

CONTENT AREA: PROGRAMMING + ANALYSIS

Architectural Programming

Vocabulary:

- **Programming Statement:** states the problem. no solution or strategy given
- **Design Concept:** gives a physical/design solution for a problem
- **Functional Program:** owner provided data for analysis/creation of a Facilities Program
- **Facilities Program:** Program that considers scope, area minimums and adjacencies, ballpark costs and site analysis

Facts/Rules:

- Programming is comprised of four components:
 - **Function:** the objectives and needs (what it should do)
 - **Form:** site, structure, existing components
 - **Economy:** budget to build and to maintain/operate
 - **Time:** the schedule needed to complete the work

Concepts/Goals:

- Programming finds the problems, parts, and data. Design solves the problem.
- Clarify the owner's concerns early in order to prevent major changes in the design process or avoid too much/not enough space later. This also gets everyone on the same page, so there's less conflict.
- Address current issues, but also be conscious of future growth and changes that may take place after the project is complete (how would the owner add on/remodel?)

Processes:

- Programming Process
 - **Establish Goals:** What are the owner's goals for the project
 - **Gather Data:** organize all site, context, users/occupancy, equipment, codes, budget, expenses, project specific information
 - **Find Relationships:** What things go together, what issues will be critical during the design process
 - **Establish Priorities:** most important function, second most, third...based on use and budget (eg: what's more important- a fancy lobby, or equipment in the lab?)
 - **State the Problem:** What needs to be answered in the design.

Interpreting Existing Site/Environmental Conditions and Data

Vocabulary:

- **Catchment Areas aka market, trade, or tributary area:** geographic area from which the participants in an activity are drawn. It grows and shrinks with the activity.
- **Residential Catchment Areas:** determined by local transit systems.
- **Proctor Compaction Test:** Geotechnical tests to determine the maximum, practically achievable, density of soils and aggregates.
- Survey:
 - **Baseline:** parallel (line that follows latitudes of earth) used as the basis for the east-west layout of the US Survey system

Standard Parallels: parallels between the baselines in the US Survey

Principal Meridian: meridian (north-south line that follows longitude of earth) that serves as the basis for the north-south grid layout of the US Survey

Guide meridian: meridians between the principal meridians

Metes-and-bounds: verbal description of land that begins at a known point and describes the bearing and length of each side of the property until the point of the beginning is reached

- Topography:

Contour interval: change in elevation between two contours. Smaller scaled maps typically have a larger interval for clarity.

Crown/Ridge: contours point “down” toward the lower elevation

Swale/Valley: contours point “up” towards the higher elevation

Hills: concentric circles with elevations getting higher towards the center

Depression: concentric circles with the elevations getting lower towards the center

- Water:

Swamp: wetland that features permanent inundation of large areas of land by shallow bodies of water, generally with a substantial number of hummocks, or dry-land protrusions

Swale: an elongated depression in the land surface that is at least seasonally wet, is usually vegetated and is normally without flowing water.

Detention Pond: low lying area that is designed to temporarily hold a set amount of water while slowly draining to another location. They are more or less around for flood control when large amounts of rain could cause flash flooding if not dealt with properly

Retention Pond: designed to hold a specific amount of water indefinitely. Usually the pond is designed to have drainage leading to another location when the water level gets above the pond capacity, but still maintains a certain capacity

Riparian Rights: system of rights and duties that determine the reasonable use, duties, and allocations of water to owners of waterfront property (includes bottomland, beach, and upland, but not the water itself). Owners can use water adjacent to their property, but can't infringe upon the rights of others to use the water.

Sheet Flow: water that flows across paved surfaces.

- Energy:

Albedo: how much radiant energy that is reflected by a surface where 0 is a flat black surface which absorbs all heat and 1 is a mirror (rate is listed as a fraction).

Conductivity: the speed with which heat passes through a material. Metals are high, and soils/sand are low.

- Weather/Climate:

Macroclimate: based on latitude, elevation, and proximity to water. Water reduces temperature extremes.

Islands/Costal Region = constant & moderate temperature

Arid/Desert Region = low humidity & greater temperature variation

Mountainous Region = winds are forced to rise

Microclimate: based on solar radiation, the angle between the ground and altitude

Greatest sun rays = perpendicular to ground

Winter Solstice = least hours of sun and low sun angle

Summer Solstice = most hours of sun and high sun angle

Vernal/Autumnal Equinox = equal hours of sun and dark

Facts/Rules:

- One acre = 43,560 square feet
- US Survey Divided land that was not already surveyed in 1780s into a square grid system:
 - Check:** area 24 mi. on a side defined by parallels/meridians & divided into 16 townships
 - Township:** area 6 miles on a side; divided into 36, 1-mile sections
 - Section:** 1 mile square parcel of land containing 640 acres
 - Quarter Section:** area 1/2 miles on each side
- Site Slope Percentage = Vertical/Horizontal x 100
 - flat area - good for all activities = <4%
 - moderate = 4 - 10%
 - steep - unusable = 10 - 50%
 - very steep, subject to erosion = + 50%
- Construction Slope Percentage = Vertical/Horizontal x 100
 - storm drains = 0.3% minimum
 - sanitary sewers = 0.4 - 1.4%
 - street surface drainage = 0.5% minimum
 - planted or large pavers = 1% minimum
 - lawns = 25% max
 - planted banks = 50% max
 - parking area/lot = 5% max
 - automobile ramps = 8% max
 - sidewalks = 10% max
 - streets/paved driveways = 10% max

Concepts/Goals:

- Choose a south facing site (use overhangs or deciduous trees to block summer sun)
- Midway on a hill is best (top is too windy, fog/cold air settles in valley)
- Summer breezes are good (courtyards/porches) block winter winds
- Location Factors for Construction:
 - **Suburban areas:** lowest costs for development and connected to urban areas
 - **Urban areas:** highest costs for development (due to labor rates)
 - **Rural areas:** variable cost based on access and existing transportation

Processes:

- **Get a Site and/or Building Survey**
 - Site Surveys: There are 3 types you can get:
 - Preliminary:** basic for preparation of architectural drawings
 - Construction:** precise condition of site and adjacent structures, bench marks
 - Possession:** records completed development
 - And they come in 2 forms:
 - Geodetic:** precise, follows spherical shape of the earth
 - Plane:** more common, assumes a flat plane of the earth
 - Aerial Photography (Google earth type images)
 - City
 - Construction (includes markers)
 - Hydrographic (oceans, rivers, lakes, etc)
 - Land (a description of the site)

Topographic (elevations, slopes)

Route (roads and utility lines)

- Building Surveys: For existing buildings, there are 3 types you can get:

Field Measurements: taken by hand

Laser Scanning: remotely measure existing spaces (quick)

Photogrammetry: establish control points and hand survey to get base coordinate system (takes much longer than laser scanning)

- **Determine the Land Use**

It depends on its role in a catchment area, location, topography, and cost.

Eight basic categories of use:

Agricultural	Institutional
Commercial	Natural Resources
Government	Open/Conservation
Industrial	Residential

- **Determine the Land Value**

It's calculated by the relation to the use that yields the highest return for the site

Comparison Method: compared to other similar parcels (can be applied to all categories of use) and is the most accurate if current data is available.

Development Method: when comparisons aren't available, use estimates to determine the selling price of lot, cost to develop, time to develop, and net sale price.

Residual/Income Approach Method: used in highly developed areas by estimating potential income from improvements that yield the highest return (highest & best use)

Allocation Method: used to determine value of improved properties by deducting the value of site improvements to get the value of the land.

- **Determine Soil Type**

Gravel: well drained and able to bear loads (+2 mm)

Sand: well drained and can serve as foundation when graded (0.5 - 2 mm)

Silt: stable when dry, swells when frozen, do not use when wet (.002 - .05 mm)

Clay: must be removed, too stiff when dry and too plastic when wet (< .002 mm)

Levels of Soil:

A Level	=	Topsoil (organic/mineral material)
B Level	=	Minerals
C Level	=	Partially weathered/fractured rock
D Level	=	Bedrock

- **Determine Potential Land Problems**

- Water within 6'-0" of land surface: pump out excavation, waterproof basement, resist hydrostatic pressure (continuous drain pipe installed at foundation)
- Rock at/near surface of site: use explosives to reduce manual labor
- Soil is soft clay, waterbearing sand or silt: construct deeper foundations or drive piles, remove poor soil
- Underground streams: avoid and be cautious of siting of structure
- Cut and Fill: balance it. There shouldn't be more taken away than added or vice versa

- **Determine Foundation Type**

Bearing Capacity: max pressure a foundation soil can take with harmful settlement

Bedrock	=	10,000 psf
Well graded gravel/sand	=	3,000 - 12,000 psf
Compacted sand/fill	=	2,000 - 3,000 psf
Silt/Clay	=	1,000 - 4,000 psf

Borings: locations depend on nature of the building and should be 20'-0" past firm strata

Open warehouses: one in each corner and one in the middle

Large structures: 50'-0" spacing

Uniform conditions: 100 - 500' spacing

Spread Footing: Most economical...\$

method. Delivers load directly to soil.

Area of the footing = load/safe bearing capacity.

Mat Foundations: Very expensive...\$\$\$ method. Typically it's only used when the strata is weak, and it acts as one continuous foundation.

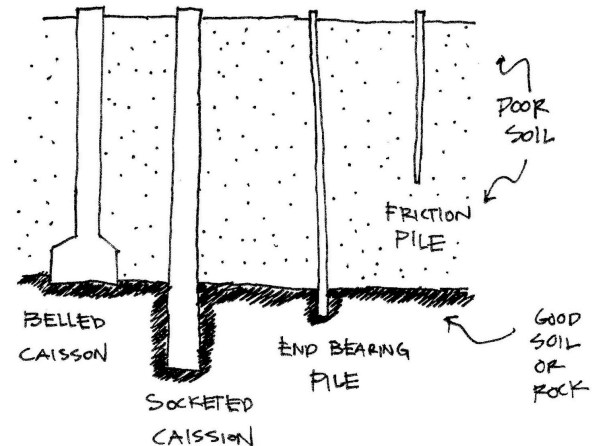
Belled Caissons: holes are drilled to firm strata and concrete poured. They're basically really, really deep spread footings

Socketed Caissons: like Belled

Caissons, but the hole is drilled deep into the strata. Bearing capacity comes from end bearing and frictional forces.

End Bearing Piles: 2-3x cost of spread footings. Driven until tip meets firm resistance from strata

Friction Pile: Driven into softer soil. Friction transmits the load between pile and soil. bearing capacity is limited by whichever is weaker: the strength of the pile or the soil



- **Prevent Future Problems**

- Connect new on-site drainage to natural drainage
- Design surface water runoff based on worst case storm scenerio
- Prevent erosion by using channels, gutters, swales, and xerioscaping

Adaptive Reuse of Buildings and/or Materials (also see detailed discussion under Codes + Regulations Content Area)

Vocabulary:

- **Mothballing:** term used in historic preservation when you designate certain areas to be repaired or restored at a later date, under a later contract.
- **Adaptive Reuse:** process of adapting old structures for purposes other than those initially intended while retaining their historic features.
- **Preservation:** the act or process of applying measures necessary to sustain the existing form, integrity and materials of an historic property.

Facts/Rules:

- **Secretary of Interior's Standards for Rehabilitation:**
 - Allow for new additions/alterations to be different from the older structure, but must be complementary in massing, size, scale, and architectural features
 - Criteria must be met if Federal Tax Credits will be used
 - Takes precedence over state/local regulations
 - Clients may discover historical significance during site analysis. Archaeological activity and proper handling of structures/artifacts must take place.

Concepts/Goals:

- Historic Preservation:
 - 4 treatments applied to historic structures (most historically accurate to least):
 - **Preservation:** least amount of work done to the building and any interventions are as inconspicuous as possible
 - **Rehabilitation:** retain and repair historic materials, but some replacement of damaged material is ok, as are additions that convey historic values
 - **Restoration:** remove inconsistent features and replace missing features in accordance with the restoration period
 - **Reconstruction:** new construction to look like how something existed at an earlier time
- Adaptive Reuse/Land Conservation:
 - Reduces the amount of sprawl in the outlying city
 - Is sometime associated with gentrification (eg: the pearl district)

Processes:

- Define factors affecting the scope of historic preservation including the nature of the effort (will it be preservation, rehab, restoration, or reconstruction?), the applicable regulations, significance of the property, and condition of the structure
- Team with structural/MEP engineers who have specialized historic preservation experience
- Complete Preliminary Analysis/Pre-design and Research:
 - Documenting existing conditions, programming the intended function/use of the building and site, doing research to investigate historic nature of project/area, determining which parts of the buildings are original and sequence of construction
 - Complete preliminary cost estimate of work to be done, and prepare applications for federal grants.
- Complete Design Phase:
 - Coordinate with standard steps of the building design process
 - Coordinate preservation with architecture/engineering development
 - Coordinate with specification/front end
- Complete Document Phase:
 - Coordinate with drawings, specs, final cost estimate
 - Coordinate with bidding/negotiation phase
 - Coordinate with construction administration, observation, and documentation
 - Reports for maintenance, determination of historic eligibility for review boards may be required

Space Planning and Facility Planning Management

Vocabulary:

- **Indigenous/Vernacular Architecture:** Specific to a time or place
- **Anthropomorphic:** relating to human characteristics
- **Fathom:** measure of the spread of arms
- **Room Data Sheets:** list all of the relationship requirements in a given room (eg: different rooms of a diagnostic imaging department have different needs, so each would have a sheet) and include layout, equipment, activity zones, lighting, temperature, and comfort requirements.
- **Assignable area:** the amount of area needed for uses in square feet used for gross area calculations

Facts/Rules:

- Gross Area = Net Area (commonly used areas) + circulation (structure/mechanical/service)
 - Include covered which is enclosed by 2+ sides whether attached or detached to the main dwelling unit.
 - Include any covered area on/below the first or main floor when the average height of the 4 corners is more than 6'-0" above natural grade at the exterior
 - Include decks, patios, other usable open areas that are enclosed on 3+ sides (includes 2 walls and a solid roof)
 - Double the sf of any interior space with a ceiling height at 15'-0" or more. Exclude stairwells with no habitable space above/below, and a max of 60 sf of additional space (e.g. entry, atrium, study loft)
 - Include any attic of at least 150 sf and with a ceiling height of at least 7'-6"
- Building Efficiency = Net Area/Gross Area
- Floor Area Ratio (FAR) = Gross Area/Site Area
- Net Area = measured from inside walls
- Gross Area = measured from exterior face of walls
- Penthouses, fan rooms, and skylights are sometimes allowed to exceed height restrictions.

