



Construction processes – from foundation to completion of a building

Part A : Basic Work Involvements in
usual Building Construction projects



Major work components in typical building project

1. Site formation
2. Sub-structure works
3. Construction of the main structure
(superstructure)
4. Building finishes
5. Building services installation

What will be involved in the Site Formation process?

Site formation is to carry out the necessary work to form and obtain a piece of land suitable to construct a building as required according to a design

However, under the hilly and congested environment of HK, very often quite a number of slope cutting works are required in the site formation process

What will be involved in the Sub-structure works?

1. Provide foundation to building
2. Construct other building structures which is below ground, these include:
 - a) transmit columns
 - b) ground beams
 - c) basement

What will be involved in the construction of the superstructure?

Construct major structural elements of a building, these include:

- a) vertical members: walls & columns
- b) horizontal members: beams & floor slabs
- c) other members: stairs, lift shaft etc.
- d) non-structural members: partition walls & other architectural features

What will be involved in building finishes works?

Provide proper finish and fitting out to a building, these include:

- a) provide internal partitioning
- b) seal up & decorate all exposed surfaces: to wall (both ext. & int.), floor & ceiling
- b) provide other functional elements in building: window, door, false ceiling, rails
- c) other essential interior fixture: sanitary appliances, bench, pantry, cupboard etc.
- d) Other interior design decoration for high-quality finishing requirements.

What will be involved in building services installation?

Provide essential electrical & mechanical equipment to allow building to function conveniently & safely, these include:

- a) power supply and electrical installation
- b) gas supply
- c) fire service installation
- d) water supply and drainage
- d) lift service
- e) heating, ventilation and air-conditioning
- f) communication systems

Who will be involved in a typical construction project?

1. The architect, responsible for
 - a) design of the building (architectural)
 - b) represent client to perform all legal/statutory functions
 - c) as the chief coordinator and liaise with all the related parties for the required administration & construction works

Who will be involved in a typical construction project? (continue)

2. Consultant engineer, responsible for
 - a) design of the building (structural/ E&M)
 - b) supervise appointed contractors for the carrying out of the building services installation
 - c) check the completed E&M works for government inspection and handing over of the building back to client upon completion

Who will be involved in a typical construction project? (continue)

3. Quantity Surveyor, responsible for
 - a) cost advisor and accountant of a project
 - b) perform cost control and routine accounting functions
 - c) supervise and prepare payment for all involved construction works
 - d) prepare interim and final account at appropriate stage of the project

Construction processes – from foundation to completion of a building

Part B : Basic Technology to Construct Buildings

The Site Formation Process

The photos below show the formation process
of a school project at To Yuen Street,
Kowloon Tong.

Removing surface soil

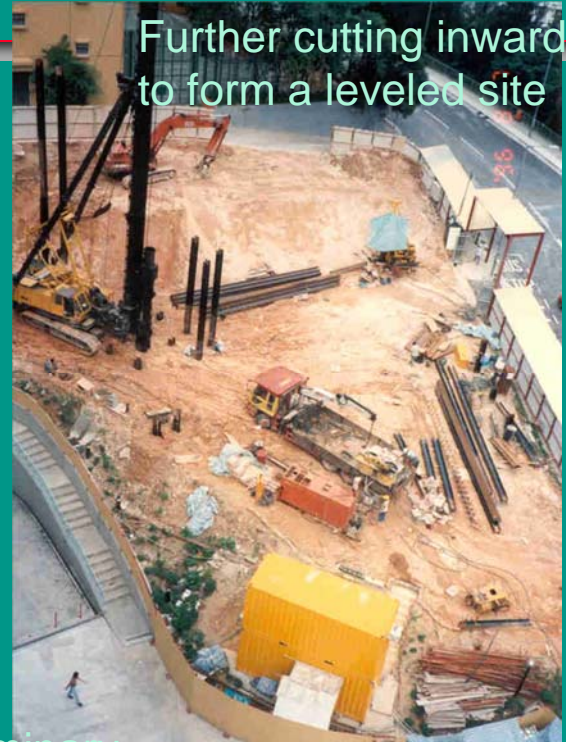


Felling and clear
away all vegetation

The Site Formation Process



Excavate to form the preliminary ground shape and profile



The Site Formation Process



Provide a cut-off wall by drilling bored-pile into ground as support for further excavation



The Site Formation Process



Excavation downward make possible with the introduction of the bored-pile wall

Substructure Works – constructing the foundation

Continued with the school example



Carry out pile test by pre-loading to ensure performance of piles



Using H-steel piles as foundation for this project

Constructing the foundation

Expose the piles to form the pile cap



Provide formwork to form the shape of pile cap

Constructing the foundation



Pile caps being formed. The larger one has the steel reinforcement being fixed, ready for the placing of concrete

The Site Formation Process

Example of large-scale site formation projects

- *Stabilize natural or new slope within the site.*



- *Forming of access road and drainage system*



Terraces (smaller strips of flatter land platform) at various levels were formed at the later stage of formation process



