

Week 1 Chiny Chap 1. PP 1.02-1.06
 Chap 2. PP 2.02-2.30
 Chap 12. PP 12.02-12.05, 12.08-12.09

Chap 1

* 1.02 - Building in context

- Buildings are created to increase the human activity in a certain area.
- Buildings are created for social, economical, and political needs.
- Certain buildings belong to only certain environments and populations.
- Topography also plays with the design of a structure.
- Materials varies due to its environment.
- Sunlight and water currents affect the placement of the structure.
- Zoning Codes also restrict certain elements of a structure.

* 1.03 - Sustainability

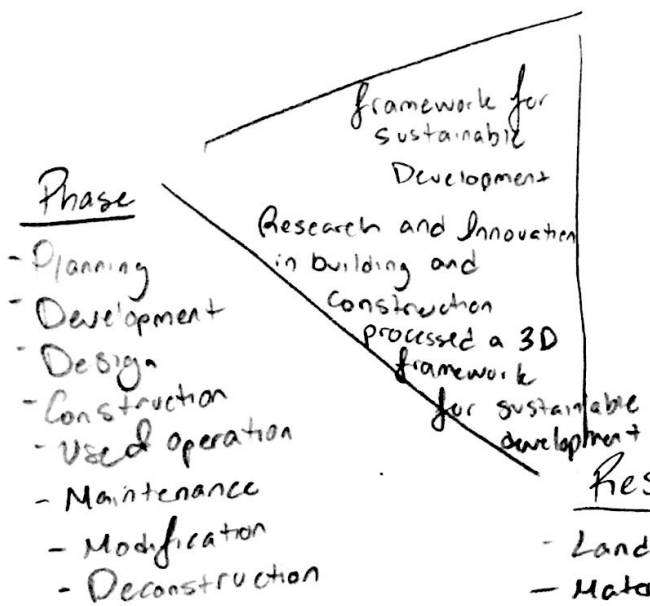
- Designs of structures that help comfort those who occupy it.
- 1987 - "United Nations World Commission on Environment and development."
- * Used to help the environment. - No negative impacts * tries to avoid negative
- Used to save resources, materials, energy, etc.
- Used for renovation.

Principles

- Reduce resource consumption
- Reuse resources
- Recycle resources for reuse
- Protect nature
- Eliminate Toxics
- Apply life cycle costing
- Focus on Quality

Resources

- Land
- Material
- Water
- Energy
- Ecosystems



* Chap 1.04 - Green Building

- Designed in an environmental sensitive manner. (Green Building)
- (Sustainability Building) - whole system of Green Building but also has social, economic, and ethical use for it.
- Green Buildings → (LEED) Leadership in Energy and Environmental Design
- LEED is very important for designing a building.
(Rating system was created by U.S Green Building Council (USGBC))

LEEDs

- LEED-NC: New Construction
- LEED-CI: Commercial Interiors
- LEED-CS: Core/Shell
- LEED-EB: Existing Buildings
- LEED-Homes
- LEED-ND
- LEED for Schools
- LEED for Healthcare
- LEED for Labs
- LEED for Retail

LEED rating system for New Construction @ addresses

- 1. Sustainable sites
- 2. Water Efficiency
- 3. Energy and Atmosphere
- 4. Materials and Resources
- 5. Indoor Environmental Quality
- 6. Innovation and design Process



* Chap 1.06 - ~~2030~~ 2030 challenge

- Environmental Group whose mission is to find solutions through designs on helping to fix the problems with Global Warming / climate change
- Goal - Efficient Materials lead to usage of less energy
- 2030 buildings will not be energized by fossil fuel *trying to achieve

* Chap 2.02 - The building

- Definition, Scale, proportion, and organization of the Interior space
- human activities by their Scale and dimension
- functional zoning of spaces according to purpose and use
- horizontal and vertical path of movement throughout the Interior space
- form, space, light, color, texture, and pattern
- Building blends with Nature.