Concepts/Goals:

- **Space/Site Planning Hierarchy**
 - **Total Building Group:** all of the buildings in a complex, group or masterplan
 - **Component Building:** an individual building in the group
 - **Activity Center:** spaces related to each other by function
 - **Space Unit:** each individual space within a center
 - Example: Medical Campus > Acute Care Hospital > Surgery Department > Pre-Op Suite
- **Space/Site Planning Considerations**
 - Relationship between site/structure
 - Response to site conditions (sun/vegetation/wind/sound)
 - Be visible but maintain human scale
 - Express and serve its purpose economically and thoughtfully
 - Utilize technologies and materials appropriately (honest tectonic expression)
 - Use local materials and building techniques
 - Create a hierarchy of parts that is interesting to look at
 - Create a relationship between the interior and exterior
 - Express human spirit and encourage human interaction

Processes:

- **Estimate Needs:**
 - Determine total area by calculating the amount of space and time required for each use:
- **Create Planning Diagrams**
 - **Matrix Chart:** numerical values of required relationships (1 = adjacent, 2 = no relationship, 3 = separate) are assigned to each program space with regard to the others
 - **Bubble Diagram:** before space planning create a loose drawing of circles that indicates required adjacencies, priorities or relationships, and relative sizes.
 - **Block Diagram:** more accurate (but still preliminary) layout of spatial organization based on bubble diagram, but with accurate sizes used.
- **Create Blocking & Stacking Diagrams**
 - **Blocking:** assigning departments to a defined area on a floor based on its desired adjacency and support requirements
 - **Stacking:** assigning floors/areas of floors to departments based on its desired adjacency and support requirements

Fixtures, Furniture, Equipment, and Finishes**Vocabulary:**

- **Furniture, Furnishings, and Equipment:** Refers to a wide assortment of products that are prefabricated or custom:

System furniture	Signage
Loose furniture	Planters
Artwork	Window Coverings
Accessories	Custom Furniture
Millwork	Awnings
Speciality Equipment	Audiovisual Equipment
Custom Lighting	
- **Ergonomics:** applied science concerned with designing equipment/furniture to maximize productivity by reducing fatigue and discomfort.
- **Freestanding Furniture:** individual tables, chairs, case goods, that aren't built in
- **Systems Furniture:** components that can be assembled, configured, and reconfigured to create workstations/workspaces. Includes panels, work surfaces, shelving, storage, and power&data support for computers/communication systems, and other equipment.

Facts/Rules:

- Services are applicable to project of all sizes
- The budget for FF&E is about 3-4x Interior design fees.
- Specialized knowledge is required with respect to construction, fabric types, available lines, specification of furniture and fabrics, installation procedures, building codes, regulations in commercial projects.
- Understand client's budget, and evaluate needs and constraints, to determine starting point for programming.

Concepts/Goals:

- Appropriate furniture reinforces the design concept of a building.
- Enhances the overall functionality of the building and influences the way that people use and interact with the space.
- Architects/design firms can offer additional services for FF&E selection/acquisition management.
- Vendors who help owners might not make selections that follow the design concept, choosing instead for low-cost, easily attainable products, that they represent or have hire quota they're looking to move.
- **Reasons for FF&E Services**
 - To furnish a new space: using new or reconfiguring old for a space.
 - To replace or upgrade existing FF&E: accommodate new/replace outdated technologies
 - To refurbish existing furniture: restore antiques, refinish furniture instead of buying new
 - To expedite FF&E procurement: get things in time for a fast track project
 - To simplify FF&E procurement: assembles FF&E from multiple sources in one coherent package/one single point of sale.

Processes:

- **Evaluate Client Needs (FF&E Programming Process)**
 - Identify and document needs for all functional spaces including:
 - Function and types of spaces (personal, common, support)
 - Number of assigned staff
 - Numbers of visitors
 - Types and quantities of items to be stored
 - Signage requirements
 - Desired artwork and interior plantings
 - Quantity, condition, and types of existing furniture to be reused
- **Prepare a Cost Estimate**
 - Line Item breakout of all FF&E to establish budget.
 - Based on current prices of items comparable to those requested
 - Client should approve budget before proceeding so architect has a benchmark for considering products.
- **Select Furniture**
 - Decisions are based on:
 - **Function:** what the client needs
 - **Durability:** how long it should last
 - **Aesthetics:** what will enhance the design
 - **Budget:** how much the client can afford
 - **Style:** what scale/size/proportion is appropriate for the space
- **Prepare Specifications**
 - Include an instruction to bidders with requirements for delivery, installation, warranties, and punch list procedures, and reference/include a furniture plan.
 - 3 types of specifications to choose from:
 - **Proprietary (Closed) Spec:** does not allow for substitution, and typically used to control aesthetics, function, and quality.
 - Identify name, model number, finish type, and submittal requirement.

- **Descriptive (Open) Spec:** used in competitive bidding, and does not give level of control in closed spec.
 - Describe characteristics, materials, finishes, workmanship, and fabrication of products and give list of comparable manufactures.
- **Performance Spec:** used with vendors who propose products they think will meet requirements
 - Describe only the desired/required results. Give no characteristics or manufactures.

- **Assemble Bid Package/Solicitation of Bids**
 - Typically a two week process for mid size projects (approx. 20,000 sf.)
 - Allow three weeks for large projects (100+ workstations)
 - Include site factors, elevator access, building access, dumpster/recycling use.
 - Award bid to a single dealer, or divvy up to different furniture, equipment, fixture providers

- **Administer Contract**
 - Owner/Supplier enter into their own contract (much like Owner/Contractor agreement)
 - Supplier sends shop drawings/submittals to architect for review and approval
 - Purchase orders are sent directly to the owner for payment, architect is copied on all correspondence and notified of any issues (long lead time, discontinued items, etc)
 - Architect helps establish installation schedule and arranges for punch list.

- **Oversee Ordering Phase (furniture acquisition process task)**
 - Review supplier's bid compared to furniture plan/spec to verify consistency
 - Review detailed furniture systems list
 - Review invoices and recommend payment (much like pay app process)
 - Review submittals for finish/fabric selections
- **Oversee Tracking/Scheduling Phase (furniture acquisition process task)**
 - Check acknowledgment for accuracy and complements
 - Record estimated delivery dates
 - Recommend substitutions/change for products with long lead time that might affect move-in date.
 - Coordinate delivery/installation schedule to ensure installation into the completed space or to arrange storage in secure (and bonded) temporary warehouse or storage area.

CONTENT AREA: ENVIRONMENTAL, SOCIAL + ECONOMIC ISSUES

Development, Deeds, + Ownership (not an ncarb knowledge/skill heading)

Vocabulary:

- **Assessment:** valuation of property for the purposes of taxes.
- **Business Improvement Districts:** used to fund public space improvements (new streetscapes/graffiti removal) with the intention that it will enhance an area's appeal. All business owners in district who would benefit pay increased taxes.
- **Tax Increment Financing:** Method cities use to issue bonds to pay for civic improvements (sewers/streets) with the intention that it will stimulate development in that area. During redevelopment, taxes are based on the pre-improved assessed value of the property. After redevelopment, taxes (and assessed value) increase due to the improvements. The difference in tax increment is used to repay the bonds.
- **General Obligation Bonds:** Used to fund a civic project (library, police/fire station) and require voter approval. All taxpayers in jurisdiction help pay off bond through property tax.
- **Developer Impact Fee:** used to fund infrastructure needed to support new developments. Paid by developers...who generally look to develop areas with lowest fee.
- **Debt Service:** An additional, long term cost to the owner, to pay off the construction loan for a project. Typically not included in the original project cost.
- **Ad Valorem Tax:** Tax based on the value of the property
- **Amortization:** decreasing or accounting for an amount over a period of time.
- **Eminent Domain:** power of the state to take private property without owner's consent, but with fair market value of the land compensation. Must be used government or public development (highways, railroads, civic center), economic development, or to mandate an easement for access (public utilities, right of way).
- Deeds:
 - **Deed Restrictions:** place limitations on the use of the property, typically by original developers, who determined what land would be used for (live, work, or play) and can't be changed by future owners.
 - **Restrictive covenants:** limitations and stipulations used in residential settings. Can be aesthetic (allowable color pallets, vegetation types/pruning, fencing materials) pet control (how many and/or living conditions), or storage related (visibility of parked cars/boats/campers).
 - **Affirmative Covenant:** commits a buyer to performing duties in the future (e.g. will make payments for common charges in a condo)
 - **Conditional Covenant:** If restriction is violated or disregarded, the land will rever back to original owners/heirs.
 - **Easements:** right to use part of a site without ownership (typically for utilities)
 - **Right-of-Way:** right for people to cross land of another (pathways/cattle drives)
 - **Party Wall Agreement:** an agreement on if and how to carry out building work on a wall that is shared by two people who each own their respective property. (typically whoever originally builds first "owns" the party wall).

Facts/Rules:

- Types of Assessments
 - **Income Approach:** used by appraisers to value properties that earn income (offices, warehouses, apartments, malls) using reliable financial data that is available for recent sales of similar income properties in a given market.
 - **Market Approach:** used to determine the true underlying value of a property based on the estimated amount for which a property would trade in a competitive auction setting.
 - **Cost Approach:** used to determine the value of the property by estimating the land value and the depreciated value of any improvements. Typically applied to special use buildings (eg: marinas)
- Types of Owners
 - **Joint Tenancy:** each tenant has a share in the whole development which passes to survivors after death
 - **Partnership:** a business built on the shares of partners. After the death of one, the partnership may be dissolved and assets are distributed to remaining partners/estate of deceased.
 - **Corporation:** a business independent of shareholders. After the death of one, their shares pass on and do not affect the business.
 - **Trustee:** a person or company who holds property or authority for the benefit of another (eg: 401(k), will, charity, etc).
- Types of Ownership
 - **Fee Simple/Fee Absolute:** the most common form of real estate title in which the owner has “absolute ownership” (taxes, easements, deed/covenant restrictions apply) and can do whatever they want with their property.
 - **Condo:** sole ownership of property, and shared ownership of common elements (hallways, lobbies, meeting rooms, pools, etc).
 - **Co-Op:** ownership of a number of shares of stock of a corporation that owns land
 - **Leasehold:** aka rental agreement, where a person owns a temporary right to land or property for a determined period of time. Sometime sublet is allowed.
 - **Sale and Leaseback:** owner sells property and then leases it back long-term at a fixed rate, in order to raise money by offloading a property to someone who wants to make a long term investment. Typically done for tax purposes.
- Development Loan Types:
 - **Blanket loan:** used by a developer to purchase land that they intend to subdivide and resell. When it's sold, the lot is released from the loan, and debt is repaid as part of the selling price.
 - **Bridge loan:** quickly granted and used to close on a property/start construction while waiting for the official (long term) loan to be approved.
 - **Mezzanine loan:** used by a developer pay a variable amount of interest during project development (starts low and gets really a high % rate at the end). Is considered a gamble, the stock in the company is collateral if revenue isn't produced by sale or lease at the end to repay the loan.
 - **Conventional mortgage:** borrow money at a fixed or adjustable interest rate, and when it's paid off, the borrower has clear title to what was purchased.
 - **Deed of Trust:** title is held by a trustee, foreclosure can happen under power of sale
- First mortgages take priority over second mortgages.

Concepts/Goals: None

Processes: None

Regional Impact on Project

Vocabulary:

- **Air Pollution Temperature Inversion Phenomenon:** the air temperature at ground level is lower than higher elevations causing the heavy, cold trapped air below to release pollutants
- **Climate:** the composite of weather conditions (described in data or quantifiable units) including temperature, humidity, atmospheric pressure, wind, and rainfall, as well as site conditions including microclimate, topography, ground cover, water, and elevation.
- **Ecology:** the science of the pattern of relationships between a group of organisms and their environment.
- **Ecosystem:** an environment of living organisms and non-living components.

Facts/Rules:

- Typical Human Comfort Zone

Winter	=	63°F - 71°F
Summer	=	66°F - 75°F
Tolerable humidity	=	30% - 60%
Uncomfortable humidity	=	+ 75%
- Winds

Basic Speed	=	70 - 80 miles/hour
Unnoticeable	=	< 50 feet/minute
Pleasant	=	50 - 100 feet/minute
Pleasant *and* noticeable	=	100 - 200 feet/minute
Drafty	=	200 - 300 feet/minute
Uncomfortable	=	+ 300 feet/minute

Pressure varies as the square of the velocity (if velocity doubles, pressure quadruples)
- Noise

Smallest difference in 2 sounds the human ear can detect is 1 decibel	
Sleeping, studying, whispering	= 30 decibels
Conversation, comfort	= 50 - 60 decibels
Safety Threshold	= 85 decibels
Rock Band!	= 90 - 100 decibels
- Trees thin out high frequency noises
- Each increase of 10 decibels the human ear perceives as 10x loud.
- Typically doubling the distance between source and ear reduces level by 6 decibels
- On freeways, doubling the distance between source and ear reduce level by 3 decibels
- Winds add "white noise" that blurs any one sound frequency.
- Walls close to a noise source reduce high frequency, but midway between the source and the ear does nothing.

Concepts/Goals:

- Ecosystems (e.g.: forest, pond, city, desert) are constantly changing, and if one component (species or non-living thing) is removed, the system will evolve to make new relationships.
- Uniform ecosystems (all rural, natural ecologies or all urban, man made ecologies) tend to be unstable. Need harmony between natural and human activities.

Processes:

- Climate issues can be dealt with by addressing planning, orientation, building materials, plantings, and vegetative or constructed shading/exposure to sun.
 - Orientation:
 - Place important spaces and windows at southeast corner of the site, it will get more sun in the winter and less in the summer
 - Place windows on the south side to get winter sun into the space
 - Use architectural overhangs/fins/louvers and to some extent deciduous vegetation to block solar rays in the summer
 - Use few windows on the east and west sides of buildings because of morning and late afternoon sun.
 - If unavoidable, use vertical fins to block solar rays.
 - Use northern windows for even daylight throughout the day
 - Heat Transmission:
 - In northern latitudes, heat transmission through walls is critical
 - In southern latitudes, heat transmission through roof is critical
 - Wind:
 - Design plazas at ground level, or open first floors, cautiously as they can be windy due to windbreaks (where part of the wind goes up and over and part goes down)

Community Based Awareness**Vocabulary:**

- **Behavior setting:** a space with definable boundaries and objects where typical pattern of behavior occurs at a particular time (e.g. Tossing a scarf during the national anthem at Jeld-Wen Field during a Timbers match)
- **Census:** systematic record taking about members of a population. Began in 1790 and occurs every 10 years.
- **Demography:** Statistical study of human populations
- **Density:** number of people per unit area
- **Population size:** actual number of people in a given location.
- **Proxemics:** the study of spatial requirements of humans and the effects of population density on behavior, communication and social interaction
- **Territoriality:** behavioral system where person/group lays claim to an area and defends it
- **Sociofugal:** grouping of people arranged in a way that each can have privacy from others

Facts/Rules:

- Densities are calculated as net or gross values. Net values do not include streets.
- Lower densities (suburbs) have high utility rates and are dependent on the automobile
- 30 People Per Acre (or 1 person per 1,452 sf)
 - Density required for public transportation to be effective/efficient.
 - High for suburban America, but typical for European towns
- Housing Types
 - **Detached Single Family:** private, one-family per building, height varies depending on style and location
 - **Two Family Houses/Duplex:** private, one-family per unit, two families per building, height varies depending on style and location, more affordable than detached single family buildings

- **Row Houses:** private, one family per unit, multiple families per building, typically two stories with a basement and 20'-0" - 35'-0" wide. Sound is a problem with shared walls on either side
- **Walk-Up Apartment:** semi-private, multiple families per building, with shared exterior circulation stairs to units, typically three stories tall, with neighboring units adjacent and above/below
- **High Rise:** semi-private, multiple families per floor in multi floor building, shared exterior, lobby, elevator, and circulation space. Least amount of implied ownership. Works well for elderly residential complexes, not so much for low-income families.
- Housing Patterns
 - **Street Front Pattern:** linear with houses lining the street
 - **End On Pattern:** rows of units on small streets at right angles to the street
 - **Court Pattern:** units face a common open space
 - **Cluster Development:** dwellings are clustered, open space is common
 - **Planned Urban Development (PUD):** large developments used to reintroduce diversity to a neighborhood an mimic cluster development. Typically phased and contains a mixture of uses

Concepts/Goals:

- **Defensible Space:** developed by Oscar Newman. In residential communities (typically low income) crime and problems can be controlled not by force, but by environmental design and a sense of ownership instilled in residents. Four key factors are:
 - **Territoriality:** one's home is sacred
 - **Natural Surveillance:** residents' ability to see what's happening in the neighborhood
 - **Image:** physical design that instills a sense of security
 - **Milieu/Environment:** surrounding amenities that affect security (proximity to police/city center/drugs)
- **Personal Space:** developed by Edward Hall. The area around a person that they consider psychologically to be "theirs". Also known as a personal bubble, it has four zones:

• Intimate Space	=	1'-6" radius around person
• Personal Space	=	4'-0" radius around person
• Social Space	=	12'-0" radius around person
• Public Space	=	25'-0" radius around person
- Each person has two social world they live in, these are interdependent:
 - **Primary:** intimate social interactions where a person develops as an individual. Friends and family are in this cluster.
 - **Secondary:** less intimate and more specialized, where a person finds and develops their place in society. Work friends, hobby groups, clubs are in this cluster.
- Design for primary and secondary clusters is critical for successful communities.