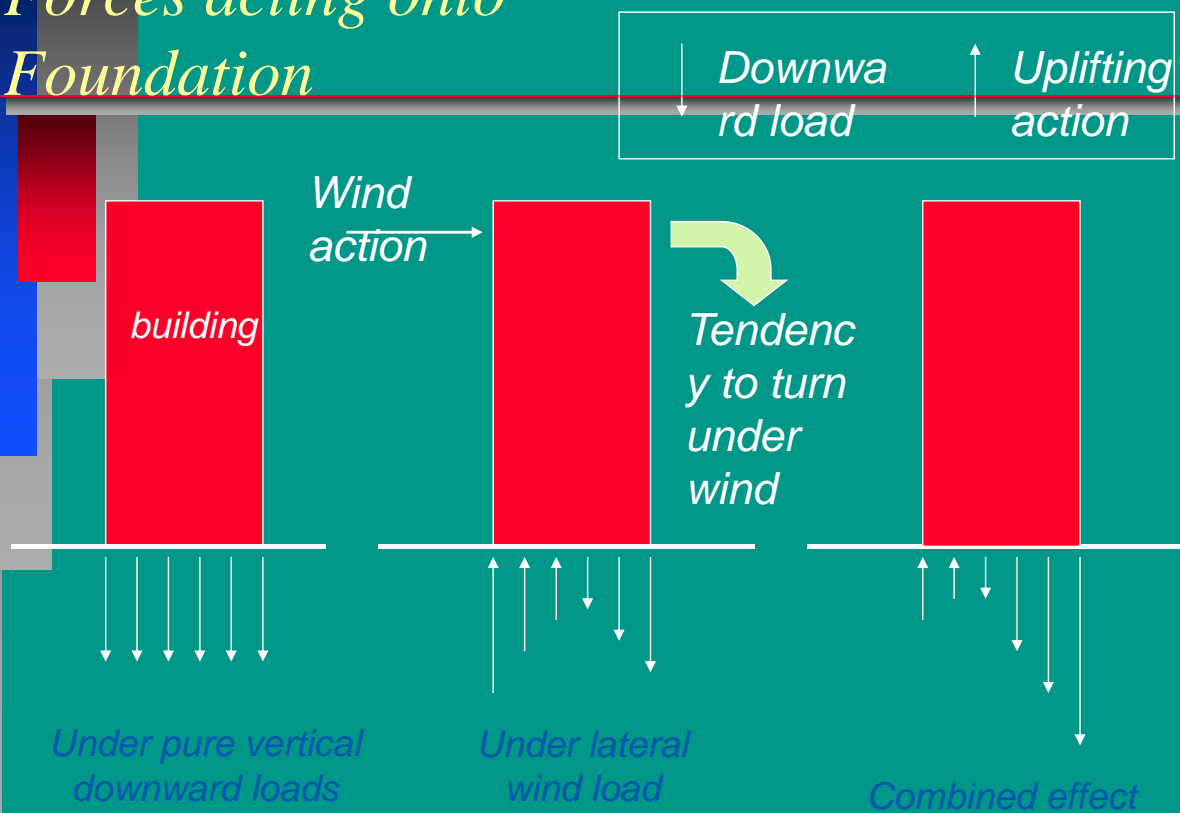
*Another example of large scale formation project –
The Anderson Road Formation*



