**Basic site programming:**

**Sun** – Solar Radiation is the sun’s energy. Most of it never reaches us. It reaches us in two forms – direct radiation and diffuse radiation. Amount of radiation received is determined by the angle of the sun’s rays, the more perpendicular the more energy. By having overhangs on the south face of the building, the summer sun is blocked, but winter sun can enter. Should have major glass on the south face, Moderate on the east and west faces and minimum on the north face.

**Wind** – cold winds typically come from the north and west and summer breezes come from the southwest. North and west sides of a building should minimize or avoid windows or entrances and use trees or other windbreaks to block the wind. Summer breezes should be channeled to cool the interior and exterior spaces.

**Snow** – where snow fall is heavy, the location and design of entrances and outdoor balconies are critical. Also, design with the reflection of snow glare.

**Humidity** – the ratio of the actual amount of moisture the air could hold at a given temperature. Relief from high humidity in the form of natural ventilation or mechanical cooling. Comfort zone is between 65 to 75 degrees and 20 to 75% relative humidity.

**Degree Days** – the number of degrees that the mean temperature for the day is below 65 degrees F. (50 degrees has 15 heating degree days).

**Regional design/methods:**

**Macroclimate** – general climate of the region; determined by many factors – solar energy it receives from the sun, mountains and oceans, latitude

**Microclimate** – climatic characteristics unique to a small area, caused by local features.

The site can be modified to make the site more comfortable.

**Water** – designer shall preserve any existing streams and can introduce water to the site as a pool, etc. In summer the water can have a cooling effect, physical or psychological.

**Trees** – they provide shade, block the wind, cool, humidify, filter the air and help to prevent rapid, destructive runoff. Deciduous trees can block summer sun, but allow winter sun to penetrate.

**Albedo** – is the reflectivity of a surface. Natural ground cover has a low albedo value, therefore reflects less heat.

**Hills** – cold air, being heavier than warm air, flows downhill. In hilly areas the coldest ground surfaces and air are found in the valleys, which may be desirable in warm climates, but not cooler climates. Slopes are more preferable in cooler climates than the valley.

**Landforms and Structures** – On windward side of a hill, wind speeds are highest near the crest, while the leeward slope has less turbulent winds. Near the bottom of the hill on the leeward side, the winds decrease to almost zero, creating a “wind shadow”.

**Other factors** – structures may be built in the ground for natural insulation and to minimize exposure to winds.

Glare from water or snow shall be minimized. Minimize west facing windows and outdoor activity areas. Take advantage of cooling summer breezes with walls or hedges to channel the breezes to cool indoor or outdoor spaces.

**Urban Microclimate** – the elimination of natural ground cover and the emission of heat, creates a microclimate which is warmer and drier than rural areas, with more rain, clouds and fog. There is also more noise, air pollution and glare.

Both Macro and Mirco consists of five major elements – sun, wind, temperature, humidity and precipitation.

**Climate** – four climate zones in USA

**Cool zone** – very long cold winters, strong winds and deep snow

**Temperate Zone** – largest climate zone. Warm and hot summer, cool and cold winters and moderate spring and fall.

**Hot-Arid zone** – desert like region – clear skies, dry air, long periods of overheating and large daily temp. Variations Days are hot, nights are cold, rainfall is minimal and vegetation is sparse.

**Hot-Humid zone** – high, relatively constant temp. and humidity, variable winds with occasionally hurricane force and torrential rains

How it affects building type size and orientation

Cool zone site planning would be to control the wind, maximizing the winter sun, group activities to minimize outdoor travel and avoid local cold air pockets.
Temperate zone site planning would include blocking cold winter winds while admitting cool summer breezes, maximizing shade in the summer, providing for extreme conditions of high wind, flooding and snow. Hot-Arid site planning should use shading and screening to provide relief from the heat and glare of the sun, preserves natural plant materials while adding compact plants and maximizes humidity and summer air movement Hot-Humid sites are designed to provide shade and air movement, while protecting against rains, flooding and strong winds.