Processes: None

Hazardous Conditions and Materials

Vocabulary:

- **Asbestos:** Naturally occurring mineral found throughout the world
- **Asbestos Containing Materials (ACM):** regulated by EPA/OSHA/State/Local Agencies
- **Permissible Exposure Limit (PEL):** standard that sets the number of asbestos fibers a worker can be exposed to.

- **National Emission Standards for Hazardous Air Pollutants (NESHAP):** an EPA regulation that dictates requirement of ACM removal before remodel/demo in order to prevent significant asbestos release into the air.
- **Asbestos Hazards Emergency Response Act (AHERA):** an EPA regulation that handles asbestos found in K-12 schools, and requires that all facilities be inspected to determine the presence and amount of asbestos
- **OSHA:** designed to protect workers who handle ACM and other hazardous materials
- **Lead:** toxic material once used in paint and other household products, found in air from industrial sources, and in drinking water from plumbing materials.

Facts/Rules:

- Asbestos
 - The three most common types of asbestos found in buildings are:
 - **Chrysotile:** white asbestos, accounts for about 95% of asbestos found
 - **Amosite:** brown asbestos
 - **Crocidolite:** blue asbestos
 - Asbestos was originally used for spray fireproofing, sound proofing, pipe insulation, floor/ceiling tiles, mastic, etc.
 - EPA banned spray application of asbestos containing fireproofing materials in 1973
 - Laboratory analysis is the only way to positively identify asbestos
 - Owner is responsible for cost to identify and remove asbestos.
 - Removal is less of a concern if no children will be living in the building
 - Health Hazards known to exist from exposure:
 - **Asbestosis:** non cancerous chronic respiratory disease caused by accumulation of asbestos fibers in the lungs
 - **Cancer of Lung, Stomach, and/or Colon**
 - **Mesothelioma:** rare cancer in the thin membrane lining the chest and abdomen
- Lead
 - Typically lead based paint that is in good condition is not a hazard
 - Children under 6 are at the greatest risk for lead poisoning
 - Most common sources for lead poisoning are by breathing or swallowing the following:
 - Deteriorating lead based paint
 - Lead contaminated dust
 - Lead contaminated residential soil
 - Health Hazards known to exist from exposure:
 - Children:
 - Damage to brain and nervous system
 - Behavioral and learning problems (e.g. Hyperactivity)
 - Slowed growth
 - Hearing Problems
 - Headaches
 - Adults:
 - Reproductive Problems
 - High blood pressure
 - Nerve disorders
 - Memory/concentration problems
 - Muscle/joint pain

Concepts/Goals: None

Processes:

- Methods to minimize/contain asbestos fibers during removal:
 - Wet methods
 - HEPA vacuuming
 - Area isolation
 - Use of Personal Protective Equipment
 - Avoid sawing, sanding and drilling
- Methods to minimize/contain lead during removal:
 - If disturbing more than 6 sf of lead paint in homes, child care facilities, or a school built before 1978, the work must be done by contractors certified by the EPA to follow procedures for safe removal
 - Contain work area
 - Minimize dust
 - Clean up thoroughly

Design Principles

Vocabulary:

- **Cardo and Decumanus:** the two major streets in a Roman town, perpendicular
- **Loop Road:** a collector/distributor road into a shopping center
- **Shakkei:** Japanese landscape technique to visually extend the foreground into the distance and surrounding context and blend new construction into it to blend the 3 together
- **Point:** a position, no dimension
- **Line:** has direction and length but no thickness
- **Plane:** has position, direction and length, but no thickness
- **Volume:** a 3D plane
- **Shape:** outline of a form
- **Size:** physical dimension
- **Color:** quality of a reflected light that articulates form and space
- **Light:** radiant energy that is perceived by the human eye
- **Texture:** applied to a surface
- **Proportion:** relationship between parts that provides harmonious order
- **Golden Section:** renaissance concept where a whole is divided so that the smaller part has the same relationship to the larger part, as the larger part has to the whole.
- **Rhythm:** regular occurrence of elements in time or space
- **Balance:** equilibrium
- **Symmetry:** balanced arrangements, typically in reference to formal design
- **Static form:** parts are equal in size and located around a reference axis
- **Dynamic form:** parts are unequal in size and arrange around a reference axis

Facts/Rules:

- Urban Organizational Patterns
 - **Linear:** in a line, connected by a transportation spine, and used when major circulation occurs between two points. Lacks a focus or center, and can be congested. Typically not used when limited by the availability of land
 - **Megalopolis:** an extensive linear arrangement of cities
 - **Axial:** like linear but in two directions.

- **Radial:** a center core where elements have a common origin or destination. It's somewhat inflexible, but compact and allows for maximum interaction.
- **Grid:** flexible, compact, and standardized layout of blocks used for complex distribution of uses. Can be boring without points of focus. Used in most US cities.
- **Precinctual:** dispersed activities likely with no center or core. Growth happens in any and all directions, and is flexible efficient, and economical
- **Concentric:** a business center in the core with concentric rings outwards. Rings blend into one another, from Original Business Center > old housing/factories > circa 1900's suburbs (streetcar suburbs) > post world war II suburbs (low density sprawl)
- **Multiple Nuclei Pattern:** several sub centers connected to each other
 - Finger plan: development occurs along transportation routes
 - Cluster/satellite plan: varying center of activities
 - Satellite pattern: like cluster, but with a distinct center (old city center)
- **Rectilinear:** streets and blocks at right angles
- **Sheet:** extensive urban area with out focal point, routes, or forms (aka sprawl)
- Standard Design Principals based on building type. Here are a few:
 - **Hotels:**
 - Separate public and private spaces from service areas/back of house function
 - Services spaces should be available on each floor
 - Unit of measure is the bed size, rooms should be sized accordingly (e.g.: a room with a king bed should be proportionally larger than one with a full bed)
 - Typical US room size = 12'-6" x 20'-0"
 - **Suburban Shopping Centers:**
 - Convenient and easy to access by both automobile and public transportation.
 - Typically car-centric, and not pedestrian friendly
 - Street Mall = 800' long (that's 4 Portland city blocks long!!) with each store given about 20'-30' of frontage and 120-140' depth.
 - A mix of tenants, shopping, food, and services (dry cleaners, banks, etc)
 - Allow 2x parking per building size (1,000 sf building = 2,000 sf parking)
 - **Schools:**
 - Separate noisy spaces (gym, cafeteria, commons) from quiet spaces (classrooms)
 - Design to mimic surrounding neighborhood character
 - Address visibility, acoustics, temperature, human scale (kid sized vs teacher sized), comfort, stimulation, and security
 - Design for teaching type (private classrooms, team teaching, open plan, etc.)
 - Standard classrooms = 800 - 1,000 sf
 - **Churches:**
 - Form is determined by ritual, standards, and history. (e.g. cathedral vs mosque)
 - Address sight lines, acoustics, procession, seating, existing congregation size and projected growth
 - Historical (pre ecumenical) organization was axial while contemporary organization is more rectangular/circular allowing for intimacy and unity.
 - **Theaters:**
 - Stage dimensions, seating and site lines vary with theater type and performance.
 - Types of stages include proscenium (most common, audience in front of stage), theater in the round (audience on all sides), thrust stage (audience on three sides)
 - Optimum depth of seating is 4-5x the stage width
 - Maintain a 30° viewing angle from the front row to the stage

- **Hospitals:**
 - Highly specialized and complex building type
 - Standard single patient rooms are 150 sf and double rooms are 200 sf (they share bathroom and lavatory)
 - Nurse stations should monitor 25 - 35 beds and be centrally located
- **Parking:**
 - Most efficient layout are 90° perpendicular spaces, which allow for the maximum amount of spaces and two way traffic
 - The cheapest parking to build is an outdoor lot, then a parking structure, then underground parking
- **Typical Building Efficiencies**
 - 55% - Hospital
 - 60% - College, Student Union; Court House; Retail Stores
 - 65% - Apartments; College, Class room & Admin
 - 70% - Auditoriums; Banks; Restaurant
 - 75% - Jails/Prisons; Office
 - 80% - Department Store
 - 85% - Garage, Service

Concepts/Goals:

- Organizational patterns are determined by site conditions and functional requirements.
- Architectural form must be determined based on function, site, cost, etc.

Processes:

- Address Human Elements
 - **Senses:** sight, sound, smell and touch give an impression of size, shape, and material. Taste probably isn't an issue unless you're dealing with Willy Wonka's flavored wallpaper :-)
 - **Style:** follow conventional and acceptable solutions to maintain consistency and harmony within space and surrounding context
 - **Culture:** different cultures use buildings differently (separation of women/men, sanitary standards, layout of spaces for rituals, feng shui, vastu shastra, etc.)
- Address building organizational values
 - **Behavioral Interests:** desired spaces to perform tasks
 - **Circulation:** ease of movement around site and building
 - **Health:** reduce stressors (noise, crowding, sun glare, sick building syndrome)
 - **Adaptability:** allow for future changes, modifications, and flexibility
 - **Cost:** use regular forms, plans, and compact arrangements
- Address building organization factors
 - **Site:** soil conditions, topography, water, sun angles, wind, noise
 - **Movement Patterns:** pedestrian and vehicular access and circulation, distribution of utilities (centralized or stacked for more efficiency)
 - **Patterns of Growth:** flexible for future use
- Determine Form:
 - Define relationship and balance between building and site:
 - A bold site with a simple building, or an empty site with a bold building

- Take cues from surrounding site/nature and blend together (shakkei/borrowed scenery) or use to dictate form (roof pitches mimic pitch of mountains)
- Address surrounding traditional form (domes, spires, roof types, elevation patterns)
- Address climate issues
- Define structure and systems (will they be exposed or hidden)
- Pursue honest tectonic form (materials do what they should, not mimic something else)
- Define scale, proportion, harmony, and hierarchy as it compares to the human body

Alternative Energy Systems, New Technologies, + Sustainable Design

Vocabulary:

- **Biophilia:** the connections that humans subconsciously seek with the rest of life.
- **Building Commissioning:** process of ensuring that systems are designed, installed, and functionally tested for effective operation/maintenance for an owner's operational needs.
- **Retrocommissioning:** systematic investigation process applied to existing buildings to improve an optimize operating/maintenance.
- **Life Cycle Costing:** provides a tool for determining long-term costs for the total building.
- **Organic feedstock:** something organic (wood fiber, paper, cotton, etc.) that mold can use as an energy source. Mold cannot eat inorganic materials like concrete, brick, or gypsum (but it loves the paper on drywall!)
- **U-Factor:** measure of heat transmission where a Low U-value has a slow heat loss or gain (brick wall) and a High U-value has a rapid heat loss or gain (window)
- **R-Value:** measure of thermal resistance in a component. (U-Value = 1/R-Value) and typically the opposite of an U-Value. Used to define level of insulation.
- **Thermal Inertia:** ability of a material to store heat (concrete/masonry walls store heat in an arid climate and release it slowly at night)
- **Design Temperature:** the average temperature that a mechanical system is designed for, either for heating (how cold it gets) or cooling (how warm it gets)

Facts/Rules:

- In the US, about 300 billion sf of building area will be constructed/remodeled by 2035.
- The architecture and building community is responsible for almost 1/2 of all US greenhouse gas emissions annually (per the US Energy Information Administration)
- North Americans spend 90% of their time indoors.
- Daylight increase productivity in the workplace and test scores in schools
- Heat loss in glass is about 20x greater than an insulated wall
- Solar heating can be cost effective, but cooling is not

Concepts/Goals:

- Green building combines the best of traditional design with updated construction technology while addressing environmental and energy crises
- Before the Industrial Revolution, environmental problems were caused mostly by concentrated amounts of compounds that occurred naturally and over time. Today the environment isn't always able to adapt to manmade materials and waste products.
- Sustainable design is the careful meshing of human purpose with the larger patterns and flows of the natural world.
- Consider stewardship, restorative acts, and regeneration of natural capital.
- Green technology follows green design (reduce need for building systems with passive design, then address the rest with systems like photovoltaics, wind power, low wattage)

Processes:

- Participate in the 2030 Challenge: a campaign to reduce fossil fuel energy consumption by designing efficient buildings or retrofitting existing ones through proper site design, building form, glass property/location, material selection, and passive heating/cooling/ventilation/daylighting.
- Minimize use of nonrenewable energy sources and maximize use of renewable energy
- Design in context:
 - Use infill/brownfield sites: reduce development on pristine habitat or farmland
 - Retain/restore waterways on or near the site
 - Use native or adapted plants that don't require maintenance and restore biodiversity
 - Plant trees to reduce heat island effect/offset carbon dioxide from building emissions
 - Use vegetated roofs to reduce amount of stormwater runoff, impervious surface area, and heat island effect. Also has a longer lifespan than a conventional membrane roofing system and lower overall maintenance cost
 - Use swales/storage basins to reduce storm water runoff
 - Avoid petroleum based fertilizers
 - Respect natural habitat/local species (be wary of noise, light pollution)
- Design in correct Climate Zone:
 - **Hot & Dry:** minimize sun exposure and effects of wind. Use small windows. Optimize thermal mass for large temperature swing during the day, and closely cluster buildings for the shade they offer each other.
 - **Hot & Humid:** minimize sun exposure, maximize natural ventilation. Use lightweight construction to minimize radiation of heat and space buildings far apart for breezes
 - **Temperate:** maximize solar gain in the winter, minimize in the summer. Maximize breezes in the summer, minimize in the winter. Take advantage of daylighting opportunities
 - **Cold:** orient buildings/openings for maximum protection from cold winds and use small windows/compact shapes to minimize heat loss. Use south facing windows to maximize solar gains.
- Create Healthy Indoor Environments:
 - Ample daylight and proper ventilation lead to greater satisfaction, more comfort, and increased productivity.
 - Supply fresh outdoor air, use passive ventilation or "Mixed-mode" systems in larger buildings that supply a mix of fresh/mechanical air.
 - Offer natural light and views to the outdoors with windows, skylights, light shelves, and the use of light colors
 - Control temperature and humidity with passive and mechanical technologies that are individually controlled by occupants.
 - Prevent moisture build up.
- Conserve Water
 - Reduce potable water use in irrigation and fixtures by using drip-irrigation or low-flow/graywater appliances
 - Use local vegetation that requires minimal or no irrigation
 - Compost

- Catch rainwater for flushing fixtures, irrigation
- Treat backwater through an on site living machine so it can be reused
- Use few impermeable surfaces
- Use environmentally preferable building materials
 - Build to the size that is needed and no larger
 - Use materials/systems engineered for maximum efficiency
 - Use durable materials that last longer and with fewer maintenance resources
 - Avoid irreplaceable/engaged resources
 - Use renewable/well managed resources
 - Use recycled/recyclable resources and avoid anything that's toxic
 - Avoid materials that general pollution during manufacturing, building, use, or disposal
 - Use materials with low embodied energy (how much fossil fuel was used to make it?)
 - Use materials the help conserve energy (thermal mass for energy, light reflective surfaces, radiant barriers, insulation)
- Plan for the long term
 - Maximize ecological, social, and economic value over time.
 - Build buildings to last (duh!)
 - Design for adaptability to accommodate future changes in program and use
 - Design for versatility to accommodate future changes in technology
 - Design for durability by using materials, construction methods and structural systems that will withstand weather, long term use, and catastrophic events.
- Make changes based on wisdom and user feedback
 - Postoccupancy surveys
 - Install equipment to monitor building performance
 - Design smaller/simpler buildings with accessible systems and short feedback loops
 - Develop a common language of building metrics understood by designers and users (e.g. This building gets xx miles per gallon)
 - Develop and share case studies. Don't hog work, ideas, and findings!!

