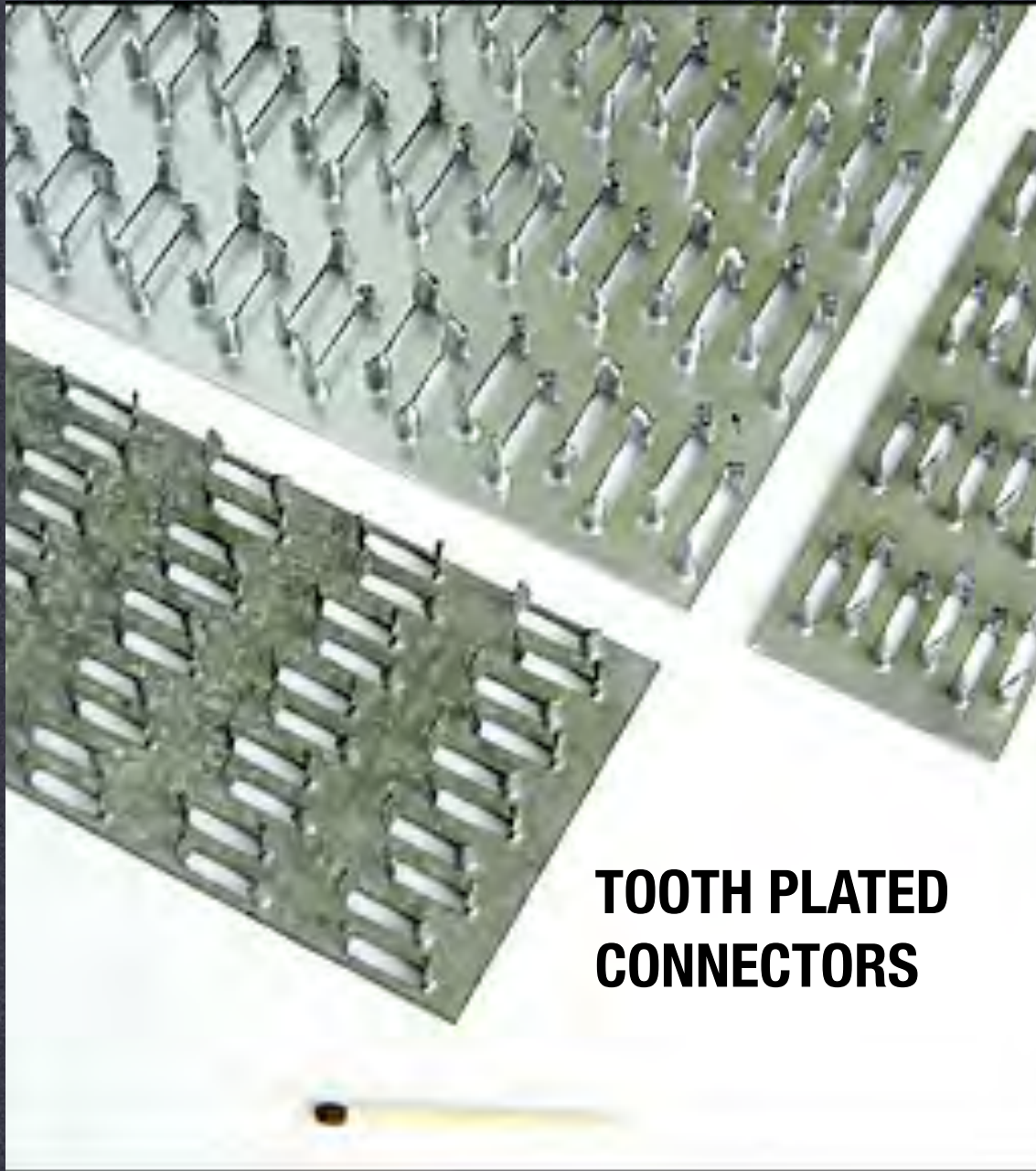
1. SCREWS COST MORE
2. SCREWS TAKE LONGER TO INSTALL
3. SCREWS CAN BE INSERTED WITH GREATER PRECISION
4. SCREWS CAN EXERT GREATER CLAMPING FORCE BETWEEN JOINED PIECES
5. SCREWS HAVE GREATER HOLDING POWER
6. SCREWS CAN BE BACKED OUT AND REINSERTED IF A COMPONENT NEEDS TO BE ADJUSTED OR REMOUNTED.

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wood fasteners - nails vs. screws

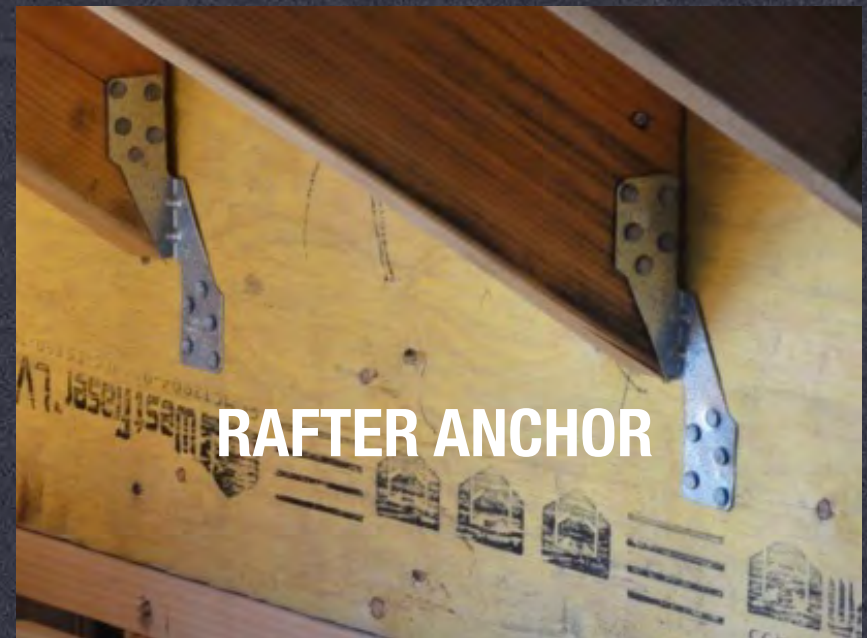
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**TOOTH PLATED
CONNECTORS**



JOIST HANGERS



RAFTER ANCHOR

WOOD

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wood fasteners + connectors

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prefabrication - trusses

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prefabrication - trusses and joists

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wrap up

WOOD'S VARIED PROPERTIES AND QUALITIES MAKE IT AMONG THE MOST POPULAR BUILDING MATERIALS IN MANY PARTS OF THE WORLD



- * strong and stiff
- * least dense structural material
- * easily worked and fastened
- * can be salvaged and reused
- * biodegradable
- * renewable resource (with well managed forests)