Soils & bearing

Three types of rock

- **Sedimentary Rock** – covers most of the earth's surface, deposition of sediments transported by streams, ocean currents, ice or wind. Types – sandstone, shale, limestone.
- **Igneous Rock** – is formed when molten rock material cools and solidifies. Types – granite is strong, hard, dense and very high bearing capacity.
- **Metamorphic Rock** – Igneous and sedimentary rock can be changed as a result of heat into metamorphic rock. Can be foliated (slate, schist and gneiss) or unfoliated (quartzite and marble).

Soils – Bedrock, horizon C (which is partially decomposed bedrock, supports little plant life), horizon B (subsoil, has been further weather and decomposed) and horizon A (topsoil, fertility of the soil).

Unified Soil Classification – groups soils into coarse-grained, fine grained and highly organic.

- **G** – gravel and gravelly soils (coarse)
- **S** – sand and sandy soil (coarse)
- **M** – very fine sand and inorganic silt (fine)
- **O** – organic silts and clays (fine)
- **P** – peat (highly organic)

Coarse grained soils are given an additional letter:

- **W** – well graded (containing a mixture of particles of various size)
- **C** – well graded with clay
- **P** – poorly graded

Fine grained soils are given an additional letter:

- **L** – low compressibility and low plasticity
- **H** – high compressibility and high plasticity

Different soil test:

- Test pits – excavated of the soil to expose subsurface soils
- Borings (wash boring, auger & core boring) – exploratory borings, from which samples of undisturbed subsurface soils are obtained to determine the types of soils. How many and how depth are determine by the engineer.

Rock has the highest bearing capacity, followed by coarse-grained soils (sands and gravels), then clays and silts (fair foundation material) to organic soils (unsuitable to support buildings).

If soil is unsuitable to support the require loads the material can be removed and fill brought in to the site. The fill is then compacted to bearing strength with a sheepsfoot roller.

Undesirable soils should be removed and replaces with granular materials. Hardpan can be artificially produced to improve undesirable soils. Adding compacted ash, subsurface drainage or lots of short piles.

Contours:

Contours are imaginary lines that connect all points of equal elevation. Existing contours are shown dashed and proposed contours are shown solid. Every fifth contour should be shown darker. Contours are labeled with the number within the lines or on the higher side.

- **Uniform slopes** – are indicted by parallel contours which are evenly spaced.
- **Convex slopes** – are shown by parallel contours spaced at increasing intervals going up hill, closer contours are at lower elevations.
- **Concave slopes** – are shown by parallel contours spaced at decreasing intervals going uphill, closer contours are at the higher elevations.
- **Valleys** – are indicted by contours which point uphill.
- **Ridges** – are indicted by contours which point downhill.
Summits and depressions – are represented by concentric closed contours. Both should have a spot elevation that is the highest or lowest point.

**Foundation types:**

**Footing types:**

**Shallow:**
- **Spread footing** – for light buildings with suitable soils
- **Column footing** – square pad of concrete that spreads the column load over a large area so bearing capacity is not exceeded.
- **Wall Footing** – cont. spread footing.
- **Combined or Cantilever footing** – connects exterior column footing to the first interior column footing.
- **Mat (raft) footing** – one large footing under the entire building (used for poor soil).
- **Boat footing** – similar to mat, soil is removed is equal to load of the building.

**Deep:**
- **Piles** – piles are driven thru the unbearable soil to adequate bearing capacity. Piles can be wood, steel or concrete.
- **Caissons** – holes drilled into the soil to the adequate bearing capacity and hole is filled with concrete.

**Excavation:**
- **Solder beam** – are wide flange steel sections driven vertically into the earth to lower the depth. Wood boards are placed horizontally.
- **Sheet piling** – vertical planks which fit tight together and are driven into the earth making a barrier before excavation.
- **Wellpoints** – are used to dewater an excavation.