Architectural History + Theory

People to Know:

Christopher Wren

Title:	Royal Architect
Dates/Era:	English Baroque
Location:	London, England
Significance:	- Masterplan for London after Great Fire of 1666 (not used) - St. Paul's Cathedral in 1710 - Designed 52 London churches

Kevin Lynch

Title:	Urban Planner
Dates/Era:	1950s/1960s
Location:	New England, USA
Significance:	- Studied under FLW at Taliesin/Professor at MIT - Coined "imageability" and "wayfinding"

- Wrote ***The Image of the City*** how users perceive and organize space as they navigate through cities. Also known as **legibility**, the ease with which people understand the layout of a place based on the following:
 - Paths:** streets, sidewalks, trails that people travel on
 - Edges:** perceived boundaries like walls, buildings, shorelines
 - Districts:** city sections distinguished by some identity/ character
 - Nodes:** focal points, intersections
 - Landmarks:** readily identifiable objects become reference points

Christopher Alexander

- Title: Architect
- Dates/Era: 1970s - present
- Location: California, USA
- Significance:
 - Wrote ***A Pattern Language*** which described a practical architectural system in what's called a "generative form". It provides rules to follow but leaves aesthetic and design decisions to the architect based on the environment. Offers methods for construction of practical/safe designs for everything from regions to hardware fixtures.

Jane Jacobs

- Title: Writer/Activist
- Dates/Era: 1950/1960s
- Location: New York City, USA/Toronto, Canada
- Significance:
 - Wrote ***The Death and Life of Great American Cities*** which is a critique of urban renewal policy of the 1950s and how they destroyed communities and created isolated, unnatural urban spaces. Wanted to abolish zoning laws and restore free markets in land. Wanted dense, mixed-use neighborhoods and vibrant communities
 - Frequently cited **Greenwich Village** as an example of a vibrant urban community
 - Coined phrase "eyes on the street" a reference to natural surveillance by people in their neighborhood

Camillo Sitte

- Title: Architect
- Dates/Era: Late 1800's
- Location: Europe
- Significance:
 - Authority on urban construction planning/regulation in Europe
 - Thought that the experience of an irregular urban structure with big plazas and monuments was more appropriate than the hygienic planning procedures in practice at the time.
 - Wrote ***City Planning According to Artistic Principles*** which suggested that the quality of urban space is more important than architectural form (the whole is much more than sum of its parts)
 - Planning cannot be done in two dimensions, but three.

- Believed Greek spaces like the **agora** (gathering place) or **forum** (marketplace) were good urban spaces
- Said a public square should be seen as a room and should form an enclosed space
- Churches and monuments shouldn't be isolated, but integrated into the squares

Baron Haussmann

Title:	Civic Planner
Dates/Era:	Mid 1800s
Location:	Paris, France
Significance:	<ul style="list-style-type: none"> - Responsible for the plan to rebuild and "modernize" Paris under Napoléon III - Encompassed all aspects of urban planning, both in the city center and in the surrounding districts. - Cut down the Luxembourg Garden and destroyed much of the old city with twisting streets and rundown apartments. - Built new wide tree lined boulevards. Placed regulations on facades/heights of buildings, public parks, sewers/waterworks, facilities and monuments. - Influenced by the frequency street revolutions, now streets were too broad for rebels to build barricades and military could assemble and get through

Tony Garnier

Title:	Architect/City Planner
Dates/Era:	1920s
Location:	Lyon, France
Significance:	<ul style="list-style-type: none"> - Wrote <i>Une Cité Industrielle</i> which suggested that functions of a city could be separated by zoning into four categories: leisure, industry, work, and transportation - Was developed in response to the industrial revolution - Schools and vocational schools are placed near the industries they're related to, and there are no churches or government/police buildings so man can rule himself. - Pioneered the use of reinforced concrete - Designed innovative building block with free standing houses - Enormous open spaces. There are few squares or parks - Trees are incorporated into important streets

Sir Ebenezer Howard

Title:	Writer/Parliament Recorderkeeper
Dates/Era:	1910s
Location:	London, UK
Significance:	<ul style="list-style-type: none"> - Wrote <i>Garden Cities of To-morrow</i> which describe a utopian city where people live harmoniously with nature, the basis for the Garden City Movement. - "Three Magnets" pull a people are: town, country, town-country - Suburban towns of limited size, but financially independent could be planned ahead and surrounded by a belt of agricultural land,

balancing the desire for the city and the country. These cities would be connected by a ring of rail transportation and surround a large central city.

Pierre Charles L'Enfant

Title:	Architect/Civil Engineer
Dates/Era:	Late 1700's/Early 1800's
Location:	New York, USA
Significance:	<ul style="list-style-type: none"> - Submitted plans for the federal city in Washington DC that followed a Baroque planning elements including grand radial avenues, sight lines, ceremonial spaces, and respect of natural contours of the land. The two most important buildings on the avenues were to be the houses of Congress and the President. - Visual connections would be made down avenues to ideal sites throughout the city, including buildings, monuments, and fountains - Was dismissed of his duties and city plan was awarded to surveyor Andrew Ellicott, who's revisions became the basis for the development - In 1901 a partial redesign of the capital used L'Enfant's plans, including the development of the national mall where his largest avenue was originally intended.

Daniel Burnham

Title:	Architect/Urban Planner
Dates/Era:	Late 1800s/Early 1900s
Location:	Chicago USA
Significance:	<ul style="list-style-type: none"> - Instrumental in the development of the skyscraper, key contributor to the Chicago School, and served as director of the World's Columbian Expo - Studied under William LeBaron Jenney and opened a firm with John Root - Designed one of the first skyscrapers: the Masonic Temple Building, which was 21 stories tall, and a skeleton frame - Designed the Flatiron Building in New York and Union Station in Washington DC - Designed the Monadnock, Reliance Building, Rookery offices, the general plan for the World's Columbian Expo in Chicago - Prepared the Plan of Chicago which laid out plans for the future of the city which controlled growth and suggested that every citizen should be within walking distance of a park - Helped with McMillan Plan which led to overall design of the national mall in Washington DC

William LeBaron Jenney

Title:	Architect
Dates/Era:	Late 1800s
Location:	Chicago, USA
Significance:	- "The Father of the American Skyscraper"

- Designed the **Home Insurance Building** the first fully metal framed building, considered to be the first skyscraper (8 stories)
- Used masonry, iron, and terra cotta flooring and partitions for fireproof construction

Clarence Stein

- Title: Architect/Urban Planner
 Dates/Era: Early 1900s
 Location: New York City, USA
 Significance:
 - Major proponent of the **Garden City Movement** in the USA
 - Collaborated with **Henry Wright** to design **Rayburn, New Jersey** a garden suburb noted for its superblock layout. There was total separation between the automobile and the pedestrian.

Lewis Mumford

- Title: Historian/Author
 Dates/Era: 1950s - 1980s
 Location: New York City, USA
 Significance:
 - Believed that what sets humans apart from animals is not our use of tools, but our use of language/symbols.
 - friends with **Frank Lloyd Wright, Clarence Stein, Edmund Bacon**
 - Critical of urban sprawl and argued that the structure of modern cities is partially responsible for social problems seen in western society. Argues that urban planning should emphasize organic relationships between people and their living spaces
 - Said the medieval city should be the basis of the ideal city. Modern cities are too much like Roman cities (a sprawling **megalopolis**) which ended in collapse.

Frederick Law Olmstead

- Title: Journalist/Landscape Architect
 Dates/Era: Late 1800s
 Location: New York City, USA
 Significance:
 - "The father of Landscape Architecture"
 - Famous for designing **Central Park** and **Prospect Park** as well as many parks throughout the country

Clarence Perry

- Title: Planner/Writer
 Dates/Era: 1920s/1930s
 Location: New York City, USA
 Significance:
 - A strong advocate of the neighborhood community and recreation center
 - Wrote **The Neighborhood Theory** which served as a framework to design functional, self-contained neighborhoods in industrial cities. Included the following core principles:

- No major traffic through residential areas, arterial streets should form the perimeter to define the “place” of the neighborhood
- Interior streets to use cul-de-sacs and curves for low volume traffic
- Population would be determined by the number of people needed to support one school, and would be about 160 acres with 10 families per acre.
- The school would be at the center of the neighborhood so that a child would have to walk 1/4 mile - 1/2 mile, and without crossing any major streets
- Shopping, churches, services would be placed on the edge of the neighborhood so that nonlocal traffic wouldn't intrude on the neighborhood
- 10% of the land area would be dedicated to parks and open space for community

Patrick Geddes

Title:	Biologist/Town Planner
Dates/Era:	Late 1800s
Location:	France
Significance:	<ul style="list-style-type: none"> - Responsible for introducing the concept of region to architecture - Believed that by changing spatial form, it would be possible to change the social structure as well - Emphasized the preservation of human life and energy rather than superficial beautification. The happiness, health, and comfort of all residents is more important than the roads and park for the rich.

Le Corbusier

Title:	Architect
Dates/Era:	1910s - 1950s
Location:	France
Significance:	<ul style="list-style-type: none"> - One of the pioneers of Modern Architecture - Distanced himself from the past, and based designs on functionality without ornamentation - Developed the Five Points of Architecture which included: pilotis (reinforced concrete stilts), a free facade (non supporting walls designed however), open plan (no structure in the way), ribbon windows (for unencumbered views), and roof garden (green area consumed by the building on the ground was relocated to the roof) - Developed The Modulor a continuation of architectural scale and proportion based off the human body, the golden ratio, fibonacci numbers, and the double unit

Louis Sullivan

Title:	Architect
Dates/Era:	Late 1800s/Early 1900s
Location:	Chicago, USA
Significance:	<ul style="list-style-type: none"> - Father of the modern skyscraper, critic of the Chicago School, mentor to Frank Lloyd Wright, and inspiration to the Prairie School. - Used steel frames with terra cotta to create tall buildings that emphasized verticality - Believed that the exterior of a building should reflect its interior structure and function. Ornamentation must be derived from nature rather than classical architecture of the past

Frank Lloyd Wright

Title:	Architect
Dates/Era:	Early 1900s
Location:	Chicago, USA
Significance:	<ul style="list-style-type: none"> - Leader of the Prairie School, and emphasized structures built in harmony with humanity and its environment, notably seen in Fallingwater.

Buckminster Fuller

Title:	Architect/Engineer/Inventor
Dates/Era:	Mid 1900s
Location:	Los Angeles, USA
Significance:	<ul style="list-style-type: none"> - Developed the geodesic dome, and futuristic prototype housing

Walter Gropius

Title:	Architect
Dates/Era:	1910s-1950s
Location:	Germany/Boston, USA
Significance:	<ul style="list-style-type: none"> - Founder of the Bauhaus School, pioneer of modern architecture, and the International Style. - emphasized the gesamtkunstwerk or total work of art

Ludwig Hilbersimer

Title:	Architect/Urban Planner
Dates/Era:	1920s-1950s
Location:	Germany/Chicago, USA
Significance:	<ul style="list-style-type: none"> - Taught at the Bauhaus - Wrote City Plan which emphasized street hierarchy including safety for children to walk to school while increasing the speed of vehicular circulation - Developed studies for the new town center which was a dissolution of major cities and a complete penetration of landscape and settlement - In order to create a sustainable relationship between human, industry, and nature, human habitation should be built in a way to secure people against disaster and crisis

Ludwig Mies van der Rohe

Title:	Architect
Dates/Era:	1920s-1950s
Location:	Germany/Chicago, USA
Significance:	<ul style="list-style-type: none"> - Pioneer of modern architecture, - “Less is more” and “God is in the details” - Sought a rational approach that would guide architecture through a creative process

Charles McKim

Title:	Architect
Dates/Era:	Late 1800s
Location:	Germany/Boston, USA
Significance:	<ul style="list-style-type: none"> - Member of McKim, Mead, and White bringing beaux-arts architecture to America. Notable buildings include Boston Public Library, Penn Station, New York Herald Building

Phillip Johnson

Title:	Architect
Dates/Era:	1940s - 2000s
Location:	New England, USA
Significance:	<ul style="list-style-type: none"> - Modern architect that worked in simple materials and glass. - Notable buildings include the Glass House and The Seagram Building

Places to Know:

Piazza Saint Peter

By:	Gian Lorenzo Bernini
Dates/Era:	1650s - 1660s
Location:	Rome
Significance:	<ul style="list-style-type: none"> - Designed so that the greatest number of people could see the Pope give his blessing - Used doric columns so not to compete with the palace-like faced by Carlo Maderno, but done at such a huge scale to evoke emotions of awe

World's Columbian Exposition

By:	Daniel Burnham and Frederick Law Olmstead
Dates/Era:	1893
Location:	Chicago, USA
Significance:	<ul style="list-style-type: none"> - Celebrated the 400th anniversary of Columbus' arrival - The prototype of what they thought a city should be - Showed desirable results could be achieved through organized efforts - Designed to follow Beaux Arts principles and French neoclassical architecture based on symmetry, balance, and splendor.

