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learning community

arch 1140

professor Montgomery

autumn 2011



SUBJECT

WOOD

chapter 3

material characteristics and fabrication

DATE

AUTUMN 2011

PROFESSOR

MONTGOMERY



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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

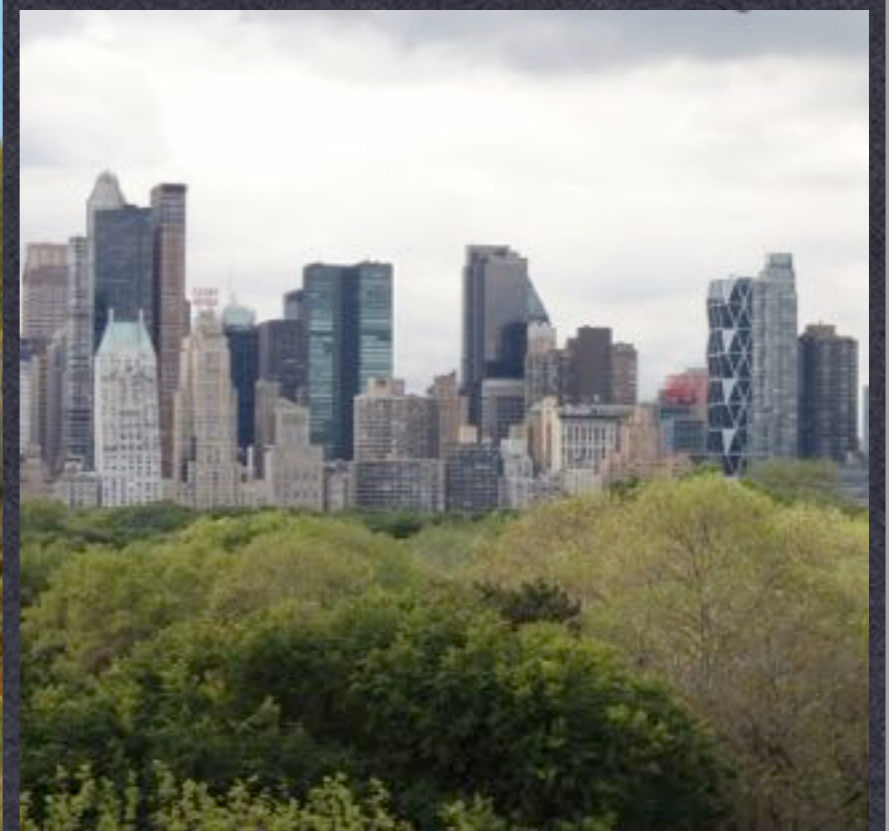


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wide variety of trees

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wide variety of trees

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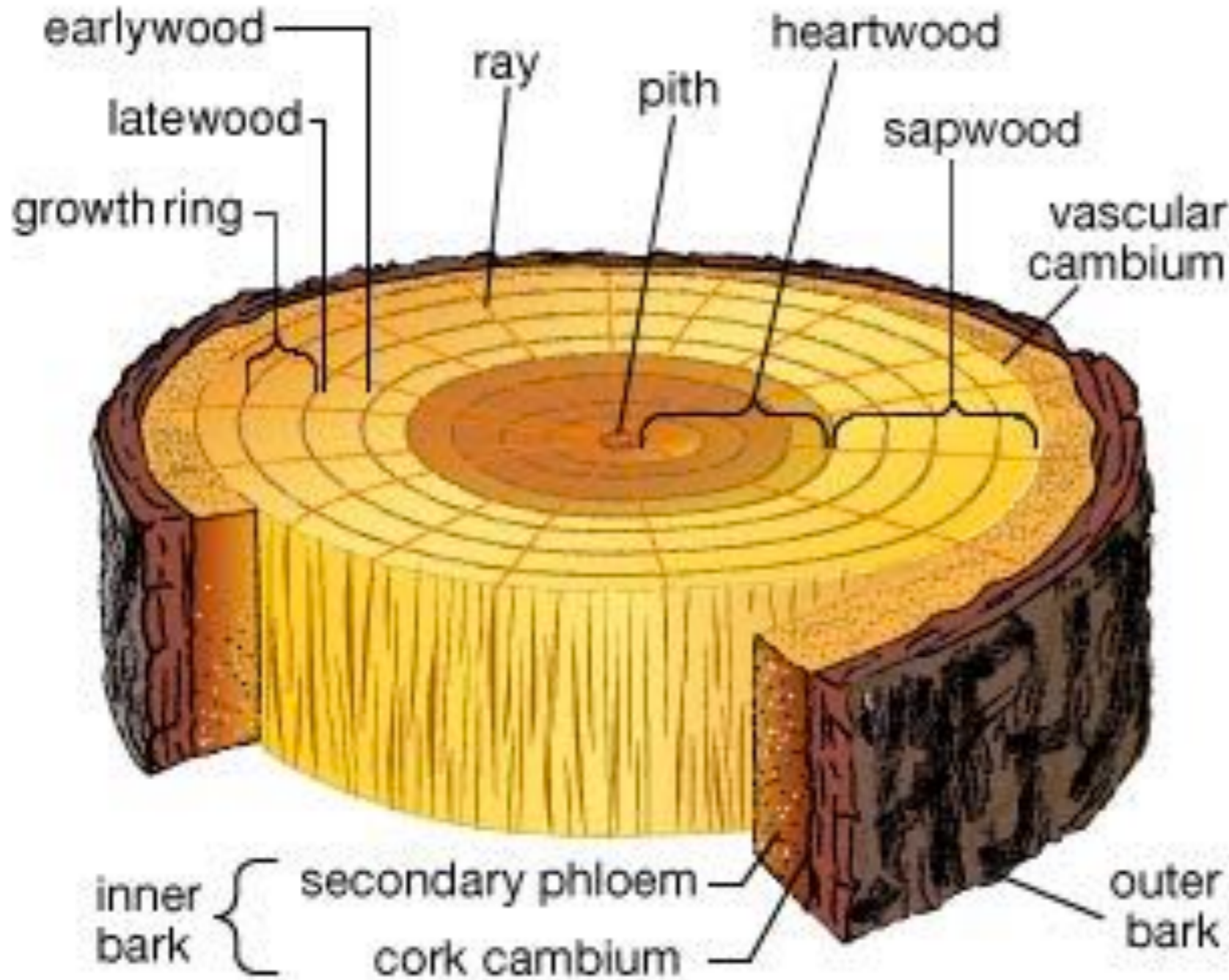


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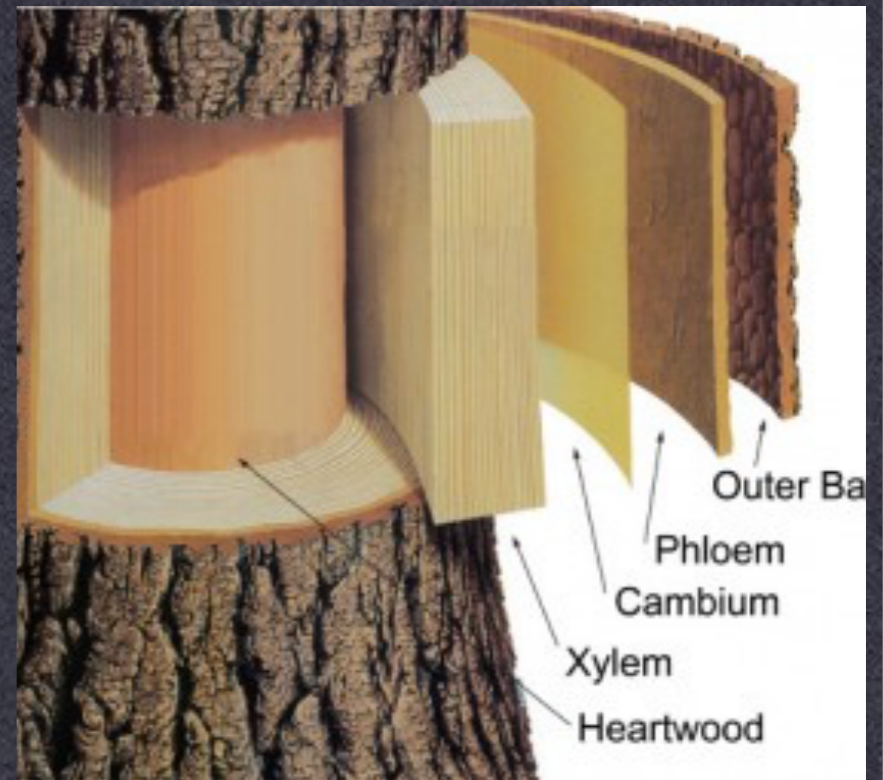
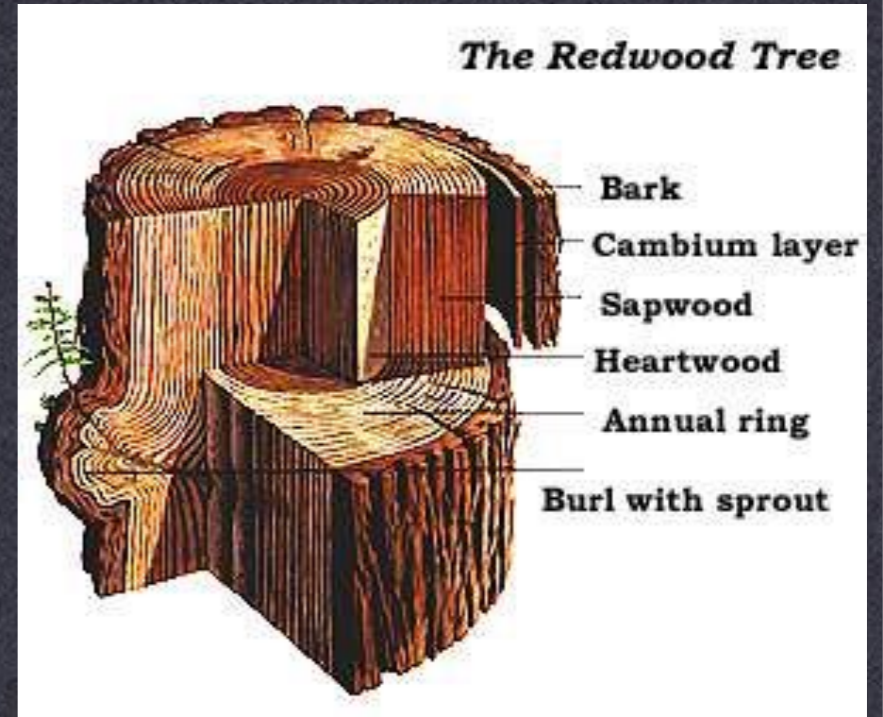
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wide variety of trees