**Retaining walls:**
Retaining wall creates a level area by cutting vertically through a bank and eliminating the slope. Retaining walls are generally constructed of masonry or concrete, but other materials like rock, timber or steel can be used.

**Waterproofing (natural and manmade)**
The primary purpose of installing a moisture vapor barrier is to prevent condensation with a structure.
Mastics are intended to seal (keep out water). It is a material used to seal joints, gaps, and cracks against dust, odors and sound. It should remain plastic and permit to move and remain free of cracks and blisters.
A building or structure needs waterproofing as concrete itself will not be watertight on its own. The conventional system of waterproofing involves 'membranes'. This relies on the application of one or more layers of membrane (available in various materials: e.g., bitumen, silicate, PVC, EPDM etc.) that act as a barrier between the water and the building structure, preventing the passage of water. However, the membrane system relies on exacting application, presenting difficulties. Problems with application or adherence to the substrate can lead to leakage.
Over the past two decades, the construction industry has had technological advances in waterproofing materials, including integral waterproofing systems as well as more advanced membrane materials.
Integral systems work within the matrix of a concrete structure, giving the concrete itself a waterproof quality. There are two main types of integral waterproofing systems: the hydrophilic and the hydrophobic systems. A hydrophilic system typically uses a crystallization technology that replaces the water in the concrete with insoluble crystals. Various brands available in the market claim similar properties, but not all can react with a wide range of cement hydration by-products, and thus require caution. Hydrophobic systems use fatty acids to block pores within the concrete, preventing water passage.
New membrane materials seek to overcome shortcomings in older methods like PVC and HDPE. Generally, new technology in waterproof membranes relies on polymer based materials that are extremely adhesive to create a seamless barrier around the outside of a structure.

**Methods for pollution treatment.**
Brownfields are abandoned or underused industrial and commercial facilities available for re-use. Expansion or redevelopment of such a facility may be complicated by real or perceived environmental contaminations.
In United States city planning, brownfield land (or simply a brownfield) is land previously used for industrial purposes or certain commercial uses. The land may be
contaminated by low concentrations of hazardous waste or pollution, and has the potential to be reused once it is cleaned up. Innovative remedial techniques employed at distressed brownfield properties in recent years include bioremediation, a remedial strategy that uses naturally occurring microbes in soils and groundwater to expedite a cleanup, and in situ oxidation, which is a remedial strategy that uses oxygen or oxidant chemicals to enhance a cleanup. Often, these strategies are used in conjunction with each other or with other remedial strategies such as soil vapor extraction. In this process, vapor from the soil phase is extracted from soils and treated, which has the effect of removing contaminants from the soils and groundwater beneath a site. Some brownfields with heavy metal contamination have even been cleaned up through an innovative approach called phytoremediation that utilizes deep-rooted plants to soak up metals in soils into the plant structure as the plant grows. After they reach maturity, the plants – which now contain the heavy metal contaminants in their tissues – are removed and disposed of as hazardous waste.

A couple on contracts:
I did a whole review for my CD exam:
http://www.areforum.org/forums/forum27/79401.html

Sewer systems, including some special situations and non-conventional options:
Sanitary sewers – must have cover to prevent breaking or freezing, but not be to deep that excavation becomes prohibitively. Lines must be sloped to provide a rate of 2 ½ to 10 feet per second. Sewage lines start at 8” for a lateral connection to many feet for trunk lines. Materials can be vitrified clay, cast iron, plastic and lightweight fiberglass reinforced mortar plastic. Waste can be a health hazard, produce offensive odors and render water unsuitable. Treatment plants change the composition of the waste material prior to its discharge into bodies of water.
Septic tank – is used when connection to treatment plant is not feasible. Septic tanks change waste into gases and effluent liquid through the action of anaerobic bacteria. Tanks are buried and vented. There size is determined by the estimated quantity of sewage to be treated. The effluent disposal method is largely dependent on soil conditions, topography and the amount of waste to be disposed. There are three principal types of systems:
- Leaching cesspools – requires a small amount of land regardless of slope. Low cost. Cannot be located in either semi-imperious or impervious soil.
- Subsoil disposal beds (underground drain fields) – can be used in any soil except impervious, but not where ground water is less than two feet below grade. Medium cost
- Sand filters – can be used in impervious soils and require relatively small area. However, they required the use of collection drains, their effluent must be carried to a non-potable watercourse and they are expensive