Savannah, Georgia City Plan

By: **James Edward Oglethorpe**
 Dates/Era: 1770s
 Location: Georgia, USA
 Significance: - first colonial town laid out on a grid system
 - groups of 40 houses are bound by major streets and each section has a public square

Philadelphia, Pennsylvania City Plan

By: **William Penn**
 Dates/Era: 1690s
 Location: Pennsylvania, USA
 Significance: - an early attempt at a “pre planned” utopian city based on a grid

Letchworth Garden City

By: **Ebenezer Howard**
 Dates/Era: 1903
 Location: Hertfordshire, England
 Significance: - the world’s first **Garden City**

Welwyn Garden City

By: **Ebenezer Howard**
 Dates/Era: 1920
 Location: Hertfordshire, England
 Significance: - the second **Garden City** and one of the first **New Towns**

Radburn, New Jersey

By: **Clarence Stein**
 Dates/Era: 1928
 Location: New Jersey, USA
 Significance: - first **Garden City** plan in the USA. It took on planning for pedestrians and automobiles, by the use of underpasses to allow pedestrians to pass under automobiles. Only 1 underpass was constructed

Reston, Virginia

By: **Robert Simon**
 Dates/Era: 1964
 Location: Virginia, USA
 Significance: - Influenced by the Radburn plan. It was the first modern post-war planned community, and features a series of underpasses that promote travel on foot

Williamsburg, Virginia

By: **Rev. W. Goodwin/John D. Rockefeller**
 Dates/Era: 1920s/1930s
 Location: Virginia, USA
 Significance: - Part of the city was acquired and restored/preserved/reconstructed to become the Colonial Williamsburg foundation

Charleston, South Carolina

By:	-
Dates/Era:	1931
Location:	South Carolina, USA
Significance:	- First city in the USA to establish a "historic district" as a response to the growing number of aging buildings from theft, demolition, and neglect

Eras/Styles to Know:

Romanesque

Dates/Era:	900s - end of 1100's
Location:	Medieval Europe
Significance:	- Round headed arches, arcades, symbolism, sometimes squished elements to fit into tight spaces

Gothic

Dates/Era:	1100s - 1300s
Location:	Europe
Significance:	- Popular for religious structures, and featured the development of the pointed arch, buttressing, and ribbed vaults. - allowed for thinner walls, larger glass windows, and vaults to be constructed over bays that were square/rectangular/odd shaped

Georgian

Dates/Era:	Late 1760s- 1790s
Location:	England/Colonial America, USA
Significance:	- General buildings were 5 bays with 2 stories and a central door, a double gambrel roof, quoining, heavy detailing (molding profile, keystone) thick chimney, 12 over 12 windows that were small compared to the building mass, and mutule blocks

Federal/Adamesque

Dates/Era:	1790s - 1820s
Location:	USA
Significance:	- Style that originated from Pompeii. - Delicate detail & ornamentation, 12 over 12 windows, circulate window in pediment, pilasters that create arcade, splayed/point lintel, finely carved moldings, fan/transom lights around doorway,

Greek Revival

Dates/Era:	1840s - 1860s
Location:	USA
Significance:	- Looks like a temple with chunky details, arched columnist with correct proportions, full pediment, correct entablature (cornice, freeze, architrave), 6 over 6 windows, squared lintel, earlier examples have lower pitched roof - Facades were in antis (two columns and two pilasters on facade)

Gothic Revival

Dates/Era:	1850s - 1860s
Location:	England (never took off in US)
Significance:	- sought to revive medieval forms in contrast to the neoclassical/ beaux arts styles prevalent at the time. Associated w/churches - steep pitch roof, painted arches, verge board, wall dormers, irregular "L" shaped plan, flat buttressing

Italianate

Dates/Era:	1865 - 1880
Location:	England/Northern Europe/US
Significance:	- Modeled on 16th century Italian renaissance architecture with picturesque aesthetics. - very tall/elongated feeling with irregular or symmetrical plan, 2 over 2 long narrow windows, paired bracket, cupola, corner quoining, squared columns with chamfered corners, cast iron details, heavy hood moldings, multiple story bay windows, shallow dormers and narrow double leaf doors.

Second Empire

Dates/Era:	1870s - 1880's
Location:	USA
Significance:	- Exactly like Italianate but with mansard roofs

Shingle Style

Dates/Era:	Late 1880s
Location:	USA/New England
Significance:	- Closely related to masonry, mimics the shape of stone, has shingles used as membrane, cavernous openings in gable are emphasized, as well as the overall volume of the building instead of details, gambrel roofs have curve edges, and shingles curve around corners and protrusions

Richardsonian Romanesque

Dates/Era:	1880s
Location:	USA
Significance:	- developed by H.H. Richardson, and basically a masonry version of the Shingle Style

Queen Anne

Dates/Era:	1880s - 1900s
Location:	USA
Significance:	- Hybrid with Shingle Style that emphasizes many wild colors, scalloped shingles, gable screens (combined verge board) turrets/towers, irregular floor plan, clapboard siding, starburst motifs, weathervanes/finials, 1 over 1 windows typical, cube/ pyramid roof, slate wallhangings/roof, chamfered bays, oriel windows, big windows with little on top

- Heavy, big proportions, with roundheaded arches, belt courses, different color stones, and ornamentation in sandstone.

American Four Square

- Dates/Era: 1890s - 1930s
 Location: USA
 Significance: - A building **type** that can be applied to any style.
 - typically a cube, with a door and window on first floor and two windows on the second floor, and a hipped roof

Colonial Revival

- Dates/Era: 1890s - 1930s
 Location: USA
 Significance: - Excessive in every way, classical columns, 8 over 8 sash windows or any # over 1 windows, blown out of scale details, swans neck pediments

Prairie School

- Dates/Era: 1890s - 1920s
 Location: USA
 Significance: - Low and wide projections that emphasize horizontality, broad eaves, stucco facades, windows and doors tucked under eaves for privacy.
 - Typically associated with **Frank Lloyd Wright**

Bungalow/Craftsman

- Dates/Era: 1913 - 1920s
 Location: USA
 Significance: - Low, small and modest construction that has a Japanese influence with square battered columns, exposed rafter tails, and emphasis of craftsmanship in design (clinkerbrick!) wide eaves, ideas borrowed from single style, and considered a dignified middle class home

Art Deco

- Dates/Era: 1929
 Location: USA
 Significance: - Vertical/stripped down gothic that seems to go on forever to the sky, any ornamentation is replaced with mechanics, and alludes to speed and industry

International Style

- Dates/Era: 1920s
 Location: Western Europe
 Significance: - An effort to industrialize craft traditions, which led to the **Bauhaus** school led by **Gropius**

Industrial Revolution

- Dates/Era: 1790s - 1860s
 Location: UK/Western Europe/USA
 Significance: - Transition from manual labor to machine based manufacturing beginning with textile industries, and the increased use of coal. Cities became dirty, unsafe places.
 - Prompted a reform movement that lead to many ideas about planning

Ordinance of 1785

- Dates/Era: 1785
 Location: USA
 Significance: - Started the rectangle survey system of the United States that reinforced the idea of grid planning that began with Penn's plan for Philadelphia

Beaux Arts Architecture

- Dates/Era: 1670s - 1960s
 Location: Europe and the US (1880 - 1920)
 Significance: - Academic neoclassical architectural style taught at the Ecole des Beaux-Arts in Paris.
 - Slightly over scale details, bold sculpture, deep cornices, swags, flat roof, hierarchy of spaces (from grand staircases to small utilitarian services), arched windows, arched/pedimented doors, classical details, symmetry, sculpture, murals, and coordinated artwork
 - In the US, the "White City" of the **World's Columbian Expo** was an example of the movement.

City Beautiful Movement

- Dates/Era: 1890s - 1900s
 Location: United States (Chicago, Detroit, DC)
 Significance: - Progressive architecture and urban planning movement with the intent of using beatification and monumental grandeur in cities to counteract the moral decay of poverty stricken urban environments.
 - It wasn't beauty for beauty's sake, but for social control and improvement of the lives of the inner-city poor.

New Urbanism:

- Dates/Era: 1980s - present
 Location: United States
 Significance: - Reform all aspects of development and urban planning (from urban remodels to suburban infill) to contain a diverse range of housing and jobs and be walkable.
 - **Ahwahnee Principles** were developed by **Duany, Platter-Zebeck, Calthorpe**, and others as a set of community principles

for land use planning that reduce traffic congestion, increase the supply of affordable housing, and rein in urban sprawl.

Other History to Know:

- **Greek Towns:** created by **Hippodamus** in 400 BC were the first urban planned cities. They used a rectilinear grid pattern with a large central area which became the **agora**, the center of the city and the society.
- **Roman Towns:** attributed to **Vitruvius** in 30s BC were rectilinear grid pattern enclosed in walled city, and built off of two main streets the **cardus and decumanus**. Towns were either for commerce or military.
- **Medieval Towns:** typically built between 1100s-1350s and had no geometry or grid, but were walled for defense.
- **Renaissance Towns:** typically built between 1300s-1600s, had a town square that was the focus, and cities were often star shaped, and built off of medieval plans
- **Baroque Towns:** typically built between 1600s - 1900s as a growth of the Renaissance. Used boulevards and avenues to connect various parts and expand the city.
- **Ownership of Land:**
 - Land was first owned communally. In England, land was owned by the King and was given to people in return for their loyalty, support, or military service
 - **Primogeniture:** land was passed from father to eldest son
 - **Fee Simple:** land could be transferred and used however the owner pleased
 - **Homestead Act:** 160 acres was free and transferred to private ownership provided a person built a house and lived on the land for five years.

CONTENT AREA: CODES + REGULATIONS

Government + Regulatory Requirements + Permit Process

Vocabulary:

- **Zoning:** uniform standards of construction originating in NYC in 1916 to protect the health, welfare and safety of people. Regulates the use of land, light, air, and open space while protecting property values and protecting against nuisances (factories in residential areas), undesirable businesses (porn shops by schools) and dangers (hazardous chemicals in public areas).
- **Incentive Zoning:** encourages private developers to provide amenities for public use in exchange for opportunity to build larger or taller structures on a site.
- **Nonconforming Use:** building is no longer permitted by the zoning ordinance. Typically allowed to stay unless it's unsafe.
- **Conditional Use:** a building that is permitted in an area that it is not zoned for, to benefit the public (e.g.: an elementary school in a residential neighborhood)
- **Variance:** applied for by an owner on a private site to ask to deviate from an ordinance in order to avoid hardship.
- **Spot Zoning:** a change in the zoning ordinance for a particular area
- **Ordinance:** a municipal law
- **Setbacks:** required open space measured between property line and face of building. Used to preserve light, air, and spaciousness
- **Building Line:** utilized by communities principally to achieve planned street patterns. They help insure that buildings will not be erected in the bed of projected streets or of potential street widenings.
- **Easements:** legal right of government or another land owner to use one's property for a specific purpose
- **Scenic Easement:** Prevents development that upsets something scenic to the public
- **Prescriptive Code:** Building code that specifies techniques, materials and methods to be used. Cut and dry and simple to administer by the official
- **Performance Code:** Building code that describes functional requirements, but leave method to achieve decisions up to the designer.
- **Fire resistance** values for how long a separation can resist the passage of fire. Stated in terms of hours and can be increased with the use of sprinklers. (eg: walls, doors, windows, floors, etc.)
- **Flame Spread Rating/Smoke Developed Ratings** measures the amount of flame and smoke a material generates. (e.g. Carpet, fabrics, etc)
- **Area of Refuge:** a location designed to hold occupants when evacuation is not safe or possible. Has a steady supply of outside air, passive fire protection, electrical integrity/emergency lighting, two way communication/call box to 24 hr manned, or outside line

Facts/Rules:

Road/Street Design

- Roads consist of straight sections (tangents) and simple curves
 - Avoid intersections that are slightly offset (like Leiser/McGloughlin)
 - Avoid intersection where the angle of roads is less than 80°

- Cartridge Roads are loop distributor-collector drive with access to the local road
- At intersections with more than 750 cars per hour, a traffic light is required
- At intersection with more than 3,000 cars per hour, grade separation is required
 - Cloverleaf: two level interchange
 - Direct left turn: where two expressways intersect
 - Diamond: expressways intersect secondary roads
- Maximum length of a block = 1,600' (that's 8 Portland Blocks!)
- Cul-de-Sacs = 400' max w/ 80' turn around
- 2 lane highway w/ 9'-0" shoulders = 40'-0" - 42'-0"
- Typical Surface Streets
 - Made of concrete, asphalt, grave, or decomposed granite
 - Width = 11'-0" - 12'-0" wide
 - Heavy Traffic Streets = 6" concrete curb and gutter
 - Minor Streets = 4" roll curb or gravel
 - Minimum curb radii @ minor streets = 12"
 - Minimum curb radii @ major streets = 50"
 - Landscape strips = 7' w/trees or 4' wide w/ground cover

Parking Design

- Spaces are typically 9'-0" wide and 18'-0" - 20'-0" long
- Accessible spaces are minimum 8'-0" wide with access alley 5'-0" wide for cars or 8'-0" wide for vans adjacent to the space
- Allow 290 sf / car when designing a lot
- Plan for 3,000 - 4,000 sf of parking for every 1,000 sf of shopping space
 - Clearance between cars = 20"
 - Circulation Aisle = 12'-0" wide
 - In lots with attendants = 8' x 18' stalls and 20' aisles
- Angle of parking affects projection and bay width of double loaded aisle:

30° parking	=	15'-7" projection	=	43'-2" bay width
35° parking	=	16'-7" projection	=	45'-2" bay width
40° parking	=	17'-6" projection	=	47'-0" bay width
45° parking	=	18'-2" projection	=	48'-4" bay width
- 90° parking is most efficient = 11 cars/100 lineal feet of curb
 - makes for easy two-way traffic and can accommodate most cars. The only disadvantage is that it can be difficult to maneuver
- 60° parking is pretty efficient = 9 cars/100 lineal feet of curb
 - Relatively economical and allows easy access to and from parking spaces
- 45° parking is pretty efficient = 8 cars/100 lineal feet of curb
 - Relatively economical and allows easy access to and from parking spaces
- 30° parking is least efficient = 5 cars/100 lineal feet of curb
 - Uneconomical.
- Slopes in parking lots should be 5% max
- In multiple story lots, ramps should be 15% max, with 8' transitions

Pedestrian Circulation

Area of a person	=	3 sf
Easy movement	=	13 sf
Crowd movement	=	7 sf
No movement	=	3 sf

Sidewalks	=	5'-0" wide min
Collector walks	=	6'-0" - 10'-0" wide min

Public Transit

- Collective Transit System: needs at least a population density of 30 persons per acre.
- Max distance to walk to a stop is 1/4 - 1/2 mile
 - Local Bus (short trips in city/long trips in burbs) = 15 - 30 mph
 - Express Bus (between medium density areas) = 40 - 60 mph
 - Rail (between areas with high density) = 40 - 70 mph

Egress Requirements

- Typical common path of travel = 75'-0" max per path
- Typical distance to an exit = 250'-0" max
- Exits cannot pass through:
 - Kitchens
 - Storerooms
 - Closets
 - (or spaces used for similar purposes)
 - Through rooms that can be locked to prevent egress
- One **Fire Tower** is required in buildings over 75'-0" (one exit, minimum)
 - Non combustible construction that is connected with mechanically vented vestibules on backup power or balconies
- Doors must swing in the direction of travel
- The number of exits is based on the number of occupants
 - Typically spaces with more than 50 occupants must have 2 exits
- Required width of exits is determined by occupants on the floor plus an allowance for occupants from floors above
- Elevators are not a means of egress
- Escalators provide a conduit for smoke and are not an approved exit
- Ramps may constitute a portion of the required legal exits
- Revolving doors must collapse to be part of required legal exit

Ventilation Systems

- Minimize the circulation of smoke by:
 - Isolating the circulation system of each fire area
 - Shifts from normal to top exhaust when there's a fire
 - Increasing air pressure to prevent flow of smoke and fumes

Standpipes

- Required for buildings with 3 or more stories
- Must be in working order during construction
- **Wet Standpipe**: continuously pressurized with water from a public supply. Hose cabinets are located at fixed distances, and hoses can be operated by occupants
- **Dry Standpipe**: not connected to a constant water supply, the firemen connect to an outside hose connection point. Cabinets are located in smoke proof stair towers and hoses are used by firemen
- **Combination**: both wet and dry. Must deliver 35 gallons/minute from each of two outlets simultaneously.