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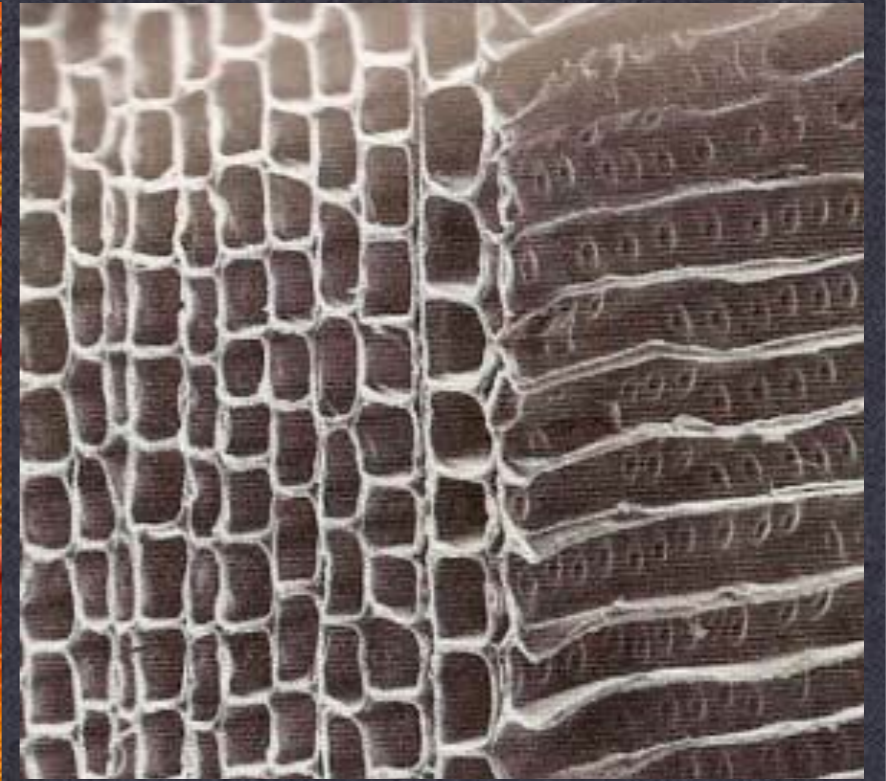
structure of trees

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**STRENGTH OF WOOD
FOLLOWS FROM ITS
CELLULAR STRUCTURE**

**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:

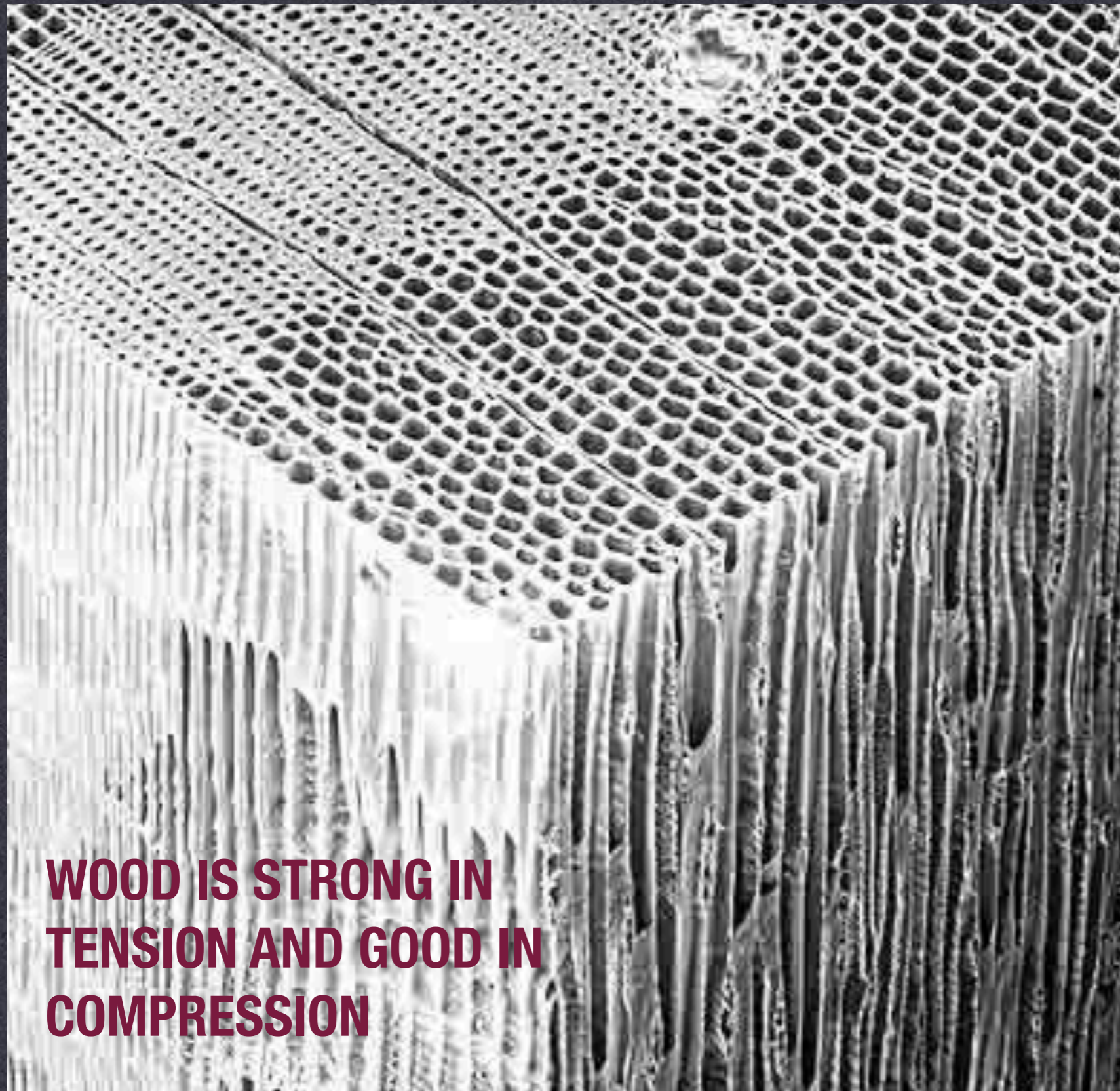
* Broadleaf Trees

WOOD

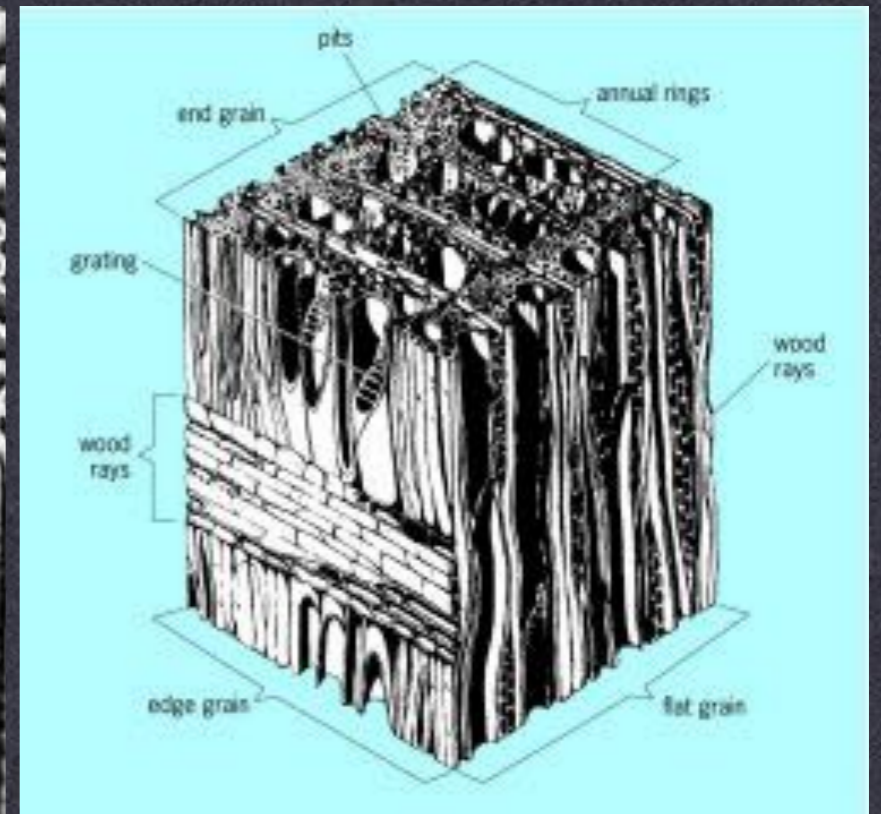
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softwoods and hardwoods