Traffic calming:
Traffic calming is a set of strategies used to slow down or reduce traffic, thereby improving safety for pedestrians and bicyclists as well as improving the environment for residents.

- Narrower traffic lanes — streets can be narrowed by extending the sidewalk, adding bollards or planters, or adding a bike lane or parking. Narrowing traffic lanes differs from other road treatments by making slower speeds seem more natural to drivers and less of an artificial imposition, as opposed to most other treatments used that physically force lower speeds or restrict route choice.
- Speed bumps, sometimes split or offset in the middle to help emergency vehicles reduce delay
- Speed humps, parabolic devices that are less aggressive than speed bumps and used on residential streets
- Speed tables, long flat-topped speed humps that slow cars more gradually than humps
- Speed cushions, a series of three small speed humps that slow cars down but allow emergency vehicles to straddle them so as not to slow response time
- Chicanes, which create a horizontal deflection causing vehicles to slow as they would for a curve
- Raised pedestrian crossings and raised intersection
- Curb extensions (also called bulbouts) which narrow the width of the roadway at pedestrian crossings
- Pedestrian refuges or small islands in the middle of the street
• Median diverters to prevent left turns or through movements into a residential area
• Changing the surface material or texture (for example, the selective use of brick or cobblestone)
• Additional give way (yield) signs
• Converting one-way streets into two-way streets
• Chokers, which are curb extensions that narrow the roadway to a single lane at points
• Allowing parking on one or both sides of a street
• Converting an intersection into a cul-de-sac or dead end
• Boom barrier, restricting through traffic to authorised vehicles only.
• Closing of streets to create pedestrian zones
• Reducing speed limits near institutions such as schools and hospitals
• Vehicle activated sign, signs which react with a message if they detect a vehicle exceeding a pre-determined speed.
• Watchman, traffic calming system

**Site accessibility - minimums/maximums, etc.**

Need to locate the site access not to interfere with street intersections. Left turns should be a minimum of 200’ from a street intersection, to not have the access blocked by cars at the intersection. Access points to sites on opposite sides of the street should avoid interfering with each other. Locate driveways directly opposite each other. Site access main consideration might be the preservation of the natural environment. Don’t destroy a row of trees to cut a path for a road, select a path that passes over less valuable land. Align the site access and path of roads with existing contours. This will cut the cost of grading and cutting the natural grade. Ramps to and from site shall be steeper than 15%. For slopes over 10%, a transition of at least 8’ in length should be provided at each end of the ramp at one-half the slope of the ramp itself.

**Site drainage:**

Drainage of the land refers to the method used to collect, conduct and dispose of unwanted rain water. A typical drainage system begins with the roof water from a building. This water flows to roof drains and downspouts that eventually conduct it to the street. Once on the street, the water flows downhill until it reaches a catch basin, where it continues in an underground drain line. The drain line may lead to a concrete channel that ultimately discharges the original roof water, plus all other runoff, into a lake or other body of water. Following are some general rules for drainage: water flows as a result of gravity, water flows perpendicular to the contours, good drainage requires a continuous flow (to slow creates bogs, to fast causes erosion), water should be drained from the building, large amounts of water should never be drained across a path.

