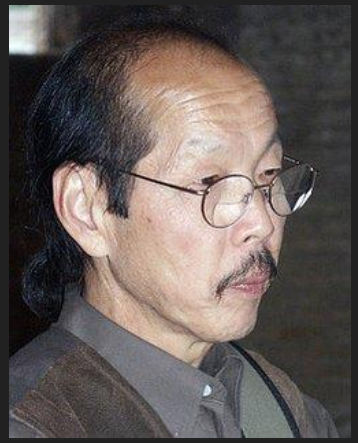
Team 1

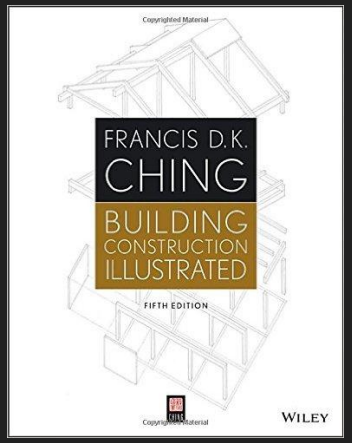
By: Randy Rivas, Bernardo Flores, Fernando Rivera, Sunny Mei, and Byron Pacheco.

-Materials

- Wood Joists

- Wood





Material

Three distinct properties

-Strength

- Elasticity: the ability of a material to deform under stress, bend, stretch, or compress, and go back to normal when stress is released.

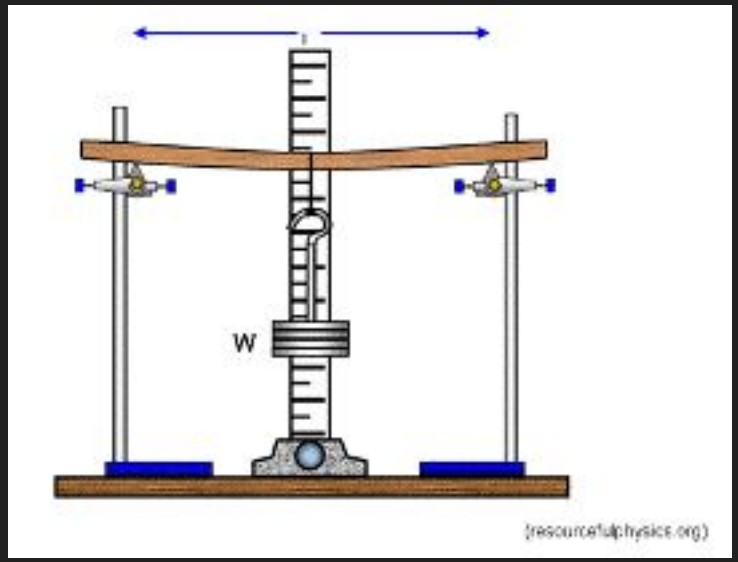
- Stiffness: is the measure of the extent of which an elastic body resists deformation. Dependant on structural shape.

Elasticity + stiffness are most effective structure materials

- Every material has a elasticity limit, once past that the material will be permanently deformed or brake. Ex: when a balloon is overinflated then released, it goes back to a bigger cripple shape than it originally was.

Examples of Elasticity

Example of Stiffness



Life cycle assesment

consequences associated with their selection and use. This examination, called a life-cycle assessment, encompasses the extraction and processing of raw materials, the manufacturing, packaging, and transportation of the finished product to the point of use, maintaining the material in use, the possible recycling and reuse of the material, and its final disposal. This assessment process consists of three components: inputs, life-cycle inventory, and outputs.

during the life cycle of a material.

- Refer to the *Environmental Resource Guide*, a project of the American Institute of Architects, for more information.