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WOOD IS STRONG IN TENSION AND GOOD IN COMPRESSION



✳ **Softwoods:**

✳ **Simple Structure**

✳ **Hardwoods:**

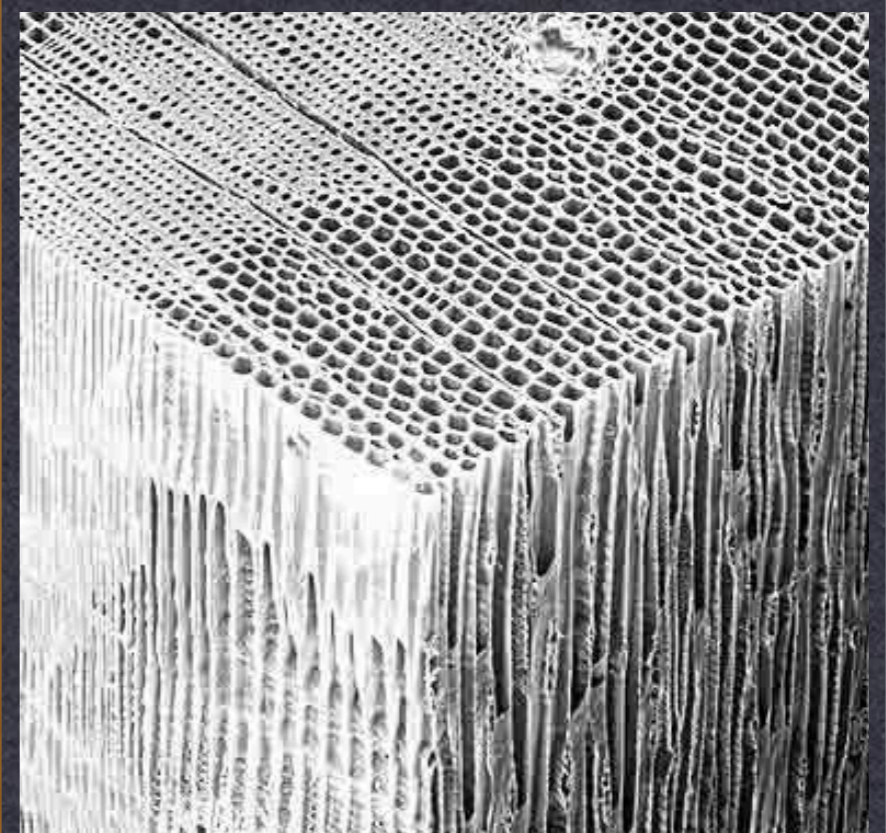
✳ **Complex Structure**

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softwoods and hardwoods

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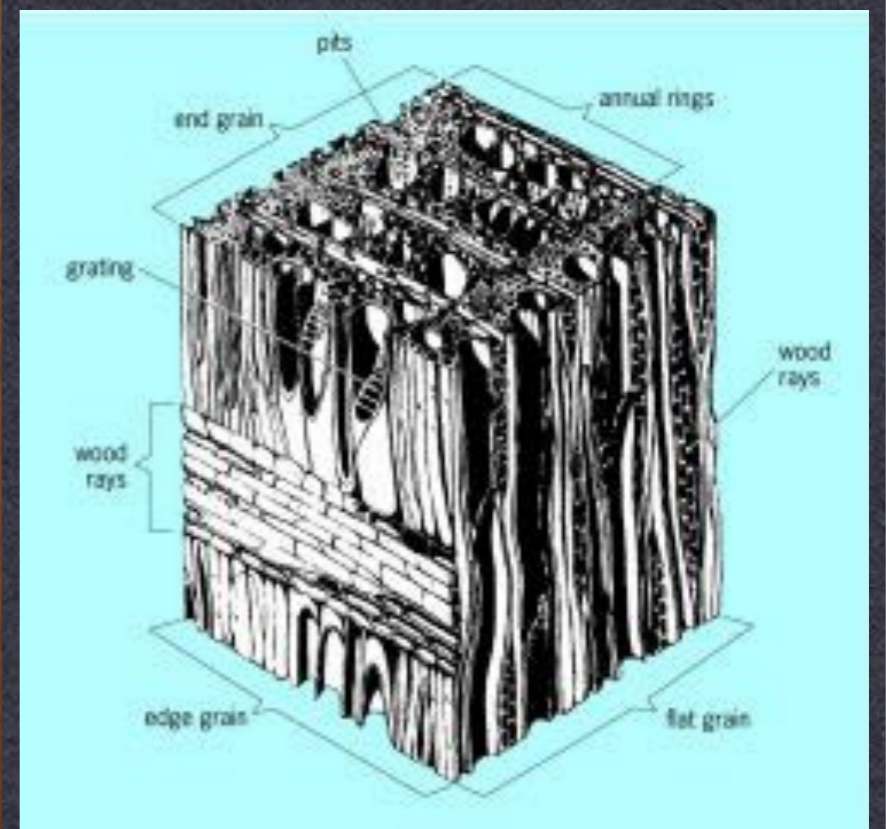


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softwood structure and grain pattern

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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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* maintain biodiversity and habitat

* selective harvesting

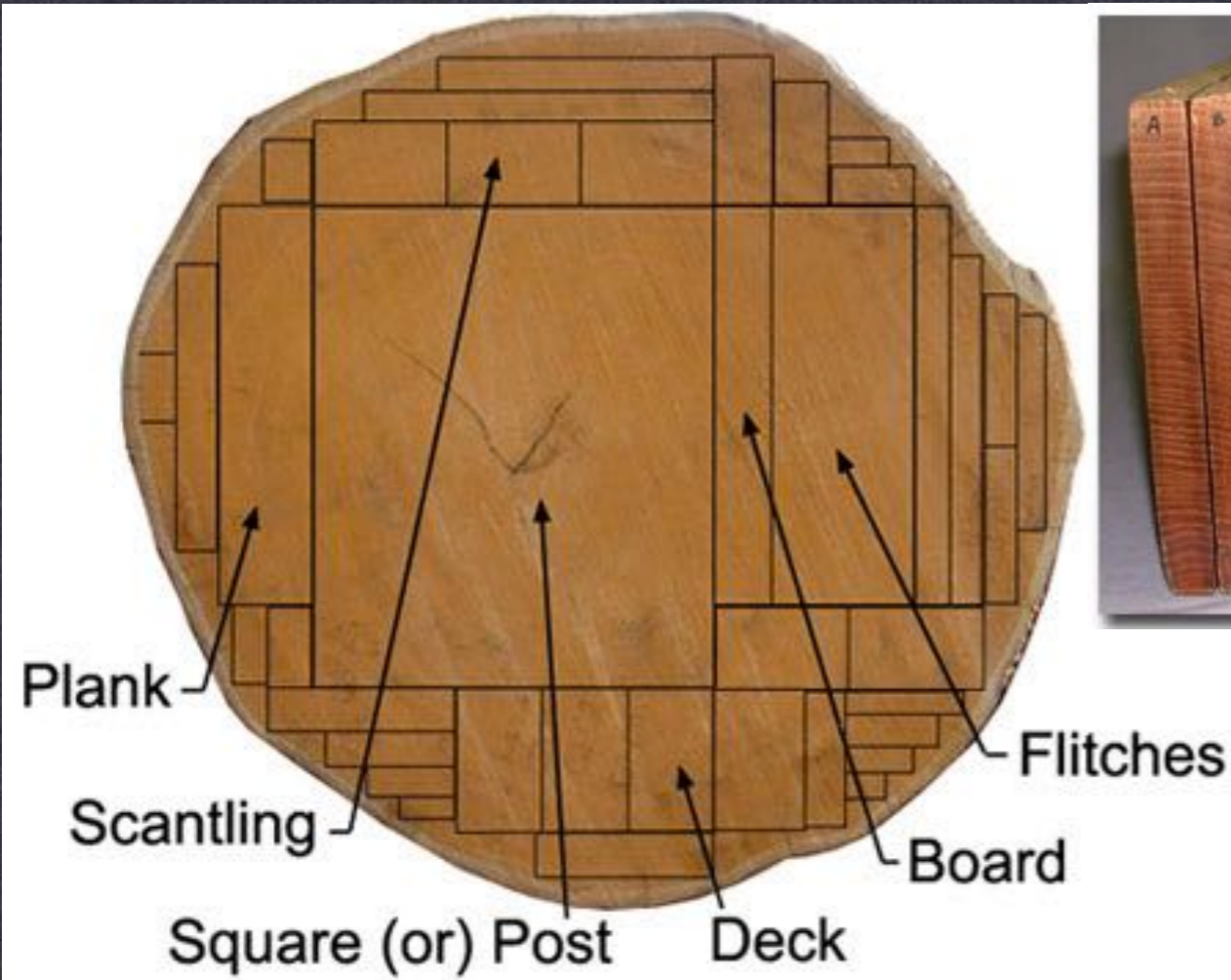
* confirm origin of wood products used in projects