Desirable slopes for drainage:

- Open land – 1/2 % min
- Streets – ½ % min
- Planted areas – 1% min to 25% max
- Large paved areas – 1% min
- Land adjacent to building – 2%
- Drainage swales – 2% min to 10% max
- Planted banks – up to 50% max

Common methods of surface drainage:

- **Swale** – graded flow paths similar to valleys. Are grade around structures.
- **Sloping plane** – area tilts in one direction, so water drains to that side. The cheapest and structures should be to the high side.
- **Warped plane** – similar to sloping plane, but entire area drains to one low corner.
- **Gutter** – two sloping planes that create a valley. The planes are slightly warped so that water can run down the valley to a collection point.
- **Central inlet** – slopes drain toward a center location, used for courtyards, patios, etc. needs catch basin and sub-surface piping to dispose of water.

Sub-surface drainage:

- **Open sub-surface system** – collects water utilizes gravel-filled ditches and performed drain pipe, or drain pipe laid with open joints. Runoff seeps thru the earth to the pipe and the pipe collects the free flowing water and carries it away in a sloping pipe.
Closed sub-surface system – closed sections of pipe that carry water from the collection points to disposal areas. Drainage independent of ground slope.

Area drain – device that collects water from a low point of a limited area and conducts it directly to underground pipes. It has a grate to prevent debris from getting into the pipes. Rim elevation – height of rim/grate. Invert elevation – depth of drain pipe.

Catch Basin – similar to area drain, except deeper and larger to collect sediment which can clog the system.

Trench drain – used to collect water along a strip before conducting it to underground pipes.

Culverts – underground pipe that runs beneath roads, driveways or paths. Should be straight, cross the road at right angle.

Drainage needs:

- **Topography** – steep areas drain quickly, too fast for percolation. Channels should be provided above and below steep banks.
- **Type of soil** – soil type determines the amount of speed and water absorption.
- **Vegetation** – thick ground covers slows down the rate of runoff, reduces erosion and reduces the need for elaborate drainage.
- **Rainfall data** – rainfall data is required to calculate the frequency and intensity of rain water to be drained.
- **Land use** – rural can have water disperse into landscape. Urban areas surface runoff occurs for short distances only and then must be directed to subsurface drainage.

**Size of area** – limited percolation such as roofs, roads, driveways.

**New Urbanism:**

The New Urbanism is a reaction to sprawl. A growing movement of architects, planners, and developers, the New Urbanism is based on principles of planning and architecture that work together to create human-scale, walkable communities.

The heart of the New Urbanism is in the design of neighborhoods, which can be defined by 13 elements, according to town planners Andres Duany and Elizabeth Plater-Zyberk, two of the founders of the Congress for the New Urbanism. An authentic neighborhood contains most of these elements:

1) The neighborhood has a discernible center. This is often a square or a green and sometimes a busy or memorable street corner. A transit stop would be located at this center.
2) Most of the dwellings are within a five-minute walk of the center, an average of roughly 2,000 feet.
3) There are a variety of dwelling types — usually houses, rowhouses and apartments — so that younger and older people, singles and families, the poor and the wealthy may find places to live.
4) At the edge of the neighborhood, there are shops and offices of sufficiently varied types to supply the weekly needs of a household.
5) A small ancillary building is permitted within the backyard of each house. It may be used as a rental unit or place to work (e.g., office or craft workshop).
6) An elementary school is close enough so that most children can walk from their home.
7) There are small playgrounds accessible to every dwelling -- not more than a tenth of a mile away.
8) Streets within the neighborhood form a connected network, which disperses traffic by providing a variety of pedestrian and vehicular routes to any destination.
9) The streets are relatively narrow and shaded by rows of trees. This slows traffic, creating an environment suitable for pedestrians and bicycles.
10) Buildings in the neighborhood center are placed close to the street, creating a well-defined outdoor room.
11) Parking lots and garage doors rarely front the street. Parking is relegated to the rear of buildings, usually accessed by alleys.
12) Certain prominent sites at the termination of street vistas or in the neighborhood center are reserved for civic buildings. These provide sites for community meetings, education, and religious or cultural activities.
13) The neighborhood is organized to be self-governing. A formal association debates and decides matters of maintenance, security, and physical change. Taxation is the responsibility of the larger community.
**Erosion:**
The process by which the surface of the earth is worn away by the action of natural elements, such as water and wind. The site is vulnerable during construction. It is not limited to sites undergoing constructions only, but can happen naturally depending on type of soils, steepness of the slopes, vegetative cover and speed and volume of runoff.