	Btu/lb
Sand & gravel	1
Wood	18
Lightweight concrete	94
Gypsum board	183
Brickwork	220
Cement	410
Glass	11,100
Plastic	18,500
Steel	19,200
Lead	25,900
Copper	29,600
Aluminum	103,500

*1 Btu/lb = 2.326 kJ/kg

Inputs

- Raw materials
- Energy
- Water

Acquisition of Raw Materials

- What impact does the extraction, mining, or harvesting process have on health and the environment?
- Is the material renewable or nonrenewable?
- Nonrenewable resources include metals and other minerals.
- Renewable resources, such as timber, vary in their rate of renewal; their rate of harvest should not exceed their rate of growth.

Processing, Manufacturing, and Packaging

- How much energy and water is required to process, manufacture, and package the material or product?

Transportation and Distribution

- Is the material or product available regionally or locally, or does it have to be shipped a long distance?

Construction, Use, and Maintenance

- Does the material perform its intended function efficiently and effectively?
- How does the material affect the indoor air quality and energy consumption of a building?
- How durable is the material or product and how much maintenance is required for its upkeep?
- What is the material's useful life?

Disposal, Recycling, and Reuse

- Usable products
  +
- How much waste and how many toxic by-products result from the manufacture and use of the material o product?

Outputs

- Waterborne effluents
- Atmospheric emissions
- Solid wastes
- Other environmental releases

Life-Cycle Inventory

Evaluating the choice of a building material is a complex matter that cannot be reduced to a simple formula yielding a precise and valid answer with certainty. For example, using less of a material with a high energy content may be more effective in conserving energy and resources than using more of a lower-energy material. Using a higher-energy material that will last longer and require less maintenance, or one that can be recycled and reused, may be more compelling

Reduce, reuse, and recycle best summarize the kinds of strategies that are effective in achieving the goal of sustainability.

- Reduce building size through more efficient layout and use of spaces.
- Reduce construction waste. LEED® MR Credit 2: Construction Waste Management
- Specify products that use raw materials more efficiently. LEED MR Credit 5: Regional Materials
- Substitute plentiful resources for scarce resources. LEED MR Credit 6: Rapidly Renewable Materials
- Reuse building materials from demolished buildings. LEED MR Credit 3: Materials Reuse
- Rehabilitate existing buildings for new uses. LEED MR Credit 1: Building Reuse

Wood

- Knots are hard nodes of wood that occur where branches join the trunk of a tree, appearing as circular, cross grained masses in a piece of sawn lumber.
- Shakes are separations along the grain of a wood piece, usually between the annual rings, caused by stresses on a tree starting or during falling
- Pitch Pockets are well defined between the annual rings of a softwood
- Check are lengthwise separations of wood across the annual rings
- Wane is the presence of bark or absence of wood at a corner or along an edge of a piece

Lumber

- Yard Lumber: Softwood lumber intended for general building purposes.
- Factory and shop Lumber: Sawn or selected primarily for further manufacture into doors, windows, and millwork.
- Lumber is specified by species and grade. Each piece of lumber is graded for structural strength and appearance

Types of Yard Lumber

Boards - Graded for their appearance rather than their strength; Used for: siding, subflooring, and interior.

Dimension Lumber - Graded for their strength rather than their appearance; Used for: Joists, planks, light framing, decking.

Timbers - Graded for their strength and serviceability, often stocked in green, undressed condition.

Structural Lumber - Dimension Lumber or Timber graded by their visual inspection or machine inspection on the basis of their strength and their intended use; Used for: Beams, stringers, posts, and timber