WOOD

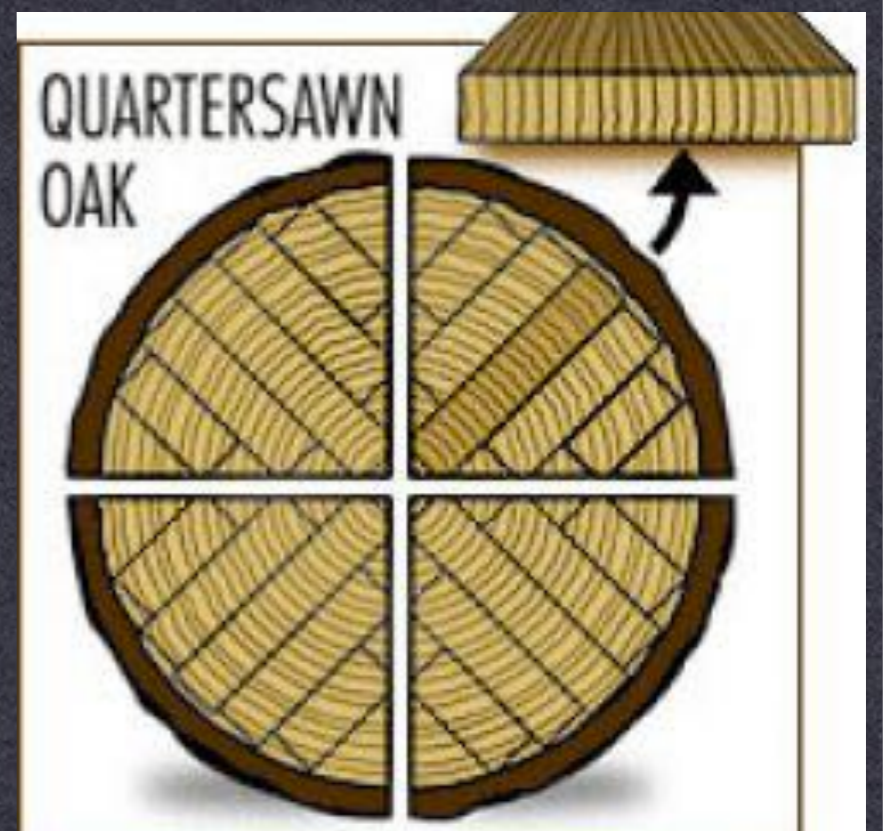
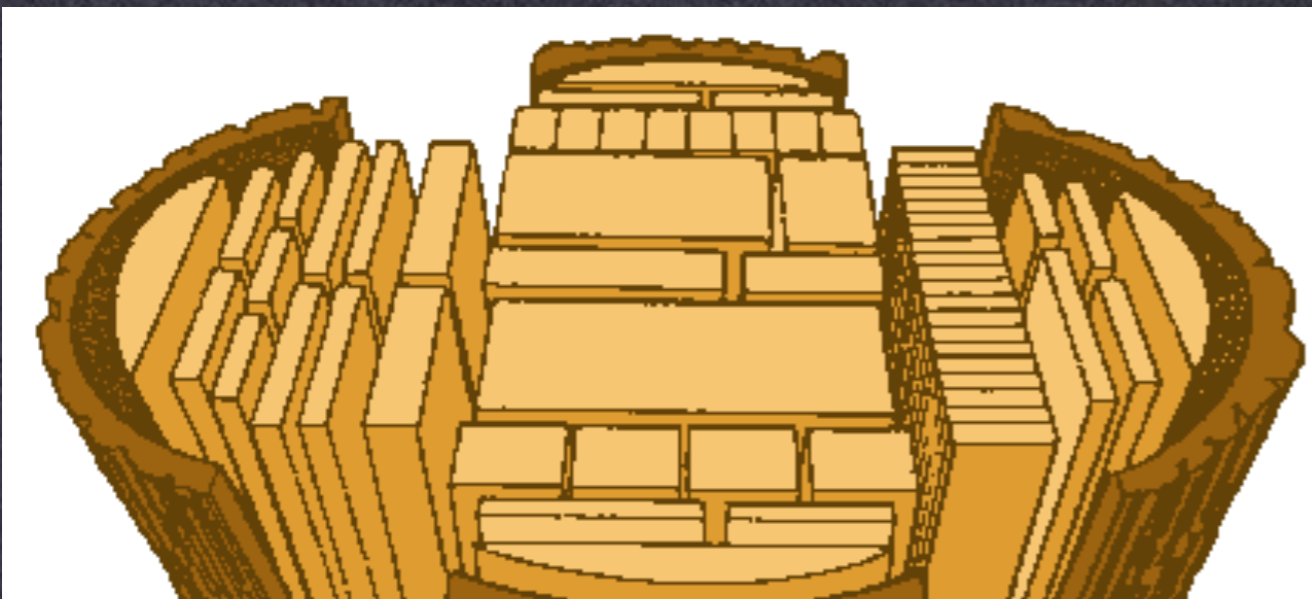
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FSC + forest stewardship council