Fire Alarms

- Instal both local alarms and alarms connect to the Fire Department.
- The one to the fire department can be manual or can be through automatic fire sensors.
- Sensor types:
 - Fixed Temperature
 - Smoke Detector
 - Product of Combustion

Water

- Dual water mains service both sides of the street = 6" residential or 8" high density
- When density is less than 1,000 people/square mile there's typically no public water supply
- Valves are located so that no single break in a line impacts more than 500'-0" of water
- Main water supplies are installed in a branch or gridiron system
- Main Wastewater lines are located at the center of the street
- Do not put wastewater/water lines adjacent for fear of contamination if a break/leak
- Wastewater lines on site need to be designed first to accommodate pitch and gravity
 - To convey solid material, must have up to a 2% slope, with velocity of 2 - 10 ft/second

Concepts/Goals:

- **Zoning Codes** vary between every city, and influence building design through the regulation of land, function, size, and exterior elements.
- If zoning ordinances and building codes give different maximum heights or areas, the lower of the two takes precedence.
- **Fire Resistance** is intended to permit safe egress, maintain structural integrity, limit the spread of fire help extinguish blaze, limit damage, and avoid collapse

Processes:

- **Determine Occupancy**
 - Establish one or more occupancy categories for a building and understand how the code treats different configurations and the relationship between different occupancies
 - **Incidental Use Areas:** areas treated as incidental must be separated by a one-hour fire barrier that have self-closing doors with no air transfer openings and/or have a fire suppression system
 - **Accessory Use Areas:** to be considered an accessory, an area can't exceed 10% of the total floor area allowed by the height/area table
 - **Mixed Occupancy:** if occupancies in a building are too large to be considered incidental/accessory then the building is considered to have mixed occupancy.
- **Identify Thresholds and Fire Areas**
 - Code emphasizes the importance of installation of an automatic fire suppression system. The threshold limit for fire suppression is based on one or more of the following:
 - The fire area or building are in which the occupancy is located
 - Where the occupancy is located in the building
 - The number of occupants in a building or fire area
 - Fire areas are enclosures that provide a certain number of hours protection based on the risk associated with the occupancy. e.g.: High Hazard (H) = 4 hrs, Utility (U) = 1 hr
 - Each fire area must be surrounded by firewalls, fire barriers (floors and walls) or exterior walls and roof.

- To avoid installing fire suppression within a space, a fire area separation can be used to subdivide a single occupancy.
 - As long as the fire areas with a building fall below the limits, no fire suppression is needed
- Sprinklers are required for any windowless stories, building taller than 55'-0", and underground structures with the lowest level below 35'-0" from the lowest level of exit discharge
- **Identify the Type of Construction**
 - Determining the limits on building height and area is tied to several factors, including the occupancy and if the building is fully sprinklered.
 - Classified according to degree of Fire resistance and determined by fire zone it is located and intended use
 - Buildings are allowed to have a one story and 20'-0" height increase if the building is protected throughout by a sprinkler system (does not apply to H occupancies)
- **Determine the Means of Egress**
 - Includes the path from any occupied space in a building to the public way, broken down into three elements:
 - **Exit access:** distance a building occupant must travel from the most remote point in the occupied portion of the exit access to the entrance of the nearest exit
 - Travel distance within a space is typically limited to 75'-0" before two distinct paths are required.
 - When a building requires two exits, the travel distance is only measure to one of the exits, not both
 - The overall travel distance from any space within a suite of offices to an exit is 250'-0", which includes the 75' of travel distance to an exit
 - **Exit:** a door that opens directly to the outside or a protected stair/ramp
 - Enclosed stairs are required to provide a fire-rated enclosure for 1 hour (2 hours if stair connect 4+ stories)
 - No limit on distance traveled within an enclosed exit
 - 50% of exits can discharge through a lobby space on the level of exit discharge if protects and has a sprinkler system
 - **Exit discharge:** the path between the exit door and the public way.
 - No dimensional limits on the travel distance once outside the building (except if exits discharge onto a balcony).
- **Determine System Requirements**
 - Other elements of the code will influence the design, including ventilation, plumbing, structural, materials, etc.
 - **Ventilation:** HVAC limits are based on minimum requirements for recirculated and fresh air required in a building from operable windows and openings. Mechanical ventilation is not required in any building, except when natural ventilation is not met.
 - Environmental issues like mold aren't addressed in building/mechanical code
 - Mechanical/Natural ventilation is required in crawl and attic spaces to prevent stagnant air
 - **Structural Design:** prescribes the minimum loads under various construction/load conditions.

- The building and its components are considered “dead loads”. Occupants are considered “live loads”.
- Environmental loads account for wind, snow, rain, earthquake, and floods that may impact a building
- **Special local conditions:** local code and regulations that are so specialized they can't be included in a general code.
- **Material limits:** specifications for minimum quality standards and means for determine the strength of a member to resist a given load.
 - Typical materials include concrete, wood, glass, steel, masonry, aluminum, and gypsum
 - New materials are permitted if their preference level can be proven and accepted by the review board.
- **Plumbing Fixtures:** Sanitation is fundamental to health, safety, and welfare of occupants. Types and numbers of fixtures to maintain sanitary conditions within a building type are mandated.

Adaptive Reuse of Buildings and/or Materials (also see general discussion under Programming + Analysis Content Area)

Vocabulary: None

Facts/Rules:

- National Park Service Standards for Preservation:
 - Use a property as it was historically intended to, or maximize the rendition of distinctive materials, features, spaces, and spatial relationships if there is a change
 - History character of a property will be retained and preserved. Do not replace historical materials that are intact or can be repaired
 - A property will be recognized as a physical record of its time, place, and use.
 - Changes to property that are now also considered historical will be preserved (e.g. the minoan columns at Knossos that were painted red as an act of restoration)
 - Distinctive materials/features/finishes/construction or examples of craftsmanship will be persevered
 - Existing condition of historic features will be evaluated to determine the appropriate level of intervention.
 - Chemical/physical treatments will be gentle if absolutely required.
 - Archeological resources will be protected/preserved in place
- Tax incentives and federal/state/local grants stimulate market for preservation
- Buildings must be 50 years old to qualify for listing on National Register of Historic Places

Concepts/Goals:

- Protection, maintenance, and repair are emphasized while replacement is minimized.
- Preservation/Restoration occurs to buildings that are specifically significant (designed by a famous architect, housed an important historic event, etc). These buildings are typically on the National Register of Historic Places
- Rehabilitation occurs to buildings in a significant historic district, but aren't individually significant (and are more likely to be able to take on a new use).

Processes:

- Prior to undertaking any work, a documented plan for preservation should be developed.
- **Identify, retain, and preserve historic materials and features:**
 - Identify the features that are important in defining the building's historic character and which must stay in order to retain that character.
 - Includes building siting, materials used (wood, brick, metal), features (roofs, porches, windows), interior materials (plaster, paint), interior features (wainscoting, moldings, stairways, spatial configuration, structural and mechanical systems)
- **Stabilize deteriorated historic materials/features as a primary measure:**
 - Include structural reinforcement, weatherization, or correct unsafe conditions
 - Should be carried out that it detracts as little as possible from the building appearance
 - Not necessary in every project
- **Protect and maintain historic materials and features:**
 - Protection generally involves the least degree of intervention
 - Includes maintenance of historic materials (rust removal, caulking, limited paint removal), cleaning (gutters, yard/landscaping), installing protective elements (fences, alarms)
- **Repair historic materials and features:**
 - Stabilize, consolidate and conserve
 - Includes repointing with correct strength mortar, patching/splicing/reinforcing wood/metal
 - All work should be physically and visually compatible
 - All work should be identifiable upon close inspection and documented for future research
- **Limited replacement of extensively deteriorate portions of historic features:**
 - Only use if all prior steps proves inadequate
 - Use surviving prototypes to replace missing/deteriorated in kind
 - Includes using wood where there was wood, metal where there was metal, etc.
 - Excludes hidden structural reinforcement and mechanical systems
 - All work should be identifiable upon inspection and documented for future research
- **Address energy efficiency, accessibility, health and life safety issues:**
 - Take care not to obscure, damage, or destroy character defining materials or features when upgrading a building to meet code and energy requirements.
 - Asbestos/Lead abatement should be carefully done so that important historic finishes are not adversely affected.

Specialty Codes + Regulations including accessibility laws, codes, and guidelines

Vocabulary:

- **Americans with Disabilities Act (ADA):** law that prohibits discrimination based on disability
- **Building Owners and Managers Association (BOMA):** professional organization that for commercial real estate professionals
- **Fair Housing Act:** law that prohibits housing discrimination on the basis of race, color, religion, sex, disability, familial status, and national origin.
- **HUD:** US Department of Housing and Urban Development

Rules/Facts:

- **ADA Accessibility Guidelines:**

- All new design or new construction areas must meet accessibility requirements
- Includes all employee work area and temporary construction that is open to the public
- Some areas are not require to be accessible:
 - Temporary construction facilities (e.g. Job shacks, scaffolding, trailers)
 - Raised areas used for security/life safety (e.g. Security or life guard towers)
 - Non-occupiable service areas accessed infrequently for maintenance (e.g. Mechanical rooms, penthouses)
 - Tollbooths
 - Water slides
 - Non-public animal containment areas
 - Raised boxes and wrestling rings
 - Raised structures for officiating/announcing sports events

- **Dimensional Standards:**

Wheelchair Passage Width	=	32" clr at a point/36" clr continuous
2 Wheelchair Passing Width	=	60" clr min
Headroom	=	80" min
Turning Space	=	5'-0" circle min
Clear floor space	=	2'-6" wide x 4'-0" long min
Changes in levels	=	1/4" max w/o edge treatment
Beveled Edge Ok	=	1/4" – 1/2" w/ 1:2 max slope
Requires Ramp	=	1/2" or more
Doors	=	32" clr min when open 90 deg
Shallow Closet Doors	=	20" clr
Door clearance	=	1'-6" clr on pull side of door
Accessible route cross slope	=	1:50 max
Ramps	Slope =	1:20 min to 1:12 max
	Width =	3'-0" wide
	Length =	30'-0" max
	Landings =	5'-0" at each end (width of ramp)
	2 Handrails =	If rise is +6" or run is +72"
Handrail Height	=	34" min - 38" max
Handrail Cross Section	=	1-1/4" - 2" and 1-1/2" clr from wall
Handrail Extension	=	12" past top and 12"+ 1 tread bottom
Stairways	=	48" clr between hand rails min
Walkways	=	1:20 max (5%)
Curb Cuts	=	3'-0" flared sides:1:10 max/front 1:12
Car Parking Space	=	9'-0" wide min with 5'-0" wide aisle
Van Parking Space	=	11'-0" wide min w/5'-0" wide aisle
Parking Space Location	=	200'-0" max from building entrance
7 - 50 car lot	=	2 accessible spaces
51 - 100 car lot	=	3 accessible spaces
101 - 150 car lot	=	5 accessible spaces

- An Area of Rescue will be located on one of the following:
 - A portion of a stairway landing within a smoke proof enclosure
 - A portion of an exterior exit balcony located immediate adjacent to an exit stair

- A portion of a 1-Hr fire resistive corridor located immediately adjacent to an exit enclosure
 - A vestibule located immediately adjunct to an exit enclosure constructed to the same fire resistive standards as required for corridors/openings
 - A portion of a stairway landing within an exit enclosure that's vented to the exterior and separated by 1-1/2 Hr doors, minimum
 - When approved, an area or room which is separated from others by a smoke barrier
 - An elevator lobby when the elevator shafts and adjacent lobbies and pressurized as required for smoke proof enclosures
- **BOMA Standards to calculate rentable area:**
 - Rentable area includes a share of common restrooms and corridors
 - No deductions are made for columns or projection necessary to the building
 - When measuring from an exterior wall which is more than 50% glass, measure from the inside face of glass
 - Measure to the centerline of demising walls
 - Measure to the inside face of walls
- **Fair Housing Act Guidelines:**
 - Covers most housing (owner-occupied building with 4 or less units, single family houses sold/rented by owner, and housing run by clubs that limit occupancy to members are sometime exempt)
 - Landlords/Real Estate Agents/Lenders can't take any of the following actions based on race, color, national origin, religion, sex, familial status, or handicap:
 - Refusal to rent or sell
 - Refuse to provide information regarding loans
 - Refuse to negotiate for housing
 - Making Housing unavailable
 - Deny a dwelling
 - Set different terms, conditions, or privileges for sale or rental (e.g.: rates, points, fees, monthly rent)
 - Falsely deny that housing is available for inspection, sale, or rental
 - For profit, persuade owners to sell or rent
 - Threaten, coerce, intimidate, or interfere with any exercising a fair housing right or assisting someone who is
 - Advertise or make a statement that indicates a limitation or preference based on race, color, national origin, religion, sex, familial status, or handicap
 - A resident with a documented disability cannot be refused the opportunity to make reasonable modification to their dwelling/common use area (at resident's expense) for the person to be able to use it.
 - A resident with a document disability cannot be refused reasonable accommodation in rules/policies/precuts or services, if necessary for the resident to use the building (e.g. A complex with a "no pet" policy must allow a visually impaired tenant to keep a guide dog)
 - Housing doesn't have to be made to a person who is a direct threat to the health and/or safety of others (through the use of violence, illegal drugs, etc)

- Requirements for New Buildings with 4 or more units and an elevator:
 - Public common area must be accessible
 - Doors and hallways must be wide enough for a wheelchair (32"-36" min)
 - All units must have:
 - An accessible rough into and through the unit
 - Accessible light switches, electrical outlets, thermostats, etc
 - Reinforced bathroom walls to allow later installation of grab bars
 - Kitchens/bathrooms can be used by people in a wheelchair
 - These rules do not replace more stringent state/local codes
- Unless a building/community qualifies as housing for older people, it can't discriminate against pregnant women, anyone securing legal custody of a child, or families with one or more children under 18 who live with a parent/legal guardian/designee with written consent.
- **Life-Safety Code (NFPA 101) Guidelines**
 - Not a legal code, but written like one to facilitate adoption into law by cities
 - Addresses construction, protection, and occupancy features necessary to minimize danger to life from fire including smoke, fumes, or panic.
 - Does not address general fire prevention or building construction features that are normally part of fire/building codes.
 - Applies to existing and new structures
 - Is a source for determination of liability in accidents
 - Groups flame spread ratings (materials propensity to burn rapidly and spread flames) into 5 classes

Class A flame spread rating	=	0-25
Class B flame spread rating	=	26-75
Class C flame spread rating	=	76-200
Class D flame spread rating	=	201-500
Class E flame spread rating	=	over 500
 - A flame spread rating number is the relative rate at which flame will spread over the surface of a material, as compared with flame spread on asbestos-cement board (rated zero) and on red oak (rated 100).
 - Flame spread rating number is not the rate at which the flame actually spreads along the surface and is not an indication of the fire resistance of the material.