* Chap 2.03 - Building Systems

- * Structural System - system of building designed to distribute lateral loads evenly and safely into members.
 - columns, piers, beams, loadbearing walls support floor and roof structure
 - foundation of a building
- * Enclosure System. - system is the shell or envelope of a building (facade)
 - roof, exterior walls, windows, and doors (facade)
 - All Enclosure systems allow privacy from public world, heat/cold (~~weather~~) (Weather), moisture
- * Mechanical System - systems that provides the services for the building
 - The water supply and sanitation, sewage
 - Air conditioning and the electrical system
 - Transportation methods within the building
 - fire fighting systems and recycling systems

* ~~Chap~~ Chap 2.06 - 2.07 - Types of Construction

- Type 1 - major building elements constructed of non-combustible materials
 - concrete, masonry, or steel
 - major fight against fire (fire resistant)
- Type 2 - similar to Type 1 - reduction in the required fire-resistant ratings of the major building elements
- Type 3 - noncombustible exterior walls and major interior elements of any materials permitted by the code.
- Type 4 - Heavy timbered - non-combustible exterior walls and major interior elements of solid or laminated wood of specified minimum sizes and without concealed spaces.
- Type 5 - structural ~~and~~ elements, exterior, and interior walls of any material permitted by code.
 - protected construction requires all building elements, except for non bearing interior walls and partitions to be 1 of 4 fire resistive construction
 - Code requires protection on exterior walls

- Walls, floors, windows, and doors should be able to cut off the spread of fire to other parts of the building

* Chap 2.08. Loads on buildings

- Dead loads - loads acting downward on a structure, which compress self weight of structure and weight of building elements
- Settlement loads - imposed on a structure by subsidence of a portion of the supporting soil, which result settlements of its foundation.
- Ground Pressure - horizontal force on vertical support (soil mass)
- Water Pressure - ~~hydrostatic~~ hydraulic force groundwater exerts on a foundation system
- Thermal/Tensile stress - material constrained against thermal expansion or contraction
- Dynamic Loads - Applied to a structure with often and rapid changes in magnitude and point of application. (Wind loads, earthquake loads)
- Static Loads - Applied slowly to a structure until it reaches its peak value without fluctuating rapidly in magnitude or position
- Rain loads - often produced on the roof which can lead to clogging of pipes
- Occupancy loads - weight of people, furniture, stored materials
- Snow loads - snow that is laid along the roof
- Live loads - any movable objects

Chap 2.09 Wind Loads

- loads of wind from kinetic energy
- structure, components, and cladding of building must be designed to resist wind-induced sliding, uplift, or overturning
- roof pitenes can depend on the interactions with wind

* Chap 2.10 Earthquake Loads

- foundations are built to sustain trembles from earthquakes
- The taller the structure the faster but shorter it shakes
- The smaller the structure the slower but longer it shakes

* Chap 2.11 Structural forces

- A force is any influence that produces a change in the shape or movement of a body.
- Collinear forces - force along a straight line.
- Concurrent forces - forces meet at an intersection/common point

* Chap 2.12 Structural Equilibrium

- magnitude, direction, and point of application of forces, and their resolution to produce a state of equilibrium.
- state of balance or rest resulting from the equal action of opposing forces
- Supported elements must react with equal / opposite forces

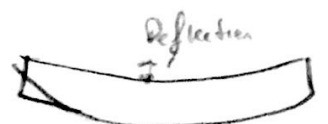


* Chap 2.13 Columns


- used to maintain vertical / axial stress
- Many are known to be crushed due to its proportion
- Kern Area = center of any horizontal section of an area
- Each column belongs on a grid which identifies equivalent spacing
- The longer the length, the wider the radius

* 2.14 Beams

- used for transversal loads / transferred into supporting elements
- Deflection and bending are caused within these beams