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Plainsawn Log

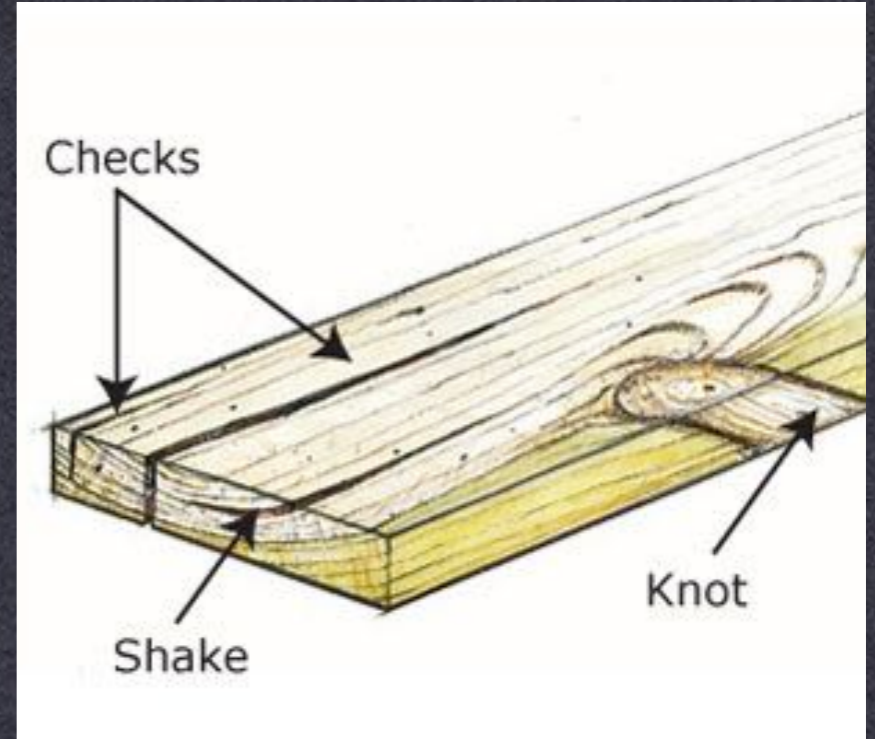
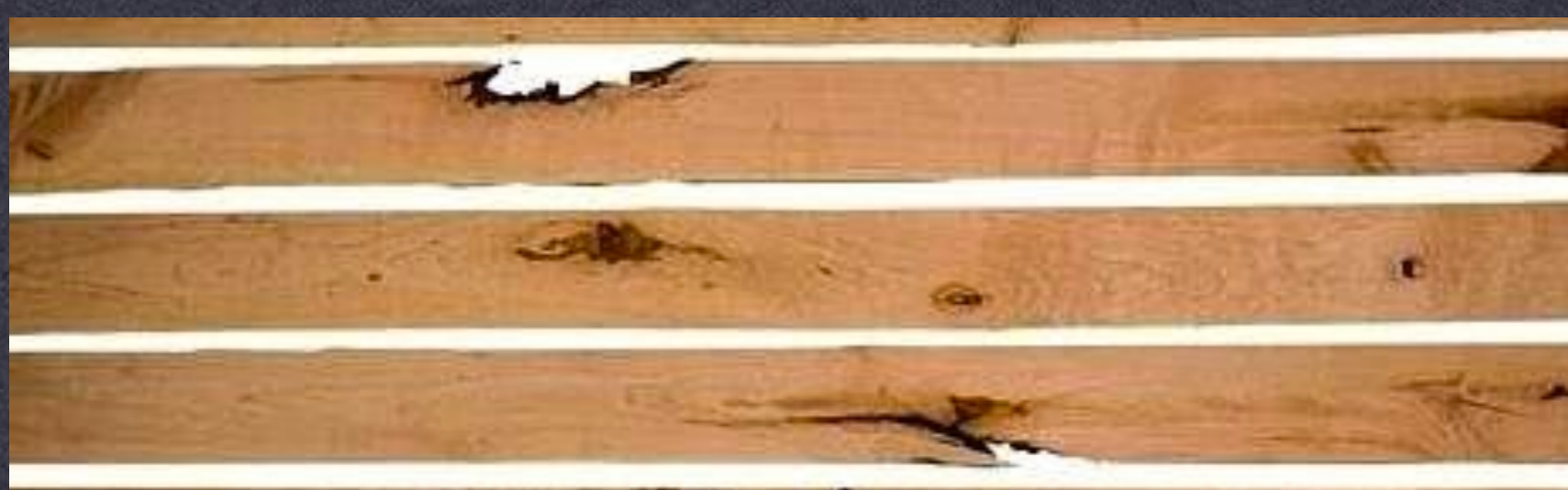
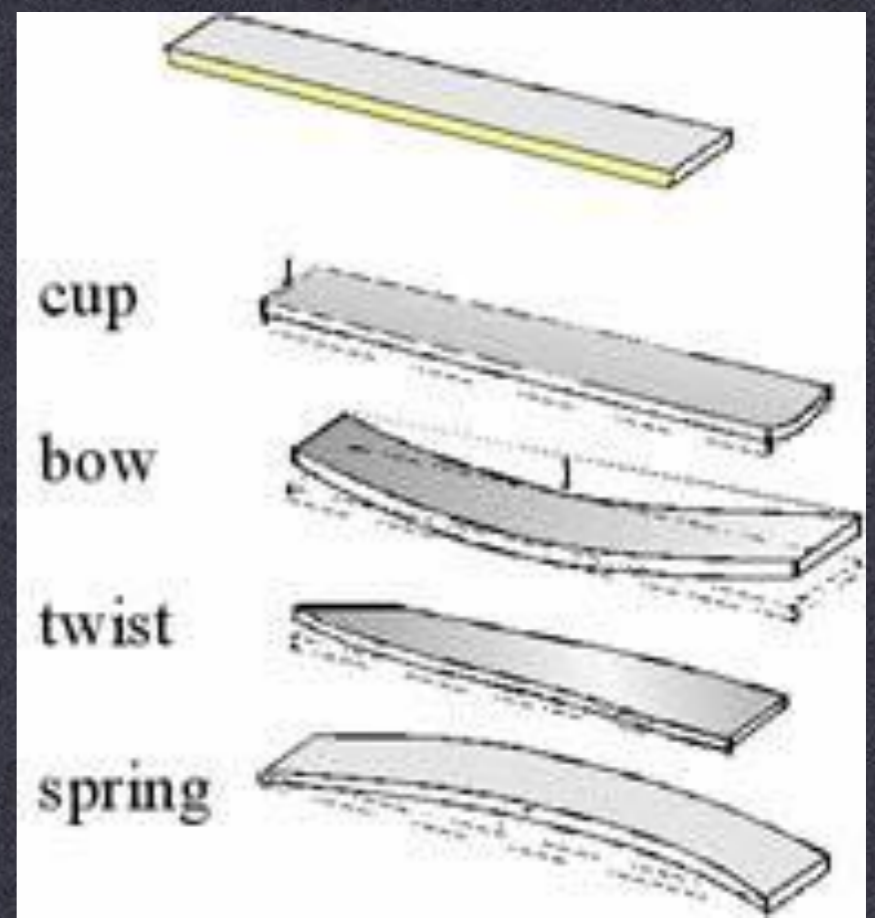
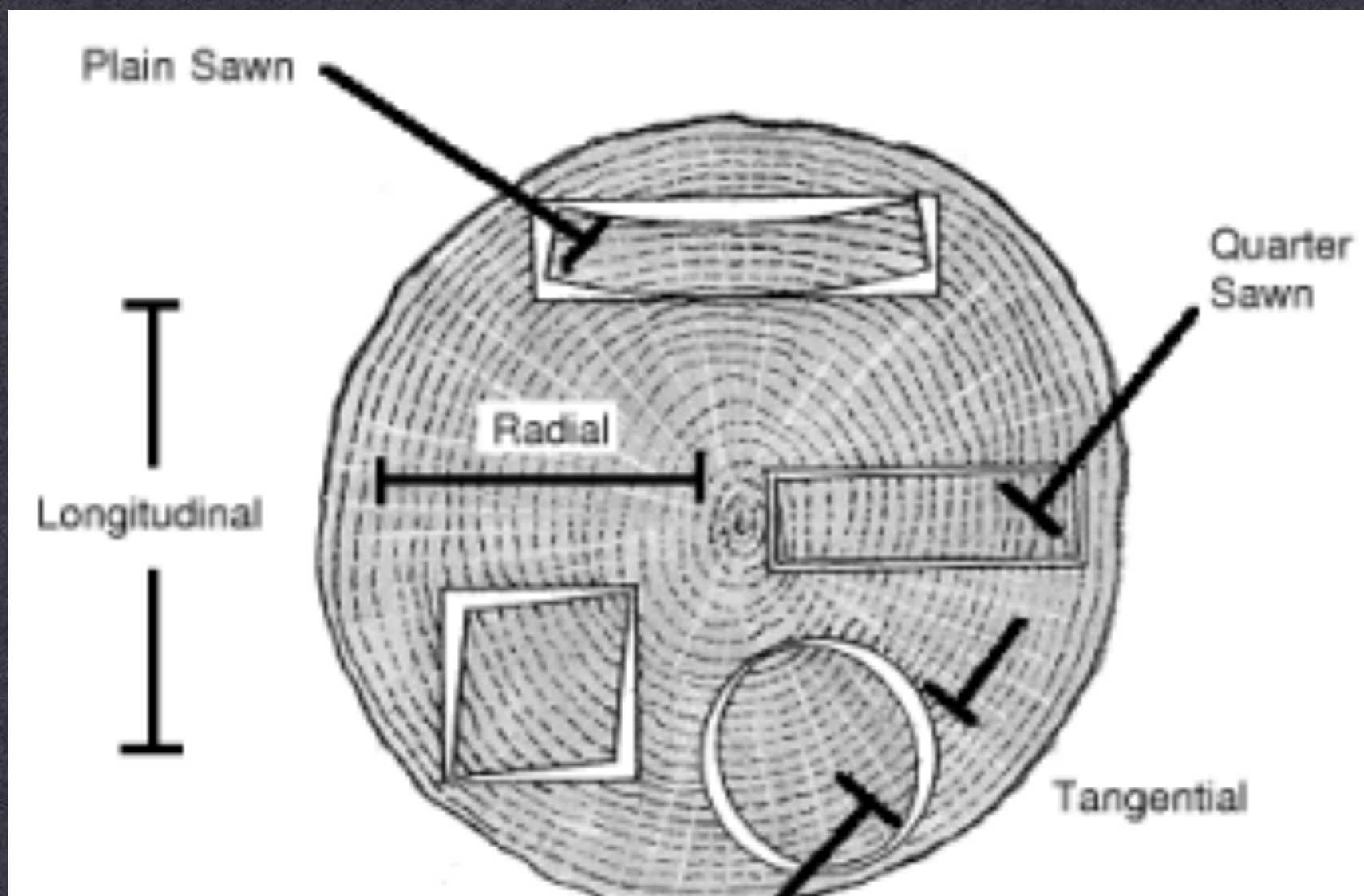


LUMBER

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sawing logs

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LUMBER

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defects

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LUMBER

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sawing logs

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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.”)

(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)

(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.)