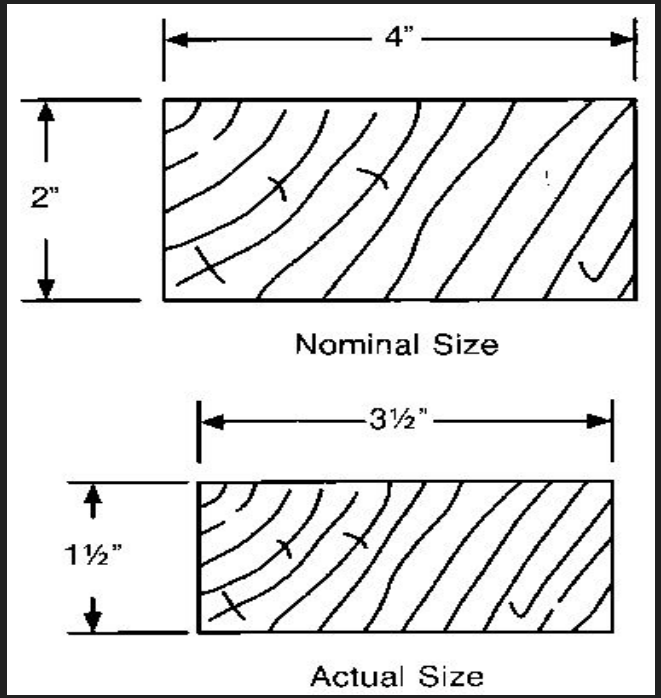
Lumber Criteria

- Wood Species - Ex: Douglas Fir, Southern Pine, Hemlock Fir, Pine, Fir, etc.
- Grade - Scale of a lumber’s structural strength and appearance.
- Visual inspection - Structural Lumber is graded visually by trained inspectors based on the quality reducing features that affect the strength, appearance, or utility.
- Machine inspection - Structural Lumber may be tested by a machine that bends the lumber to test the elasticity of the wood, in order to electronically assign an appropriate stress grade; As well as taking into account the effects of knots, slope grain, density, and moisture content of the the lumber.

Reading a grademark

- Mill Origin
- Moisture Content
- Seasoning
- Stress Grade
- Species

Moisture Content



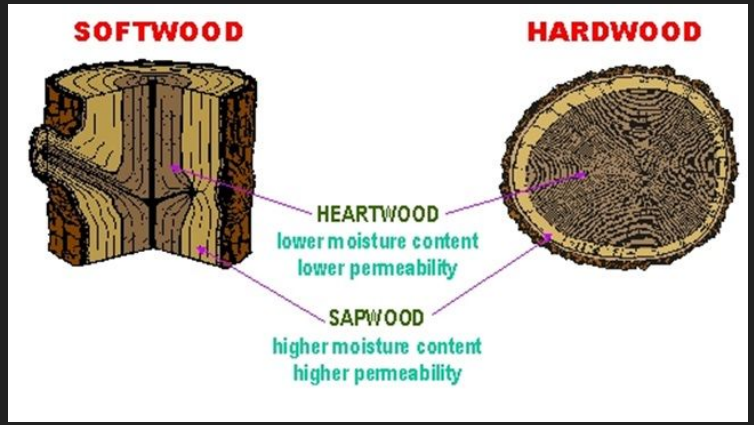
Wood:12.11-12.12

- According to Ching, there are two types of major wood: softwood and hardwood.
- The difference between hardwoods and softwoods are that of pores. Hardwoods have a variety of pores of that in size and shape. The pores allow water to travel from the roots to nourish the wood. This also contributes to a hardwood's grain pattern. The hardwood's structure also makes it more thick and allows it to be more resistant to fire.
- Softwoods have a very unique system than that of its counterpart, which consist of straight, linear tubes (tracheids, not pores), which transport water and produce sap and provide strength to the stem.

Softwood v. Hardwood

Here are some examples and descriptions of softwood and hardwood

Softwood	Hardwood
Wide sapwood band	Narrow sapwood
Usually softer	Usually harder
Usually lighter when dried	Usually stronger
Heartwood seldom, or rarely durable	Heartwood is very durable
Generally cheaper in price, may be used for timber, paper, and even Christmas trees	Provide durability for construction projects, hardflooring, and even high quality furniture.
Examples may be: pine, fir, hemlock, and spruce.	Examples may be; broad-leaved flowering tree such as: cherry, maple or oak.



Brief Description of Softwood and Hardwood

Wood Panel Product

Wood panels are less like to shrink or swell up.
It is less work to install, it is a more efficient use of wood than solid wood.

Plywood-Created by bonding veneers together with heat and pressure. Usually contains grains of adjacent plies at right angles.