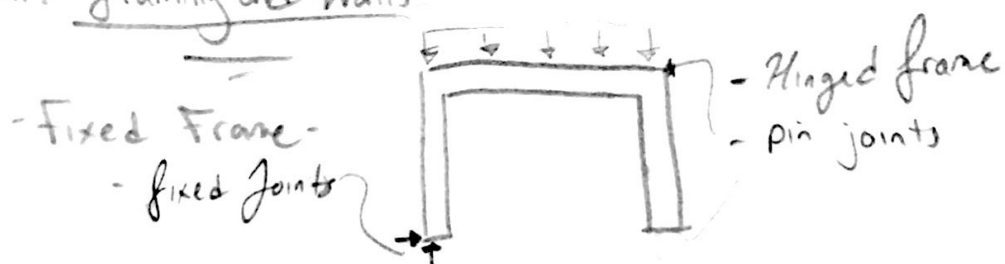
* Chap 2.15 Beam Spans

- Simple beam - rests on supports on both ends
- Cantilever - support only on one end (fixed end)
- Overhanging beam - beam extended beyond one support.
- Double overhanging - beam extended beyond both supports
- fixed end beam - both ends restrained against translation and rotation. (reduce maximum deflection)
- Suspended Span - supported by overhangs of two adjoining spans 
- Continuous Beam - extends over more than 2 supports

* Chap 2.16 Trusses

- Structural frame based off geometric rigidity of a Δ and composed of linear members
- Connected with Web members
- "Heel" lower, supported end of truss.
- These trusses are very good for axial stress.

* Chap 2.17 Framing and Walls



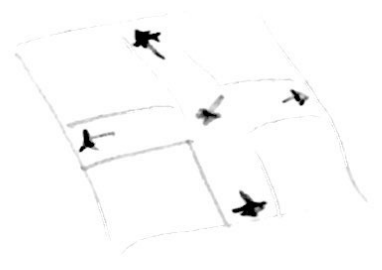
- 3 hinged Frame
- 2 grid sections that connect and support with pin joints



Chapter 2.18. Plate structure

Rigid, planar structures that are placed along the stiffest placement of its supports.

