Construction principles

- Sequence in the construction process

- Solid construction vs. Filigree construction
  - Strength and durability issues
  - Available natural resources
  - Flexibility and permanence
  - Solar gains management
Foundations

- Foundation requirements
  - Safe against structural failure
  - No differential settlement
  - Feasible technically and economically

Image by MIT OCW.
Excavation

- Constraints on slope from soil type
  - Cohesive soil
  - Frictional soil

Image by MIT OCW.
Foundations

- Excavation
  - Constraints on slope from soil type
  - Constraints on slope from available space
Excavation

- Sheeting and bracing
  - Soldier beams
  - Sheeting piling techniques
Excavation

- Sheet ing and bracing
  - Soldier beams
  - Sheet ing piling techniques
  - Sl urry wall
Excavation

- Sheeting and bracing
  - Water table issue
- Covering of base of excavation

Image by MIT OCW.
Foundations

- Loadbearing elements and load-carrying soil
  - Shallow foundation
  - Footing
  - Deep foundation
Plinths

- Protection of façade
- Required for sloped topography
Protection against humidity

- Protection against splashing water (e.g. Pebbles)
- Grass
- Top soil, 25-30 cm
- Pebbles
- Damp roof membrane (dpm) to protect against water from the soil (unheated basement)
  (a) normal level of moisture: black paint (bituminous compound, 2-3 mm)
  (b) higher level of moisture a) + waterproof concrete (chemical additive)
  (c) groundwater: e.g. multi-layer bituminous roofing felt (fully bonded)

Filter layer (unnecessary in groundwater; at best as mechanical protection for damp-proof membrane)
(a) filter boards: e.g. concrete with expanded clay aggregate, or polystyrene, d = 4-5 cm
(b) filter mat: plastic film with honeycomb structure, d = 2-3 cm
(c) perimeter insulation with drainage function

Geotextile mat/fleece (to prevent contamination of pebble fill)
Pebble fill
Sloping side to excavation (angle depends on subsoil)
Perforated/porous pipe bedded in lean concrete, fall approx. 0.5%
Lean concrete (binding layer, e.g. to help place reinforcement), d = 5-10 cm

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Protection against humidity

- **Capillarity**
  - \( F_c [N/m] = 2\pi r \sigma \cos \alpha \)
  - \( F_c \div (\pi r^2) = \rho g h \)
Foundations

- Protection against humidity
  - Capillarity
  - Prevention measures
Main reference for lecture contents:


Additional readings relevant to lecture topics:

- "Fundamentals of Building Construction" by Allen: Chap. ...
- "Building Construction Illustrated" by Ching & Adams: Chap ...