KD-HT
Stud
 SPFs

000



(4) ALS Supervisory Agency

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

(3) Species or Species Grouping

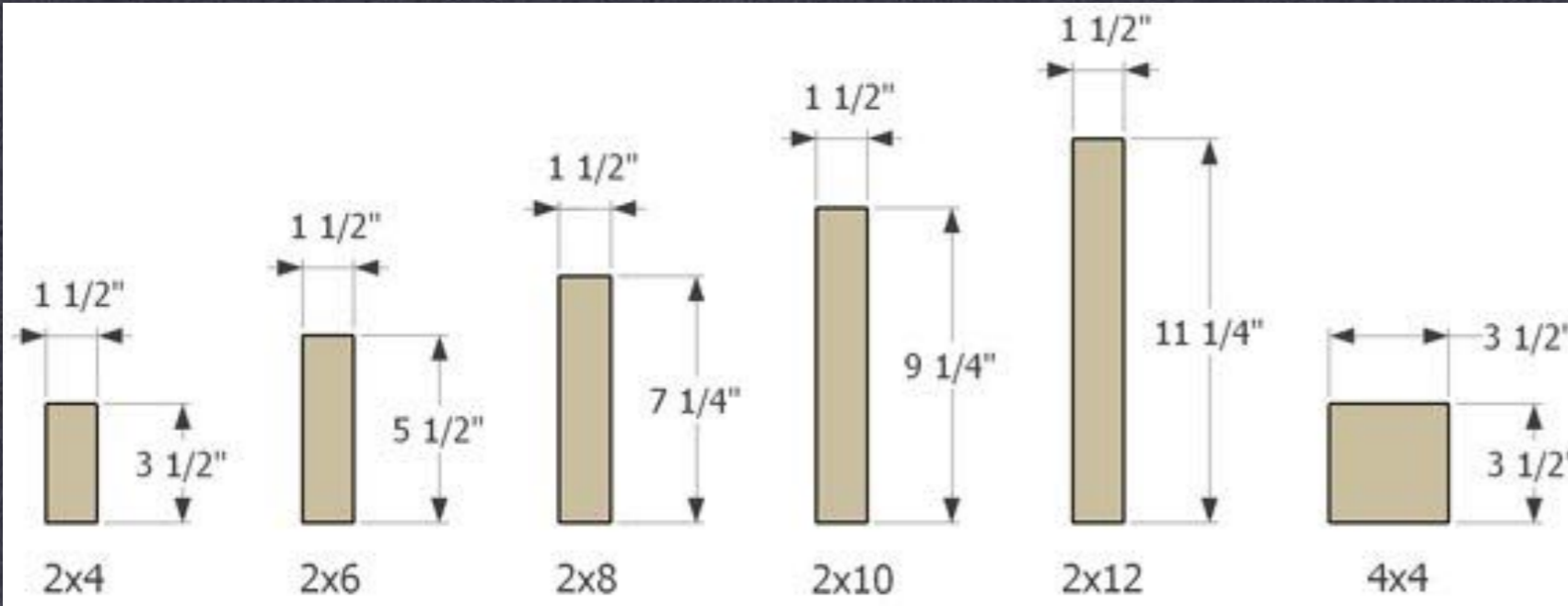
The species or species group of the product is indicated by its officially recognized name or abbreviation. In this example, SPFs = Spruce-Pine-Fir (south). (See the full list of Northeastern Species and Species Groups in Section 1 of the “Standard Grading Rules for Northeastern Lumber.”)

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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

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LUMBER

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manufactured wood products

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* **GLUE LAMINATED
WOOD**

* **STRUCTURAL
COMPOSITE LUMBER**

* **LAMINATED
STRAND LUMBER**

* **ORIENTED
STRAND LUMBER**

* **LAMINATED
VENEER LUMBER**

LUMBER

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manufactured wood products

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wood panel products

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*ORIENTED STRAND BOARD

*PARTICLE BOARD

*FIBERBOARD

*MDF

*VENEER PLYWOOD

*MEDIUM DENSITY OVERLAY



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wood panel products

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<p>APA THE ENGINEERED WOOD ASSOCIATION</p>		<p>APA THE ENGINEERED WOOD ASSOCIATION</p>		<p>APA THE ENGINEERED WOOD ASSOCIATION</p>	
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	16 oc 11/32 INCH — 6
3	SIZED FOR SPACING	3	SIZED FOR SPACING	3	GROUP 1 — 10
4	T&G NET WIDTH 47-1/2	4	EXPOSURE 1	4	EXTERIOR
5	EXPOSURE 1	5	000 — 7	5	000 — 7
6	— 7	6	PS 2-04 SHEATHING	6	PS 1-07 PRP-100
7	PS 1-07 UNDERLAYMENT	7	PRP-100 HUD-UM-40 — 11	7	PRP-100 HUD-UM-40 — 11
8	PRP-100 — 8	8	CONSTRUCTION SHEATHING — 12	8	PRP-100 HUD-UM-40 — 11
		9		9	
		10		10	
		11		11	
		12		12	
		13	2R48/2F24	13	
		14	18mm	14	
		15	CSA 0325	15	
			STRENGTH AXIS THIS DIRECTION		

1	Panel grade	7	Mill number	13	Panel mark – Rating and end-use designation per the Canadian standard
2	Span Rating	8	APA's performance rated panel standard	14	Canadian performance rated panel standard
3	Tongue-and-groove	9	Siding face grade	15	Panel face orientation indicator
4	Bond classification	10	Species group number		
5	Product Standard	11	HUD recognition		
6	Thickness	12	Panel grade, Canadian standard		



LUMBER

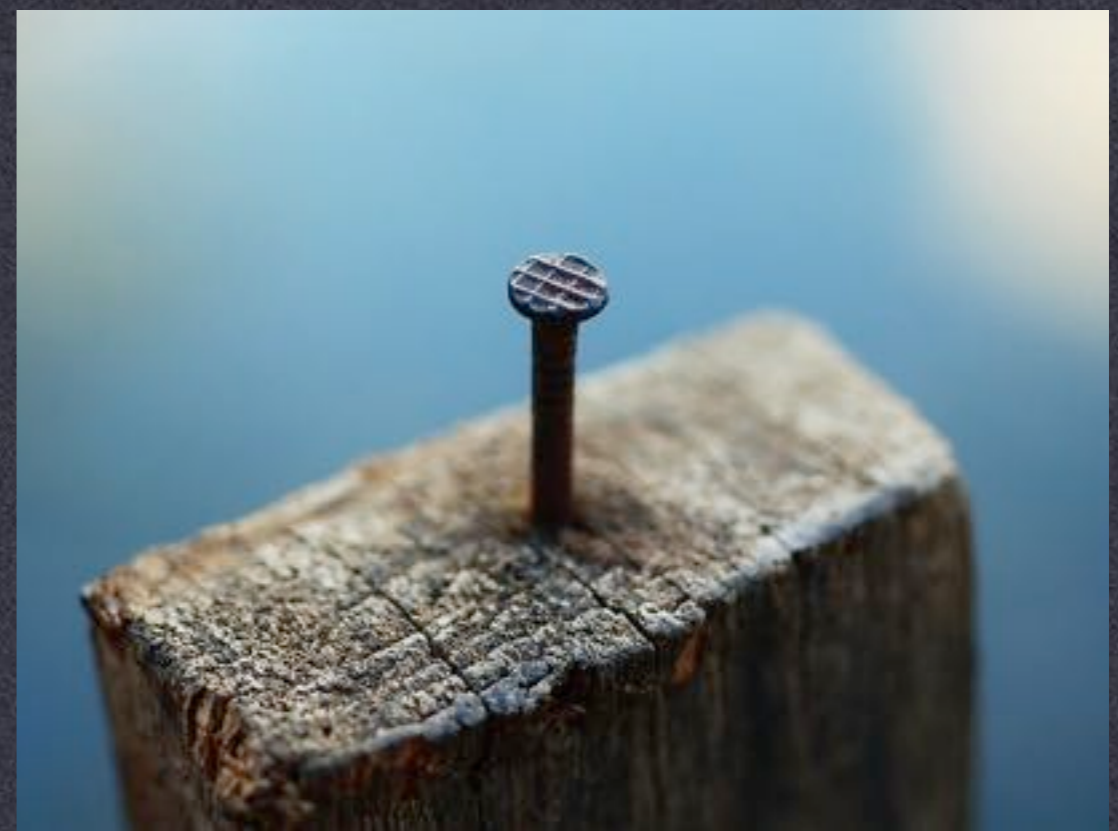
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wood panel products