The plate should be squared
folded plates are after thin



Chapter 2.19. Structural Units

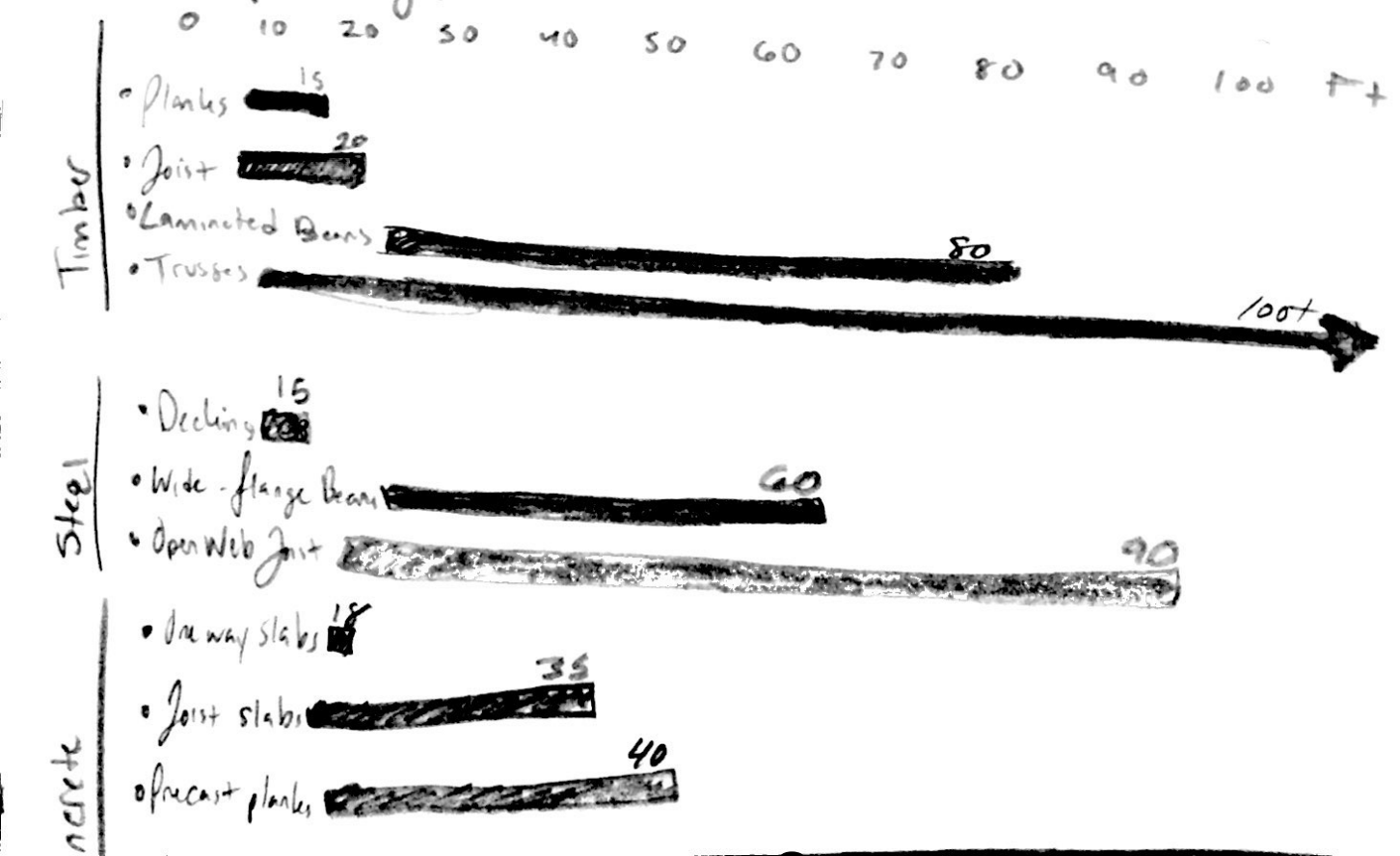
Principal structural elements of columns, beams, slabs, and load bearing walls - (All these allow for an enclosed habitation)

slabs, planks are able to create flooring

All things that are used to construct something

Chapter 2.20 Structural spans

Representative Span Ranges



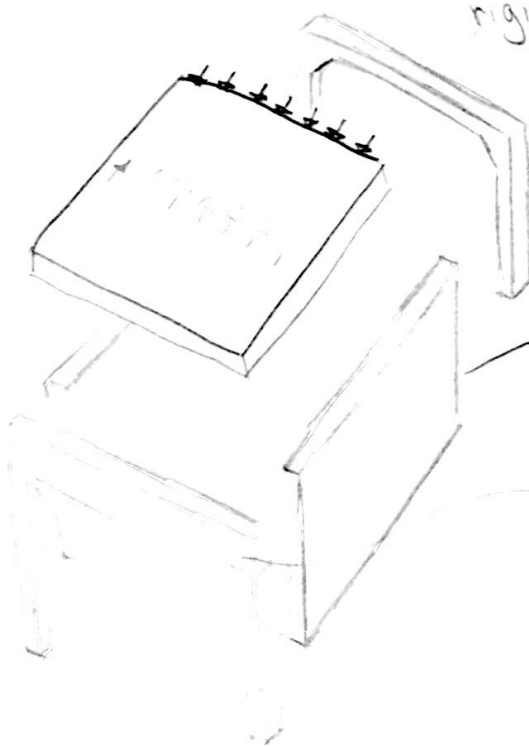
Chap 2.21 Structural Patterns

- Grid lines both vertical and horizontal are created for the placement of columns, piers, load bearing walls.
- The intersection of the grids are the placement in which these supports collect loads.
- Grid does not need to be spaced equally. Just need to be 90° .
- Any non bearing walls can be placed off the grid but are used for spatial and circulation purposes.