Measures to control erosion:
- Disturb as little area as possible
- Do not remove any planting unless absolutely necessary.
- Stockpile and protect topsoil to be reuse after construction.
- Provide temporary dams and channels to slow down runoff and collect eroded soil.
- Leave soil exposed for as short a time as possible.
- Avoid steep banks.
- Replant exposed areas as soon as feasible.

Minimize erosion can be done by employing a variety of slope stabilization techniques:
- Planting
- Applying mulch
- Facing banks with rubble or riprap
- Retaining banks with cribbing or retaining walls

Slides can occur naturally or result of improper grading.
- Steep slopes will more likely slide
- Fine grained soils are more likely to susceptible to sliding than coarse grained soils.
- Water may trigger a slide because of the increase in the soil weight and the planes being lubricated.
- Layered soils slide more readily than homogeneous soils.
- Undercutting an existing slope – cutting away the toe.

**ADA ramps & parking:**
Minimum dimensions of handicapped parking stalls – 20 Ft long by 8 Ft wide. Must have 5 Ft wide adjacent and parallel vehicle pull-up space. An accessible route must be located in front of the stalls, to avoid hazard of handicapped persons having to circulate behind parked vehicles.

Under 5% or 1:20 are considered walks. Ramps shall be 1:12. require a 5’ foot landing at top and bottom of ramp and 30’ max length. Handrails should be located at each side of a ramp if its rise is greater than 6 inches or its greater than 72”.

**Wetlands:**
A wetland is an area of land whose soil is saturated with moisture either permanently or seasonally. Such areas may also be covered partially or completely by shallow pools of water. Wetlands include swamps, marshes, and bogs, among others. The water found in wetlands can be saltwater, freshwater, or brackish. Wetlands are considered the most biologically diverse of all ecosystems.

**What does Zoning cover vs building codes:**
Zoning code defines the local interests and conditions. Can restrict specific areas to certain types of building occupancies (commercial, residential and industrial). Can limit heights, floor area, coverage and setbacks. Can restrict building types in specific areas (materials) Building code intended to provide for public health and safety. Provides use classifications, construction classifications, fire safety, means of egress.

**Town/City development history:**
Started as rectilinear land pattern (agricultural) or circular (herdsmen). Greek cities at first were irregular, but in the fifth century a planner named Hippodamus set a grid pattern on the proposed site. The grid was superimposed on rocky hillside sites in disregard to the natural terrain, occasionally a street would require steps. Had center of town called Agora, or market place.

Medieval town was a labyrinthine form and surrounded by heavy fortified walls. The church was the center of the town.

Renaissance development became more intellectual, more formal and more monumental. Renaissance introduced spacious urban plazas, broad boulevards and vast, formal gardens. Pierre Charles L’Enfant was the 1st city planner in this country, Washington DC. He used a geometric plan, which had diagonal and radial streets superimposed on a typical grid layout.

The machine age shifted from the farm to the factory having the effect of soaring expansion in population density. The speed of this dramatic change took its toll on the urban environment in the form of congestion, pollution and painfully unhealthy living conditions.
20th century planners came up with the idea of the garden city. Ebenezer Howard proposed the creation of a city on 1,000 acres with 30,000 inhabitants. At the central core was public buildings surrounded by commercial shops and dwellings with industrial facilities located on the city’s outskirts. All of this was encircled by a permanent green belt of about 5,000 acres.

Henry Wright and Clarence Stein tried to minimize the conflicts between automobiles and people, they conceived the superblock. The superblock was an island of green, bordered by dwellings, with roads and parkings placed at the periphery, which was used at Radburn, NJ.