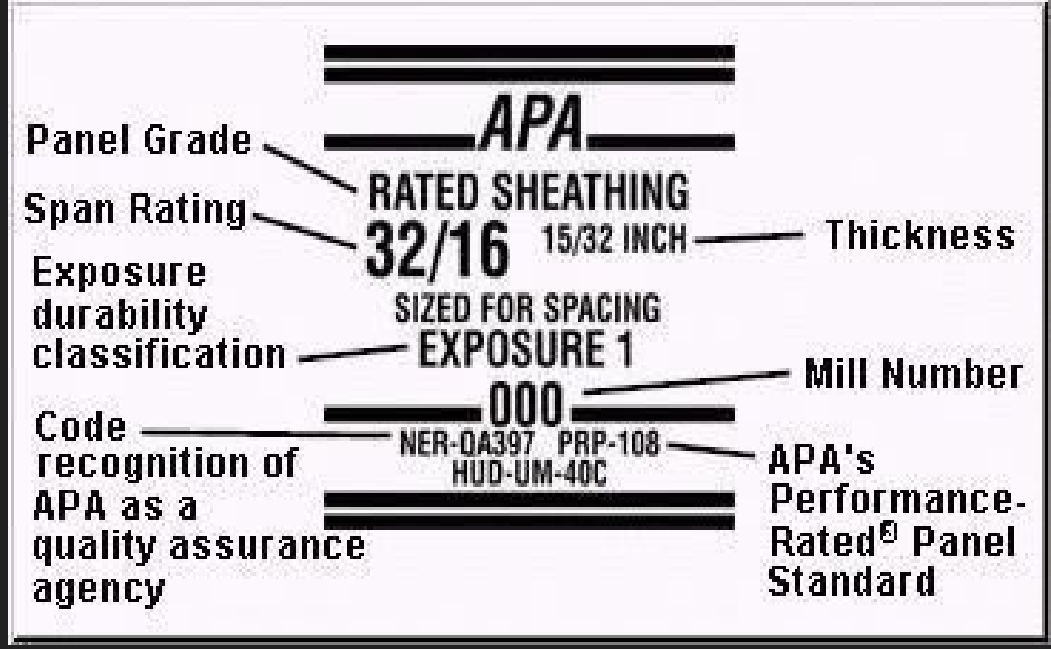
Grade Stomp= It is the trademark of APA (American Plywood Association). It is a stamp on the back of the wood panel to identify the panels garde, thickness, span rating, exposure durability classification, mill number and the National Research Board (NRB).

Exposure Durability is a classification of a wood panel product according to ts ability to withstand exposure to weather or moisture without weakening. There are two different types of Exposures. Exposure 1 and Exposure 2.

Exposure 1= Structural wood panel that has glue line on the exterior for repeating wetting.

Exposure 2= Structural wood panel that has intermediate glue line for minimal wetting.

Plywood



Grade Stomp

High Density Overlay=Exterior Wood Panel has a resin fiber overlay on both sides providing smooth, hard, abrasion surface, used for concrete forms, cabinets and counter parts.

Medium Density Overlay=Exterior Wood Panel which has phenolic or melamine resin overlay on one or both sides providing a smooth base for painting.

Particleboard=Created by bonding small wood particles under heat and pressure. It is used for coe materials for decorative panels and cabinet work, and as underlayment for floors.

Oriented Strand Board=It is commonly used for sheathing an as subflooring. Created by bonding layers long, thin wood strands under heat and pressure using a waterproof adhesive.

Waferboard=Composed of large, thin wood flakes bonded under heat and pressure with a waterproof adhesive.

Sources

- **Ching, Francis D.K“*Building Construction Illustrated,*” Wiley: Fifth Edition**
- **Hardwood vs Softwood Timber. May 14, 2015 http://www.buyqldtimber.com.au/news-3/Hardwood-vs-Softwood-Timber.aspx**
- **"Hardwood vs Softwood." *Diffen.com.* Diffen LLC, n.d. Web. 5 Mar 2016. http://www.diffen.com/difference/Hardwood_vs_Softwood >**