Chap 2.22 Lateral Stability

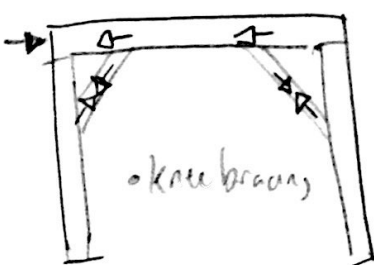
- Horizontal diaphragm - rigid floor structure, flat, deep beam - transfers loads laterally to vertical shear walls, braced frames, or rigid frames



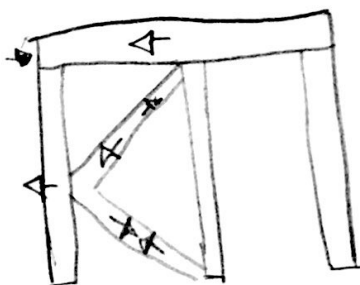
- Rigid frame - steel or reinforced concrete frame with rigid joints - resist changes in angular relationship

shear wall - wood, concrete, or masonry wall capable of resisting changes in shape and transfer lateral loads to foundation

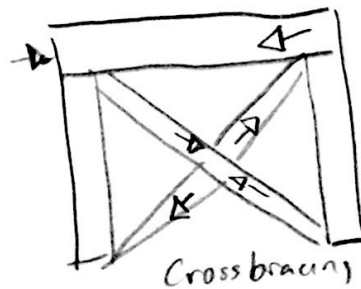
Braced framing - timber or steel framed braced with diagonal members



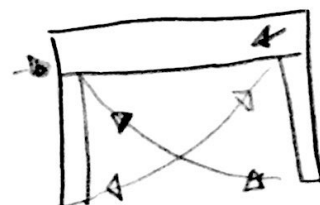
knee bracing



k-brace



Cross bracing



wire bracing

Chap 2.24. High Rise Structures

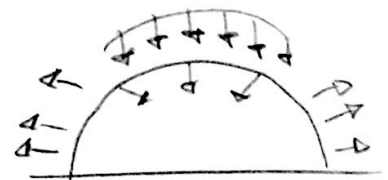
- For taller buildings, it is necessary to use rigid frames with additional bracing mechanism.
- It has to have a stable core.
- A tuned mass damper is a heavy mass mounted on rollers and attached to an upper portion of a tall building. - This helps with less sway of the building

Chap 2.25 Arches and Vaults

- Arches used for support and to create openings. They are able to transfer loads easier than a post and lintel.
- Used for decorative purposes as well
- Vaults (Crossed/Barrel) are created with continuous Arches (Tunnel like)

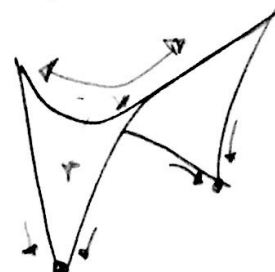
Chap 2.26 Domes.

- Sphere surface having a circular plan that is constructed of stacked blocks
- There are major keys along the surface of the dome that needed for it not to collapse.

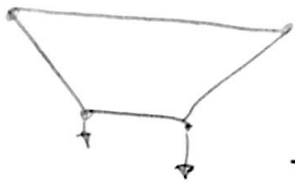


Chap 2.27 Shell structures

- thin, curved plate structures made of reinforced concrete
- They are able to transfer compressive, tensile, and shear stresses
- Due to thinness, it has little bending resistance.



Chap 2.28 Cable Structures



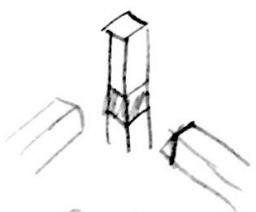
- Cables can only be used purely for tension.
- Have no resistance for bending
- Single-curvature - parallel series of cables to support surface - forming beams or plates
- Double curvature - upper/lower sets of cables for different curvatures

Chap 2.29. Membrane Structures

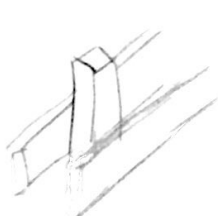
- thin, flexible surfaces that carry loads primarily through development of tensile stresses
- They can be suspended / stretched

Ex: Tents. - They can also be supported by air.