**CPTED (vandalism prevention & security thru design)**
Defensible space is a concept first proposed by the architect Oscar Newman and developed further by Alice Coleman. It is the idea that crime and delinquency can be controlled and mitigated through environmental design. The idea is important because it relates an individual's environment to his or her expectation of crime in the community. There are four factors that make a defensible space:

- **Territoriality** – or the idea that one’s home is scared.
- **Natural surveillance** – the link between an area’s physical characteristics and the residents’ ability to see what is happening.
- **Image** – the capacity of physical design to impart a sense of security.
- **Milieu (environment)** – other features that may affect security, such as proximity to a police substation or busy commercial area.

**LEED:**

**Site Concepts**
Stormwater – should not be used for potable needs if there are sources available that pose less health risk. Stormwater can be used in many locales to reduce potable water needs for irrigation, toilets, custodial needs and fire suppression.

**Civil engineering drawings:**
Review site symbols on page 102 of Kaplan.

- **Calculations:**
  - **Grading** – Convenient way to measure ground slope is by percentages. If H is horizontal distance and V is vertical distance, then g is the grade 
    \[ g = \frac{V}{H}(100) \]
    for example 50% slope refers to a vertical dimension of 1 ft and a horizontal dimension of 2 ft.
  - **General grades** –
    - Fewer than 4% are considered flat – less than 4’ per 100’ horiz. – all activities
    - Between 4% & 10% are moderate – 4’-10’ per 100’ horiz – require effort to climb or descend
    - Between 10% & 50% are steep – 10’-50’ per 100’ horiz – steep, may be usable for limited activity only.
  - Over 50% are very steep – 50’-100’ per 100’ horiz – subject to soil erosion
  - Handicapped ramps – for every 1’ vertical 12’ horizontal is required, 1/12 (100) = 8.3%
  - Generally, roads should not exceed a 10% slope. A 15% slope (15’ per 100’ horiz) approached the limit a vehicle can climb for a sustained period of time.
  - Parking lot areas should not exceed 5% slope (5’ per 100’ horiz)
  - Grass areas should not exceed 25% slope (25’ per 100’ horiz)
  - Streets, paved drives should not exceed 10% slope (10’ per 100’ horiz)
  - Planted areas should have at least 1% slope (1’ per 100’ horiz).
  - **Parking estimates** – 400 SF per parked vehicle

- **Cubic footage** – LxWxH
  - Simple definitions like how many cubic feet in a cubic yard (27), how many square feet in a square yard (9), how many square feet in an acre (43,560).
  - Know how to protect trees if construction work is being done around them.
    1. Barriers shall be placed at the canopy line of mature trees and a minimum of 2 feet from shrubs to protect branches from tall equipment and root systems from compaction. They shall be constructed of durable materials in sturdy manner to surround the plant.
    2. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches.
    3. Where grades are to be lowered use a retaining wall and terrace to protect the roots. These should begin at the dripline of the tree. For small trees and shrubs the stem diameter is converted to feet and doubled, such that a 3 inch tree should be protected to 6 feet.
4. Where grades are to be raised use retaining walls of durable material, as specified, to form a tree well. Wells deeper than 12 inches will be provided with a drain tile at the original ground surface to facilitate water removal. Drain tile should drain to a sump or well with small stone.

5. In wooded areas wood chips spread to a depth of 4 inches can be used to prevent soil compaction over the root system.

6. Trenching across tree root systems shall pass no closer to the trunk than 6 feet. Tunnels for utilities under root systems should be at least 18 inches below ground surface.

- know how to convert gallons into cubic feet – 1 gallon = 0.133680 cubic foot
- know how to read the sun angle chart.
  Different charts for different Latitudes. Can plot suns travel thought the sky and know where it will be at any time of the day.

- know the special conditions to a septic tank on high water table condition – Anyone know anything about this?