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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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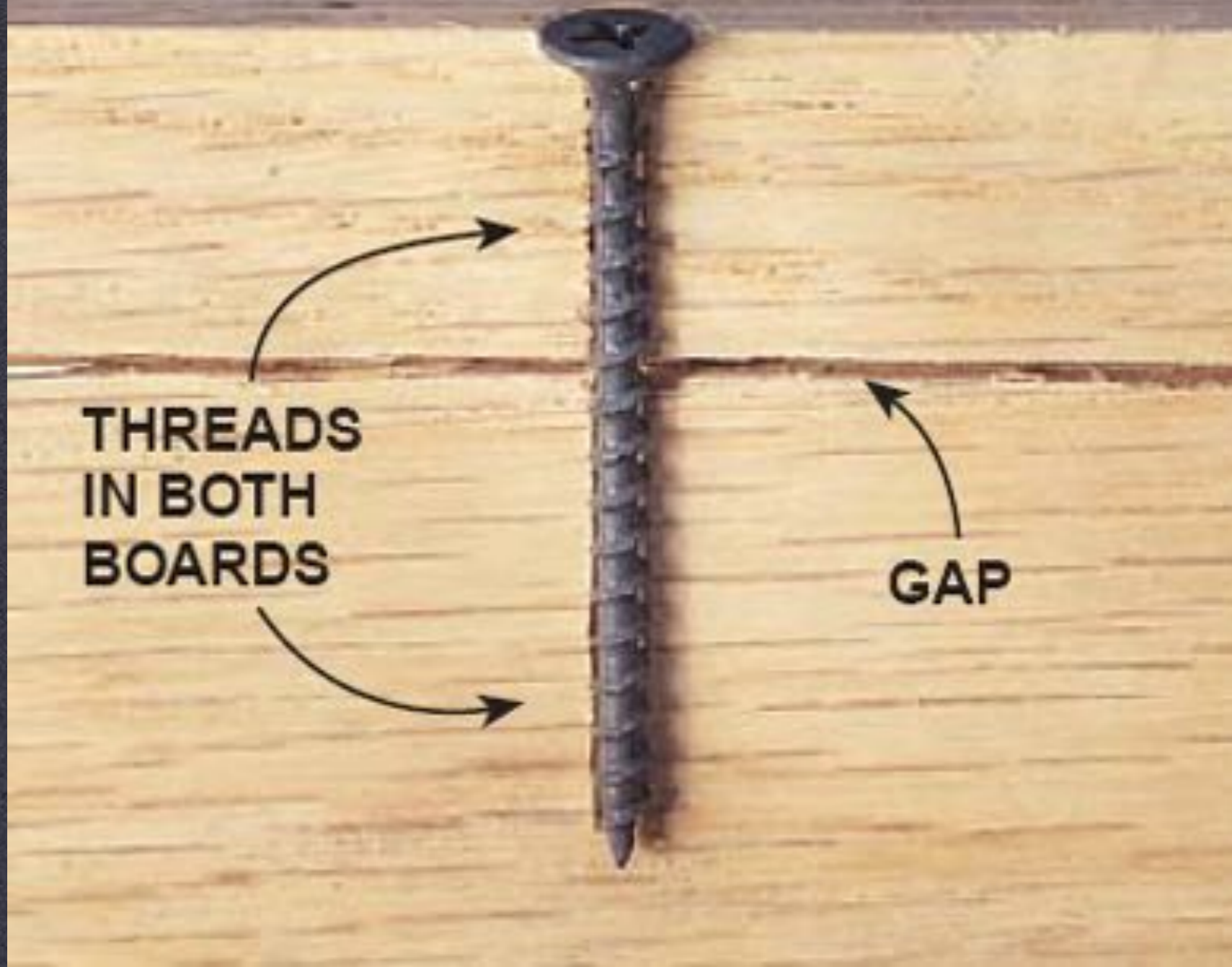
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wood fasteners + tools

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DRYWALL SCREW

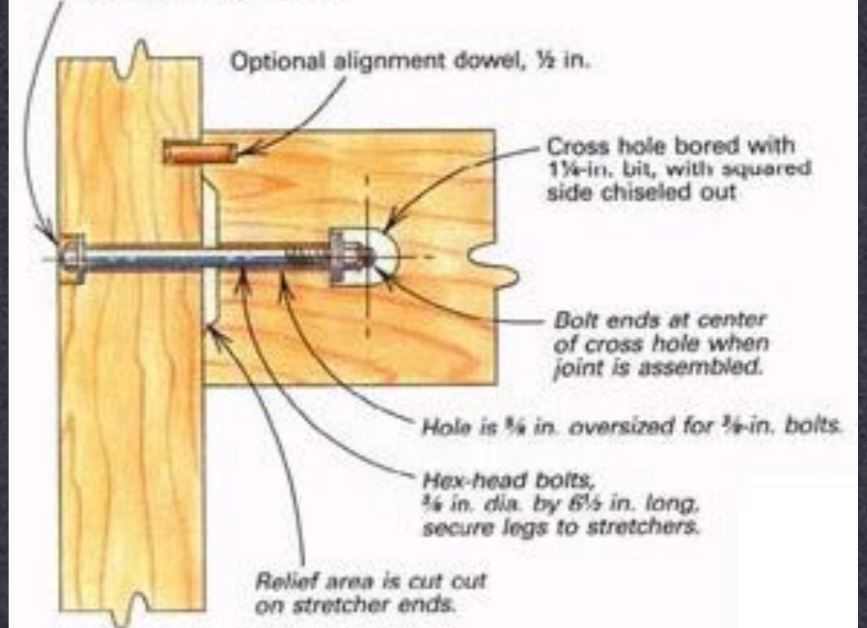


WOOD SCREW



Joinery detail

Countersunk hole, 1 in. dia. by 1/2 in. deep, for bolt head and washer.