Concepts/Goals:

- Accessibility services scope can vary depending on the size of the client, their organization, and the project.
- Name recognition matters...large, public, visible companies are more vulnerable to lawsuits so need to be prepared for issues.

Processes:

- Identify client's potential accessibility problem areas and desired outcomes
- Identify strategies for correcting problems including a proposed implementation schedule and budget/cost analysis
- Develop prototype design details for implementation
- Prepare and administer surveys if required to assess population using building
- Prepare client training program manuals and facility monitoring documentation

CONTENT AREA: PROJECT + PRACTICE MANAGEMENT

Project Delivery Methods

Vocabulary:

- **Unbundling:** when an owner structures their own project teams, lead by a third party project manager.

Facts/Rules:

- **Key Players:** owner - architect - contractor
- **Key Construction Delivery Methods:** Design-Bid-Build, Design-Build, Construction Management
- **Key Professional Delivery Methods:** Owner/Architect (with consultants, Multiple Prime, Joint Venture)

Concepts/Goals:

- The architect/consultant relationship may be established just for the project, or it could be a long standing working relationship
- Architect's coordination responsibilities should be limited to coordinating services with those of the consultants or other design professionals retained by the owner.
- All design professionals should be contractually obligated to coordinate their services with those of the architect, no matter who they contract with.
- The architect should never assume responsibility for internal coordination of any other design professionals work.
- **Architect-Consultant Agreement:** architect assumes primary contractual responsibility to the owner for the accuracy and completeness of the work of the architect's consultants.
 - If something goes wrong, the architect can be held liable.
 - Agreement should parallel owner-architect agreement
- **Multiple Prime:** a design professional holds an agreement directly with the owner or their project manager. The owner may:
 - Provide overall coordination of the multiple prime design professionals, including the architect, through in-house staff
 - Assign coordination to a project/program manager
 - Allocate coordination to one of the design professionals...maybe the architect
- **Joint Venture:** a contractual union between two or more firms for one or more specific projects.
 - Enables firms to combine key resources while allowing each participating firm to pursue other projects.
 - Essentially like a partnership
 - Retains no and pays no income taxes...it passes profits and losses and tax liabilities to its participating members.
 - Participating firms are individually and jointly liable to the client and others for the services offered by the joint venture.
 - Typically formed only for the purpose of seeking a specific project.
 - E.g.: a international firm joins with a local firm to complete a project

Processes: None

Project Budget Management

Vocabulary:

- **Preliminary Costs:** SF Cost Estimates; based on occupancy, size & type of construction
- **Detailed Costs:** Itemized break down
- **Utilization Ratio:** Used by firms to determine the amount of time spent on billable work as a percentage of total time the employee is compensated. $UR = \text{billable hours} / \text{total hours}$
- **Value Engineering:** process to get the best value for the project using similar, but more affordable materials and techniques
- **Pro-forma:** financial analysis of a building project which involves cost/return on investment
- **Cost of money or debt service:** principal and interest payments
- **Depreciation:** federal tax benefit with the idea that a building loses value as it ages
- **General Obligation Bond:** used to finance non revenue collecting facilities
- **Revenue Bond:** Used to finance revenue collecting projects (tolls, etc)

Facts/Rules:

- There are multiple methods of calculating fees for architectural services:
 - **Multiple of Direct Salary Expense (DSE):** everyone's direct salary/wages multiplied by a factor to cover fringe benefits (e.g. Employee health insurance), overhead, and profit
 - **Multiple of Direct Personnel Expense (DPE):** fringe benefits are included in direct salary/wages...that expense is multiplied by a factor to cover overhead and profit
 - **Professional Fee plus Expenses:** professional services are separated from the services from identified costs (reimbursables, consultants, etc)
 - **Hourly Billing Rate:** project is billed at standard rates for every hour worked. Often this is to a "not to exceed" value without consent of the owner.
 - **Stipulated/Lump Sum:** a specific amount is agreed upon for the total payment
 - **Percentage of the cost of work:** based on a percentage of construction cost
 - **Unit price contract:** based on acceptance and incorporation of unit price quotes for the various portions of the project
- Add a fixed percentage contingency (5-10%) in complex or remodel jobs to address any unforeseen problems or issues that come up during the design and/or construction
- Traditional design fees:

Architecture	=	10% of construction cost
Mechanical	=	15%
Electrical	=	12.5%
Civil	=	10.5%
Structural	=	9.4%
- Traditional contractor fees:

General Overhead	=	8-10% value of firm value
Project Overhead	=	4-10% of construction cost
Profit	=	15-20% small jobs 10-15% large jobs 5 - 10% very large jobs
- Traditional construction fees:

Construction Cost	=	Amount of \$\$ to build
Construction Budget	=	85% construction cost
Contractor's OH/Profit	=	15 - 40% construction cost
Surveys, testing, fees, FF&E	=	15%

- Traditional project budget:

Site Acquisition	=	not included in project budget
Utility/Off Site Construction	=	not included in project budget
On Site construction	=	10-20% of construction cost
Building construction	=	10-15% of construction cost
Contingencies	=	5-10% of construction cost
Professional Services	=	varies
Inspection and Testing	=	varies
Financing	=	varies

- It is normal practice to anticipate construction cost escalation on the basis of an annual increase projected to the midpoint of construction.

Concepts/Goals:

- Cost Projection Objectives:
 - Complete the project within the financial limits set by the owner
 - Provide an appropriate use of resources/value for the money within the budget
 - Optimize longer-term life cycle costs by examine alternative that offer the best balance between upfront costs and maintenance costs
 - Provide the owner with relative implications to the budget based on owner decisions throughout the project duration.
- Cost Projections for a project are based on four factors:
 - **Cost Factors:** what influences the project
 - **Project Scope:** what's included in the building
 - **Quality:** how nice the building will be (construction, technologies, finishes)
 - **Budget:** how much the owner can spend
- Typically architect estimates cannot account for inflation, market conditions, and contractor means and methods.
- Other factors that influence the construction budget include:
 - Availability of labor and materials (if there's no work, people will do jobs for cheap, if there is work, prices go up...basic supply and demand principle)
 - Labor rates fluctuate depending on cost of living, demand, project location, deadline
 - Material prices fluctuate depending on the market, where they ship from, etc
 - Convenience of transportation
 - The more remote the location the more expensive
 - Costs are less predictable in rural areas

Processes:

- The appropriate type of cost estimating for a building depends on the phase of the project it is developed to:
 - **Pre-Planning/Proposal:** based on unit costs (the cost per person, cost per bed, cost per sf, etc)
 - **Programming:** based on unit cost system (cost per sf) based on similar building types and/or functions of spaces
 - **Schematic Design:** based on the major elements of each building system (mechanical, electrical, plumbing, structure)
 - **Design Development:** based on detailed components (curtain walls, storefronts, lay-in ceilings, etc)

- **Construction Documents:** based on unit rates for construction competes, assemblies and systems. This estimate is what pre-bid cost checks and cost breakdowns are based on.

Project Schedule Management

Vocabulary: None

Facts/Rules:

- Typical phase breakdown for architectural services (programming is an extra service):

Schematic Design	=	15%
Design Development	=	15%
Construction Documents	=	35%
Bid/Negotiation	=	5%
Construction Administration	=	30%

 Sometime Project Closeout is broken out to about 2-5%
- Project calendar days = number of working days x 5 or 7
- Schedules are impacted and influenced by:
 - The size of the project
 - The complexity of the budget
 - The number of people working on the project
 - Client action/reaction time (and to an extent, municipal review time)
- Risks of extending the schedule:
 - Can increase costs due to inflation
 - Team members could change, causing a learning curve
- Risks of shortening the schedule:
 - Requires people to work overtime (costly/inefficient)
 - Requires the need to hire more people (learning curve to project and office standards)
 - If no employee changes are made, drawings can turn out poor, uncoordinated, etc
 - Generally causes higher costs for design and construction for a lower quality project

Concepts/Goals:

- Projects follow different types of construction schedules:
 - **Gantt/Bar Chart:** illustrates start to finish dates of a project broken out by activity.
 - They focus primarily on schedule management rather than the size of the project or the relative size of the work elements/activities.
 - Can't show the relationship between activities
 - **Critical Path Method:** all events expected to occur and operations to be performed in completed a given process are rendered in a form permitting determination of the optimum sequence and duration of each operation.
 - The diagram is called a **Network Diagram**
 - Circles are start and finishes, arrows are tasks, numbers show the time for each task to occur.
 - **Critical Path:** the path with the longest required time from start to finish is the basis for the schedule. Activities on this path are called **critical activities**.
 - **Float:** range of time during which non critical activities can start/end without affecting the overall schedule
 - **Total Float:** individual float times added together don't influence the critical path time
- **Fast Track Schedule:** Construction documents are issued in phases and construction begins while design is still being finishes.

- Requires coordination between architects, contractors, and construction managers
- Requires staged bidding, which might result in multiple contractors.
- Can reduce time of project by 10-30%

Processes:

- Scheduling the five phases of the design process varies depending on the project size and complexity, the quality of the client's program, the design team, and the decision making ability of the client. Generally the following applies:

Schematic Design	=	1 - 2 months
Design Development	=	2 - 6 months
Construction Documents	=	3 - 7 months
Bid/Negotiation	=	3 - 6 weeks (contractors: 2 weeks to bid)
Construction Administration	=	Varies
Contingencies	=	25-50% of length of project

Contracts for Professional Service + Contract Negotiation

Vocabulary:

Facts/Rules:

- Types of AIA Contracts:

A Series	=	Owner + General Contractor Agreements
B Series	=	Owner + Architect Agreements
C Series	=	Architect + Consultant Agreements (joint ventures)
D Series	=	Industry Standard Documents
G Series	=	Contract & Office Administration Forms

- **Division One:** The General Requirements Division of the specifications which establishes the administrative/procedural duties of the contractor, architect, owner during construction.
- **General Contract:** The agreements between the owner and the contractor for the construction of a project.
- **General Conditions:** The part of the contract documents which states the rights, responsibilities, and relationships of the parties involved (owner/arch/consultant/contractor/sub/vendor)
- **Supplementary General Conditions:** Additional conditions, included in the project manual, that are used to modify the General Conditions of the Contract for Construction in order to allow for any specific legal, climatic, or site conditions of the particular project.
- **Special Conditions:** Additional requirements to the Supplementary General Conditions of the Contract for Construction. These requirements are usually requested by government or local building agencies. Special conditions are used when supplementary conditions must be further extended.
- **General Requirements:** defines the specific procedures that a contractor must follow.
- **Single Prime Contract:** A contract for building construction under which one prime contractor is responsible for the entire project, in contrast to having separate contracts.
- **Separate Prime Contract:** One of several owner-contractor agreements for a project, each of which provides for constructing a major portion of the work (general construction, electrical, mechanical, etc.)

Concepts/Goals:**A101: Standard Form of Agreement Between Owner & Contractor:**

- Document Partners with AIA A201: General Conditions
- Contract Document the contractor agrees to are: Agreement, Conditions of the contract (general and supplementary), drawings, specs, addenda, and any other additional documents
- Contract supersedes prior negotiations, representations or agreements, written or oral
- The date of the commencement of work is date of agreement unless other date is listed
- Contract time is measured from the date of commencement
- Set the date for substantial completion
- Call out provisions for liquidated damages or early completion bonuses
- Liquidated damages are not a penalty to be inflicted on the Contractor, but must bear an actual and reasonably estimable relationship to the owner's loss if construction is not completed on time.
- If liquidated damages are to be assessed because delayed construction will result in actual loss to the Owner, the amount of damage due for each day lost should be entered in the Supplementary Conditions or the Agreement.
- Contract sum is called out in a lump sum amount based on alternates and/or unit prices
- Pay Applications are for 1 month ending on the last day of the month unless specified differently, and are based on the schedule of values supplied by the contractor.
- Typical progress payment = percentage of contract sum complete or stored on site + state sales tax (if applicable) – retainage – prior payments
- The last day upon which work may be included in an Application should normally be no less than 14 days prior to the payment due date, in consideration of the 7 days required for the architect's evaluation of the Application and issuance of a Certificate for Payment and the time subsequently accorded the Owner to make payment.
- Unless owner approve, contractor shall not make advanced payments to suppliers for materials/equipment which has not been delivered & stored on site
- Final payment issued when contractor has fully performed contract requirements (some minor punch list issues can remain) and final certificate of payment is issued by the architect
- Owner to pay w/in 30 days of the final certificate of payment
- Contract can be terminated/suspended by either party per the A201 General Conditions

A201: General Conditions of the Contract for Construction**(notes from Schiff-Hardin Lectures)**

- Part of the construction contract
- Not a contract, there's no signatures, and it's not project specific. It's generic.
- Most important document in the industry
- Owner is responsible for determining the time limits for construction
- "Pro" contractor documents aren't included in the contract documents.
- No direct contract between architect/contractor, owner/subcontractor.
- Doesn't bind/contract architect for anything.
- Architect is intended to be a third party beneficiary in this agreement.
- Architect/consultants are owners of their respective instruments of services.
- Owner will designate in writing who will be the owner's agent with actual authority
- Architect is not the owner's agent for dealing with the contractor. Not directly responsible to owner except for what the architect has to do to complete their contract obligations
- Contractor's biggest worry is money and they have the right to ask the owner to furnish evidence that they can pay for the project.