Chap 2.30 Joints and Connections



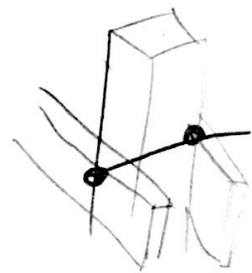
Butt J.



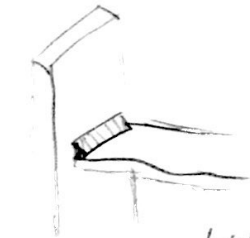
Interlocking/
overlapping J.



Molded J.



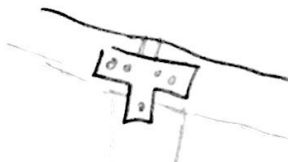
Point connector / bolt



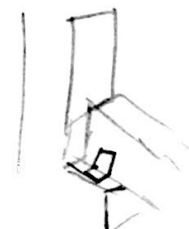
Linear Connector/Weld



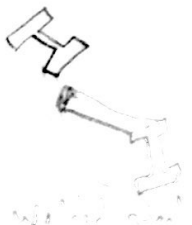
Surface Connector
glue



Bolted Connection



Precast concrete



Welded joint



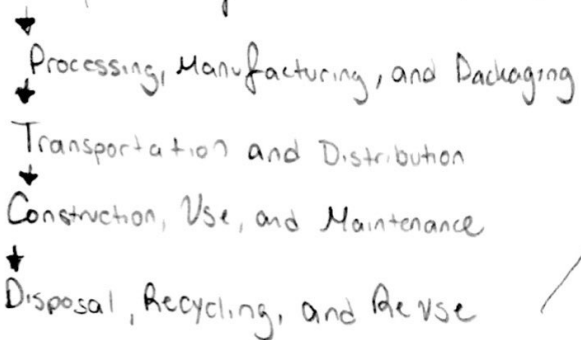
reinforced

Chap 12.02 Building Material

- Each building material has its own strength and resistance towards nature
- Elasticity - ability to deform under stress, (bend, stretch, or compress)
- Stiffness - force required to push or pull a material to its elastic limit.
- Temperature - also effects the durability of a material (will it transfer heat/cold flows)

- Resistance to water/snow.

- Acquisition of Raw Materials



Cycle of material used for Construction

- How much toxins have been produced
- How much energy is wasted
- How much water was wasted

Chap 12.04 - 12.05 Concrete

- made from cement, water, aggregate (Mineral material, sand, gravel) 60-80% lightweight concrete (shale, slate aggregate), and admixtures

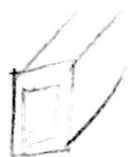
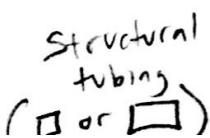
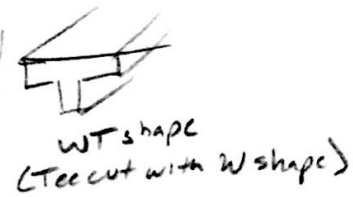
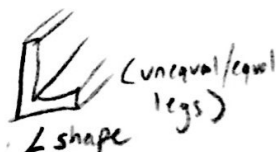
- Water: Cement Ratio - Right amount of Water will equal good use for cement.
 - little water = hard cement (hard to form/work with)
 - Too much water = weak cement (will break)

- Concrete is weak in tension - so they are reinforced with steel bars to take in the tension and stress for loads.

- Both Concrete and steel - very strong support (very few cracks)

- 1/8 inch diameter of steel bars - *Also depends on placement of structure

Chap 12.08 steel



- Many support/structure elements are consist of steel. Carbon steel / mild/soft

Chap 12.09 Nonferrous Metals

- other solid materials such as aluminum, iron, silver, etc can be covered with a transparent film to appear in warmer colors - process
- These metal can be used to develop furniture pieces / ornaments. (Anodizing)