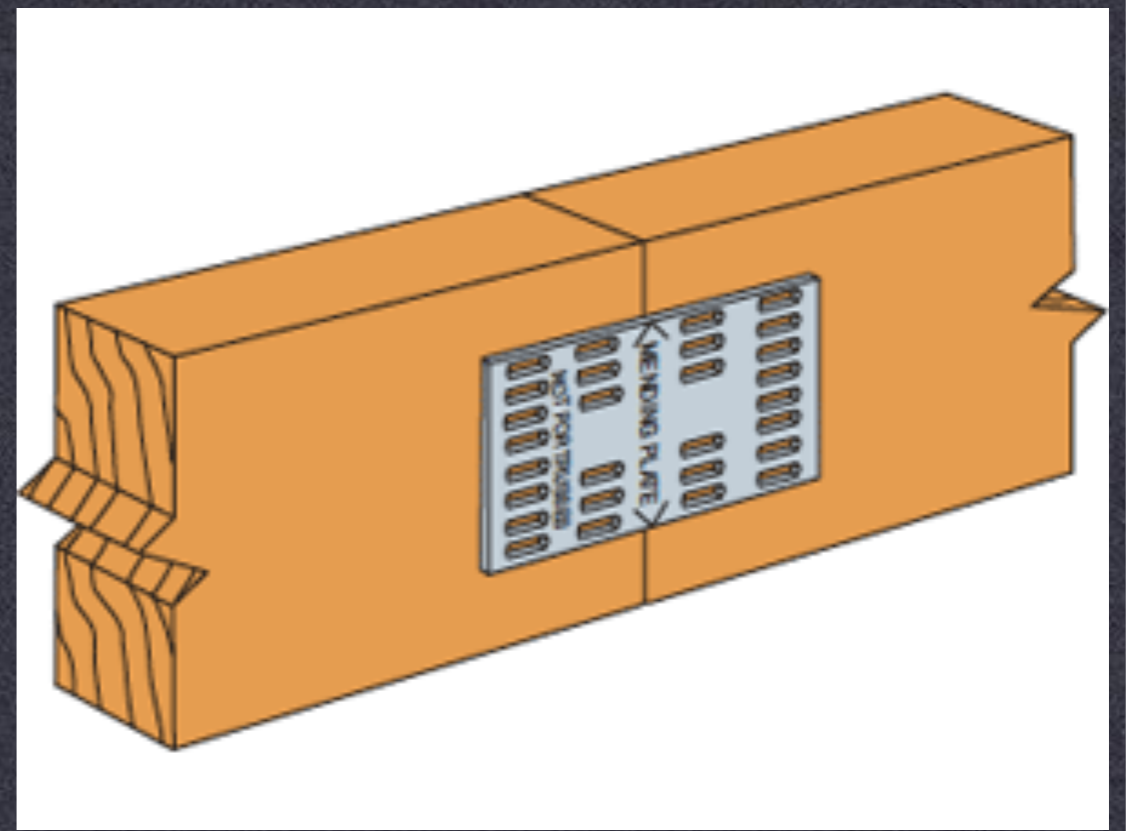
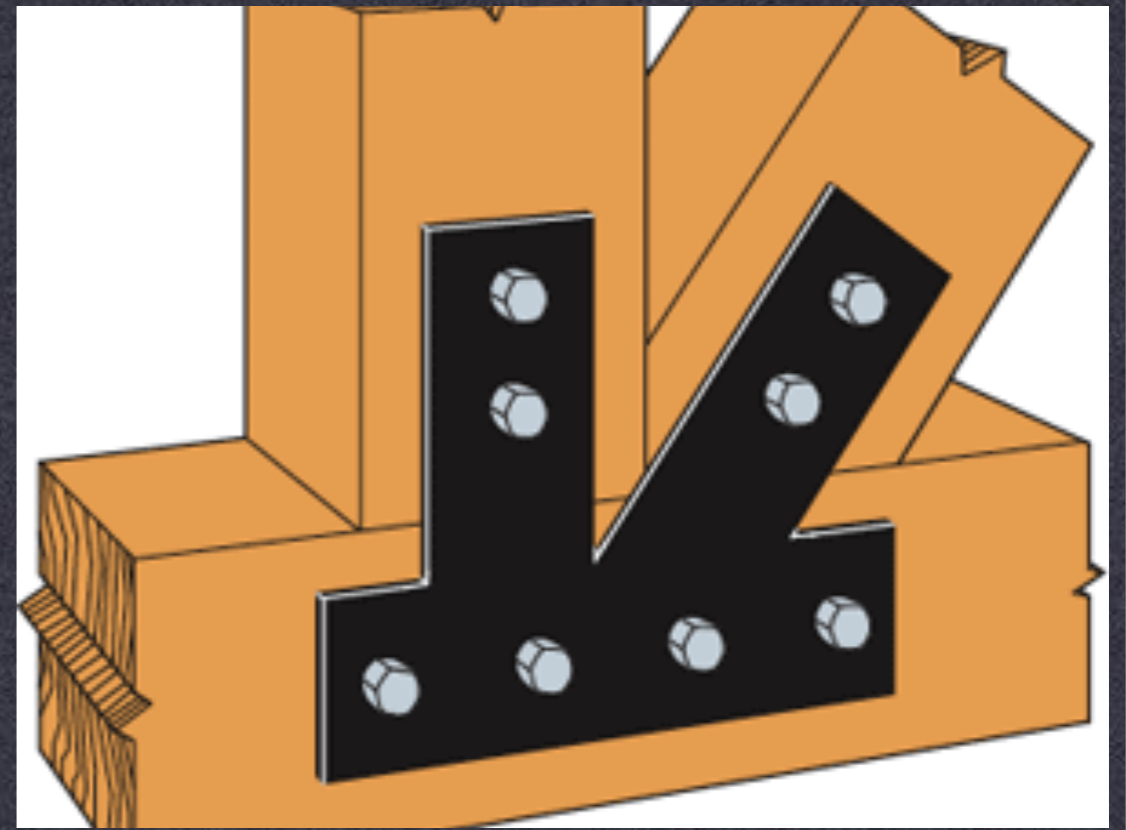
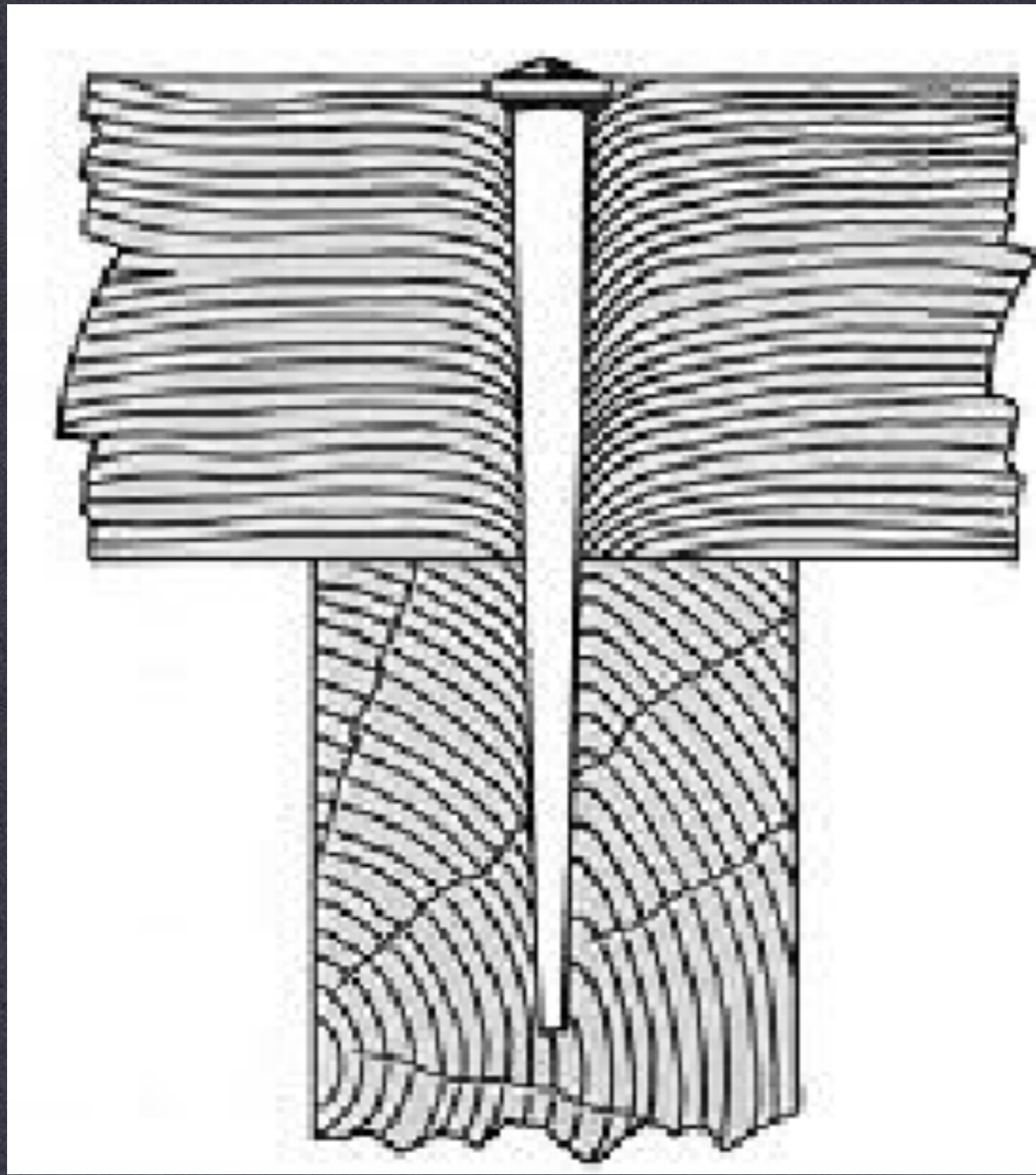


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wood fasteners - screws + bolts

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wood fasteners + connectors

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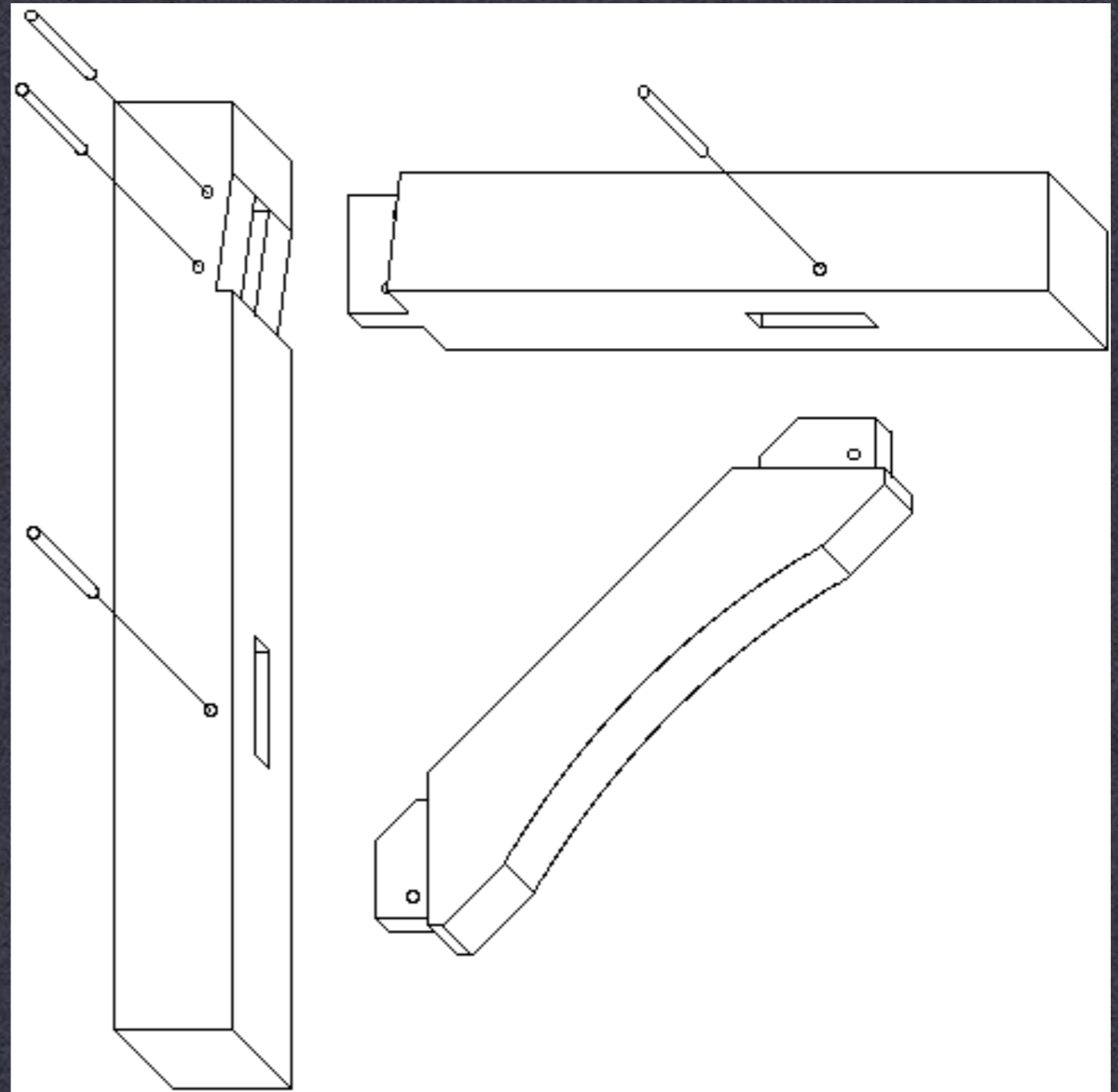


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traditional joinery

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traditional joinery

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prefabrication - trusses

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WOOD

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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)