- If contractor fails to do work, or correct work that isn't agreement with the documents, the owner can stop the work until the problem is fixed.
- If contractor does something wrong, and doesn't fix it within 10 days of notice, then the owner can pay someone else to do it, and reduce the contract sum by a CO to pay for the corrections.
- Signing the contract by the contractor that the contractor has visited the site, is generally familiar with site, and with the requirements of the documents
- If contractor finds a problem or error, they have to let the architect know (no sandbagging). They can't play dumb.
- Contractor not required to check drawings against code, but if they see something that doesn't comply they have to say something.
- Contractor is not liable for errors and omissions made by the architect.
- Contractor is solely responsible for means, methods, techniques, sequences, and safety procedures.
- Contract is responsible to the owner for acts and omissions of the contractor's employees, subs and other people performing work
- Substitutions can only be made with the approval of the owner.
- Warranty is like a guarantee which is being made to the owner and the architect.
- General warranties of quality have no time limit
- Contractor secures and pays for building permit
- If the contractor knows something is illegal and builds it anyway, they're responsible to fix it
- Type one concealed/unknown site conditions: drawings are wrong based on what architect or consultant were given.
- Type two differing site conditions: documents are silenced, typically something is missing
- If a concealed or unknown condition is found, then contractor gets an equitable (time and or money) adjustment.
- Indian Village Clause: if remains, archaeological sites or wetlands are found, work must stop until a federal solution is determined.
- Allowance: a placeholder for something not fully designed or specified (e.g.; \$5,000 for cabinets that haven't been spec'd at the time of bid)
- Contractors often cheat with allowances to look like the lower bidder. Have to take these out of bids so actual hard prices are being compared to determine lowest bidder.
- Contractor will supply a schedule of the work for the architect's information. Don't approve.
- Contractor rarely submits a submittal schedule.
- Submittals that are not required by the contract documents may be returned by the architect without action.
- Contractor isn't relieved from responsibility for deviating from the shop drawings if the architect misses a mistake that isn't called out by the contractor.
- Indemnification is used in the guise of contribution/allocation of fault.
- Architect will be an owner's representative when given explicit authority.
- Owner and contractor will try to communicate through the architect
- Architect has the authority to reject work and require to special testing/inspection
- Archie will interpret and decide matters concerning performance under and requirements of the contract documents. Decisions will be in writing and will be fair and impartial.
- Subcontractors operate under the same rules and procedures as the general contractor
- General contract remains liable to the owner for subs mistakes
- Subs aren't responsible for other subs (unless they're sub-subcontractors)
- If a contractor is not paid, they can place a lien on the property. They have 90 days to send a letter to the contractor, owner, and architect, and then 30 days to file the lien.
- If the general contractor is paid and the subs file a lien, the contractor is responsible to deal with it.
- Changes are modifications in the work
- Change Order (CO) is usually in writing, signed by the owner, contractor, and architect to say that the change complies with the design

- If owner wants a change but can't agree with the contractor, owner can give a construction change directive. The change can progress, but the price/time can be settled upon later.
- Architect has the authority to issue minor change in the work, that don't affect price/time
- Change orders can be additive or deductive (additive includes markup, deducts don't)
- Contractor is entitled to have a change order when the owner makes a change, there's an architectural mistake, or other times when the owner is responsible event.
- Excusable events (tornado, storm, force major events) that delay the project, but owner's aren't responsible. There's an extension of time. Cost is covered by an insurance policy.
- Inexcusable events are when the contractor is at fault and the contractor is not entitled to extra time or money.
- A cardinal change is something an owner doesn't have the right to make the contractor do. If they do, the contractor can terminate the contract without breach of contract
- Issues of delay are the biggest source of claims and fighting that goes on.
- Once the owner moves in at substantial completion, then the construction time has stopped
- There is always a trade off between time and money.
- Critical path through a project is the sequence of work that must be done in that order to complete the project. If you add a day to a critical path activity, then you add a day to the project.
- Contractor prepare schedule of values and includes and updated copy with each pay app
- Contractor warrants title to the work, or freedom from liens, for all work covered on pay app
- Contractor will pay subcontractors within 7 days of receiving payment
- Owner/Architect have no responsibility to ensure that subcontractor gets paid when general does
- Progress payments occur until about 95% complete, then it's substantial completion
- Contractor prepares punch list, architect makes an inspection and adds to it as needed
- Certificate of final completion means everything is done
- By accepting final payment, contractor waives all rights except those previously made in writing
- Retainage is typically 10% of the contract price
- Contractor is totally responsible for safety issues
- If contractors find hazardous materials, they'll stop work, notify owner/architect, get lab testing, and the owner will hold contractor harmless.
- Owner has the right to require a bond posted.
- One year warranty to come back and fix anything that's broken from the date of substantial completion
- No claim can be made after 10 years by either party
- Contractor can terminate with 7 days notice. Typical reason is for failure to receive payment, or the govt shuts down the project
- Owner can suspend/terminate for convince, but has to pay contractor for all work done and paid for lost profits.
- 21 days written notice for claims and disputes after occurrence
- Architect is typically the decision maker (but can be someone else) when dealing with dispute, unless owner/contractor decide to go on to mediation (then arbitration/litigation)

B101: Standard Form of Agreement between Owner + Architect (notes from Schiff-Hardin Lectures)

- Architecture agreements...by and for architects
- If services increase then so should your fees
- Architects do not make guarantees or warranties. They are professionals.
- Scope of Architect's Basic Services = most important article in contract
- Architect is responsible for basic services. (Architecture, MEP. Civil typically isn't)

- Architect is entitled to rely on accuracy and completeness of services and information furnished by the owner/owner's consultants.
- **No Sandbagging Allowed:** no sitting on incorrect information that you discover. Promptly notify owner of an error or issue in writing.
- Architect not responsible for an owner's decision made without architect's approval. Usually initiated by the contractor for cheaper substations that might not be in the best interest of the project.
- Can't be responsible for filing with the city/govt because if something is held up by them, then you could take the blame.
- During schematic design you must at least talk about environmentally design options
- Architect typically only gets in liability trouble in two phases: CD's and CA.
- Architect has no control/responsibility over means, methods, techniques, procedures, and safety. Or for the contractor to be responsible for the contractor's failure to perform the work in accordance with the contract documents.
- A **site visit** is not a **site inspection**. Visits are eye-balling, looking at things in a general fashion...making sure that when fully complete the project is in compliance with the contract documents.
- Will report to owner any known deviations/defects that you are aware of (no sandbagging)
- Architect has authority to reject work that is not in compliance with the contract documents
- Will review submittals for checking the conformance with information given and their design concept expressed in the contract documents.
- In design build, engineers hired by the construction team must prepare, stamp, and seal documents. You can trust that their engineer is just as capable as yours.
- Cost of work = total cost of project, but does not include compensation to architect or architects consultants, cost of land, financing costs, etc.
- RFIs are turned around quickly.
- Architect will conduct **inspection** (a painstaking, detailed analysis) to determine date of substantial completion.
- Final Certificate of Payment = Project Over
- Contractor prepares initial draft of punchlist, and architect's adds what's missing.
- Prior to the one year expiration of the date from substation completion, architect walks the site with owner to review how the facility is working, without compensation. It's really a PR move to get your face in front of the owner again.
- Additional/Optional Services include programming, measured drawings, existing facility surveys, civil engineering, landscape design, BIM, LEED certification, FF&E...etc.
- Additional services necessary that are your fault must be done without additional compensation.
- There are limits on basic services, architect should't be penalized for faults of others (e.g.; 2 reviews of shop drawings are ok...any more and you're spending too much time dealing with the contractor's errors)
- Assumes that the owner is somewhat sophisticated. They'll provide information architect needs for design, including:
 - a written program.
 - Establish and update a project budget.
 - Identify a representative authorized to act on the owner's behalf.
 - Furnish surveys/geotechnical services
 - Owner will coordinate their consultants with you
 - Won't sandbag you if they find out something is wrong
 - Will fill architect in on anything communicated with the contractor

- Coordinate the architect's duties stated in the construction contract with what's in the architect/owner contracts.
- Architect estimates are different than contractor estimates. It's very rough.
- Surprised owners are the number one source of claims
- If architect's budget exceeds owner's budget, the architect will make recommendations to adjust the size/quality/budget and the owner will cooperate.
- If bids come in too high from budget, then architect/owner has different options. Including, architect must, for free, value engineer documents down to make the budget. Architect doesn't have to pay the difference of price of bid and budget.
- Intellectual Property: ideas are real and personal
- Architects and their consultants are owners of their instruments of service. Owner's are licensed to use the documents.
- Owner can only use documents for their project, if the owner doesn't pay, then they can't use the drawings under federal copyright law.
- If owner uses drawings without you, (e.g. Terminates architect but gives the documents to the contractor to build from) then they indemnify/hold architect harmless from any liability issues, and must pay any legal fees that arise from the use of the documents.
- Architect/owner waive consequential damages or remote damages that arise.
- Mediation required prior to arbitration or litigation
 - Mediation fees shared equally
 - Held in place where project is located unless agreed upon
 - Resolutions are enforceable as settlement agreements
- Arbitration – used when mediation does not resolve issue
 - Demand for arbitration cannot occur after legal proceedings have been started
 - Arbitration relates to owner and architect only under terms of agreement
 - Award rendered by arbitrator is final
- Agreement governed by law in the principal place of business of the architect unless otherwise indicated
- No responsibility for hazardous materials
- Owner will give professional credit to architect on owner's promotional materials for project
- Termination/Suspension:
 - Owner failure to pay is cause for suspension
 - Owner can suspend for their conveniences, without cause. Architect can't
 - Architect to provide 7 days written notice
 - Before resuming services architect shall be paid all sums due & expenses for interruption & resumption of work
 - If project suspended more than 30 days by owner architect is due compensation for all services performed prior to suspension
 - **Termination expenses:** expenses due to the termination of the project for which architect is not otherwise compensated + amount for anticipated profit on the value of services not performed by the architect (almost always taken out by owners during their review)
- No third party that will invest rights in the project.
- Architect has right to use photos/representations of their work for marketing
- Compensation type (lump sum, hourly, %) is defined & breakout of project phase % given
- If owner fires architect midstream and tries to keep using the documents with a different architect (cheaper, etc) then the owner will pay a licensing fee.
- Owner won't withhold amounts from architect's compensation unless architect is liable
- This is a total agreement and supersedes any previous agreement.

C141: Standard Form of Agreement Between Architect & Consultant

- Consultants are responsible for code compliance for their areas of work
- Signing of documents makes consultant responsible for compliance with applicable codes and regulation
- Consultants are responsible for the accurate production of their own drawings and specifications; should check own documents for consistency

Processes: None

Construction Procurement Process

Vocabulary: None

Facts/Rules:

- **Design – Bid – Build Construction Delivery Method:**
 - Most common of delivery methods... public work traditionally uses this method
 - Consists of three parties: owner, architect, and contractor
 - Two separate contracts: owner + architect and owner + builder
 - Established process with legal and procedural guidelines
 - Typically involves competitively bid, lump sum construction contracts based on complete and prescriptive contract documents
 - Work is conducted in a linear sequence
 - Final contractor selection based on lowest responsible bid or total contract price
- **Design – Build Construction Delivery Method:**
 - Two parties: owner and designer-builder
 - Consolidated entity provides design and construction services to the owner
 - Offers the owner a single source of responsibility
 - Provides continuous execution of design and construction
 - Phases overlap – design and build (fast track)
 - There is only one contract: between owner + design-build organization
 - Design-build entity can be led by either architect or general contractor (though typically it's led by the contractor)
- **Construction Management Construction Delivery Method**
 - Three parties: owner, designer, construction manager
 - Two contracts issued: owner + architect and owner + construction manager
 - Construction manager typically provides pre-construction services during the design phase then takes on the financial obligation for construction under a specified cost agreement
 - Frequently based on a guaranteed maximum price
 - Construction manager contracts with subcontractors
 - No contractual relationship between the designer and construction manager
 - Phases will often overlap, allowing for fast track project

Concepts/Goals: None

Processes:

- **Contractor Selection Approaches** are typically based on price, qualification or a combination of the two. Depending on the owner and what kind of funding they have (loan, grant, etc) contractors can be selected through various methods:
 - Request for Qualifications (RFQ): no bid or price given to complete work, just experience
 - Request for Proposal (RFP): presentation on how project would be done submitted
 - Interviews to review bidders
 - Negotiation to settle on contract price
 - Low-Bid: Based only on the lowest total cost (sometime with alternates)
 - Best Value Bid: based on weighing bid and qualifications

Risk Management + Legal Issues Pertaining to Practice + Contracts**Vocabulary:**

- **Mediation:** not legally binding. Use of a mediator to reach agreement between each party
- **Arbitration:** legal technique for the resolution of disputes outside the courts. It's a form of binding dispute resolution, equivalent to litigation in the courts.
- **Litigation:** conflicts/disputes that are resolved in a court of law. Typically a last option.
- **Subrogation:** legal technique where an insure takes over for a party for whom it has made a payment. (e.g. damage to a property under construction caused by a subcontractor is covered by insurance who then sues subcontractor in the owner's name)

Facts/Rules:

- Architects should carry multiple types of insurance for their protection.
 - More than the required minimum insurance may be needed for a job. Anything extra is noted in the supplemental conditions
- Types of Insurance include:
 - **Professional Liability:** Held by architects/design professionals. Liability due to negligence or not meeting the standard of care expected of them. (eg: not designing ADA compliant restrooms in a public building)
 - **Workers Comp:** Held by almost everyone. Liability to employees for injury or sickness as a result of their employment.
 - **Property/Builders Risk:** Held by owner. Covers any damages, loss of work on site/ off site/in transit.
 - **Loss of Use:** Held by owner. Covers any financial loss due to delay in construction because of damage, accidents, fire, other hazards needed to be dealt with.
 - **Product & Completed Operations:** held by contractor. Liability for damages caused by installed goods after the construction phase and transfer of title.
 - **Contractual/Indemnification:** Liability assumed by contract where contractors agree to hold owners/architects harmless for damages that are the result of specific events.
- The owner can require the contractor to submit a certificate of insurance with a bid to prove what insurance he carries and what his limits are.
- **NO SUBROGATION.** Owner/Contractor should keep this provision in the AIA 201 document, so the insurance company, after paying out, can put themselves in the shoes of their client and go after whoever might be responsible for the damage that's otherwise "No-Fault". You don't want the owner's insurance company going after the contractor if there's some sort of freak fire in the middle of the night that could somehow be tied back to him.

Concepts/Goals:

- **AIA Ethical Standards**

- Code applies to all AIA members regardless of membership category
- Common ethics violations:
 - Attribution of credit
 - Accurate representation of qualifications
 - Attainment and provision of examples of work
- Basic honesty Penalties for Violations:
 - Admonition (private) – letter of ruling sent to the parties and kept in the member's file
 - Censure (public) – letter is sent and notification of the case and ruling is published to AIA membership
 - Suspension of membership – membership is suspended for period of time; 1 or 2 years & ruling is published
 - Termination of membership – membership is terminated & ruling is published

Processes: None

CONTENT AREA: SITE ZONING VIGNETTE

Steps For Completion

Site Plan

- Write down all requirements from the program on paper. Note setbacks, easements, heights, and any special instructions
- Turn on Grid
- Turn on Full Cursor
- Sketch all site setback lines: front, rear, sides
- Sketch any non-linear high water/curved setback requirements with a series of circles with a radius of the required setback. Place the center of the circle on the line, and draw all setback lines tangent to the edges of the circles.
- Draw Surface Improvements (blue)
- Sketch all building setback lines: front, rear, sides, easements
- Draw Buildable area (yellow)
- Verify all lines with the requirements...just to be safe.

Section

- Locate the section cut line
- Sketch vertical lines down from where contours intersect the section line
- Locate benchmark
- Draw grade profile from labeled heights of contours. Note any swales or ridges.
- Sketch any limits, including max height, angles or offsets from edges of property
- Draw building profile. Do not draw a profile line along top of the grade.
- Verify all lines with the requirements...is the building profile cut in the right spot?

Tips

- Use the grid
- Use the full cursor
- Verify math and double check dimensions with measure tool
- Verify scales of grids...vertical and horizontal might be different
- Get dimensions as accurate as possible. If lines won't snap directly in the correct spot, err on the minimum and make the line slightly smaller than the maximum requirement
- If building profile line won't snap directly to the grade, take it one click past the line into the ground
- If the angled line won't work out exactly, make it within .05 degrees (e.g. If you can't get a 30° line, try for a 29.99°)

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