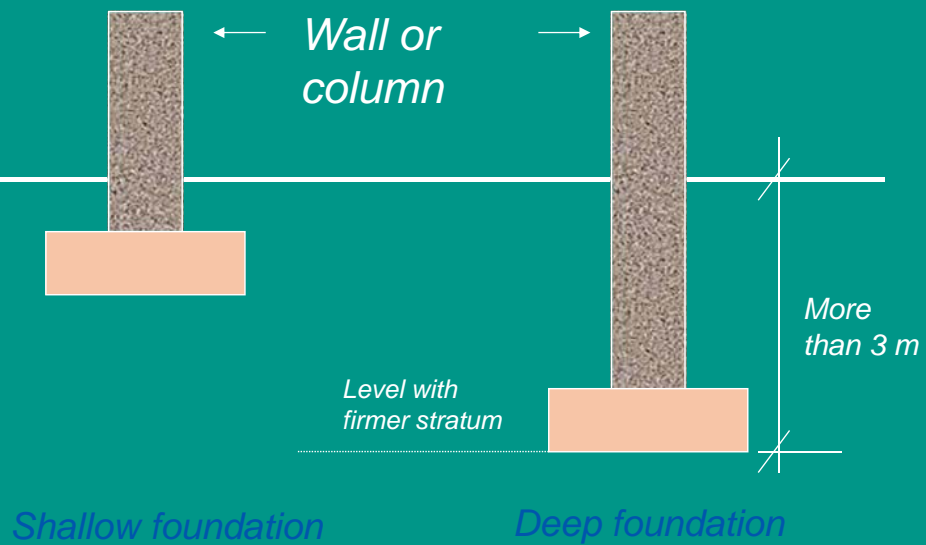
The actual view on site



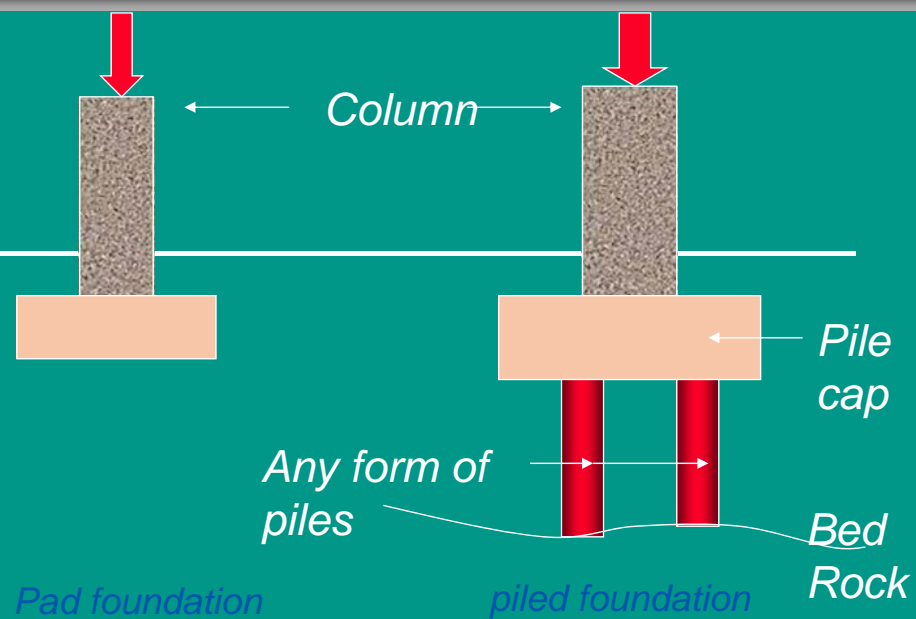
Forces acting onto Foundation



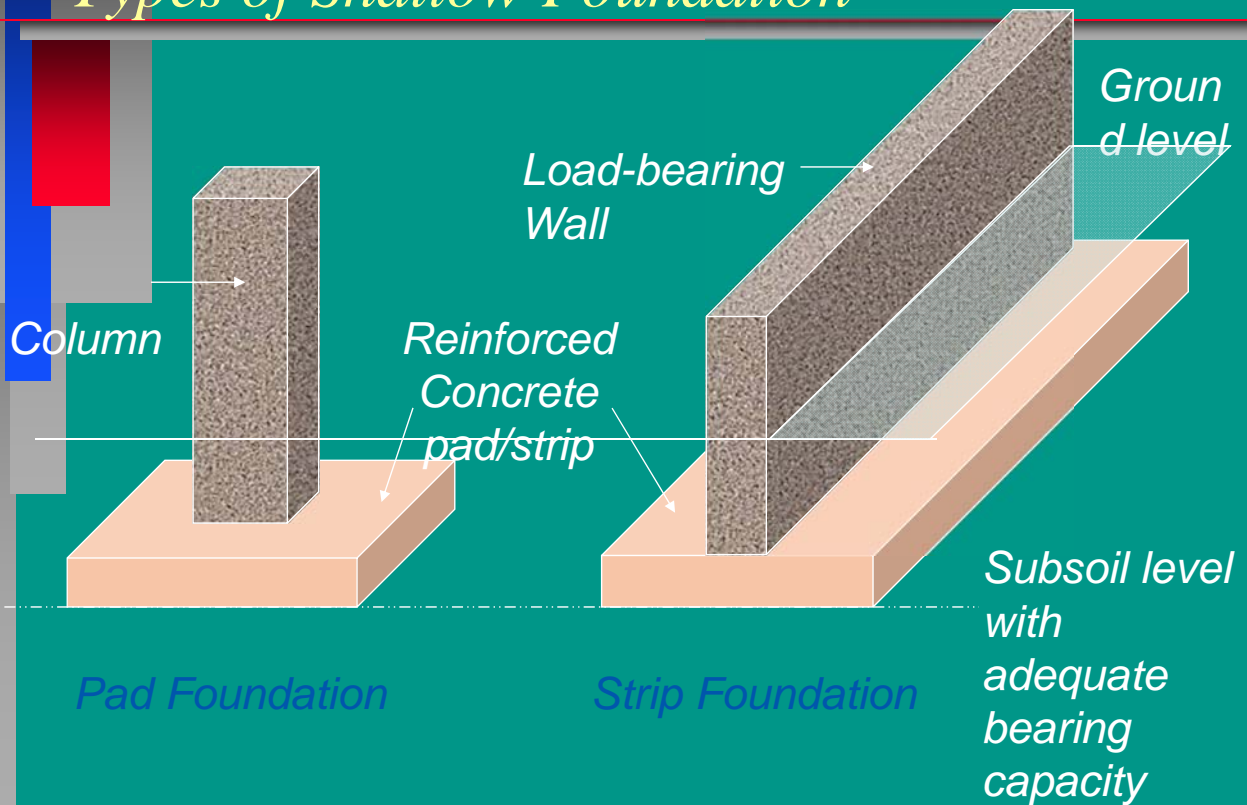
Examples of Shallow Foundation



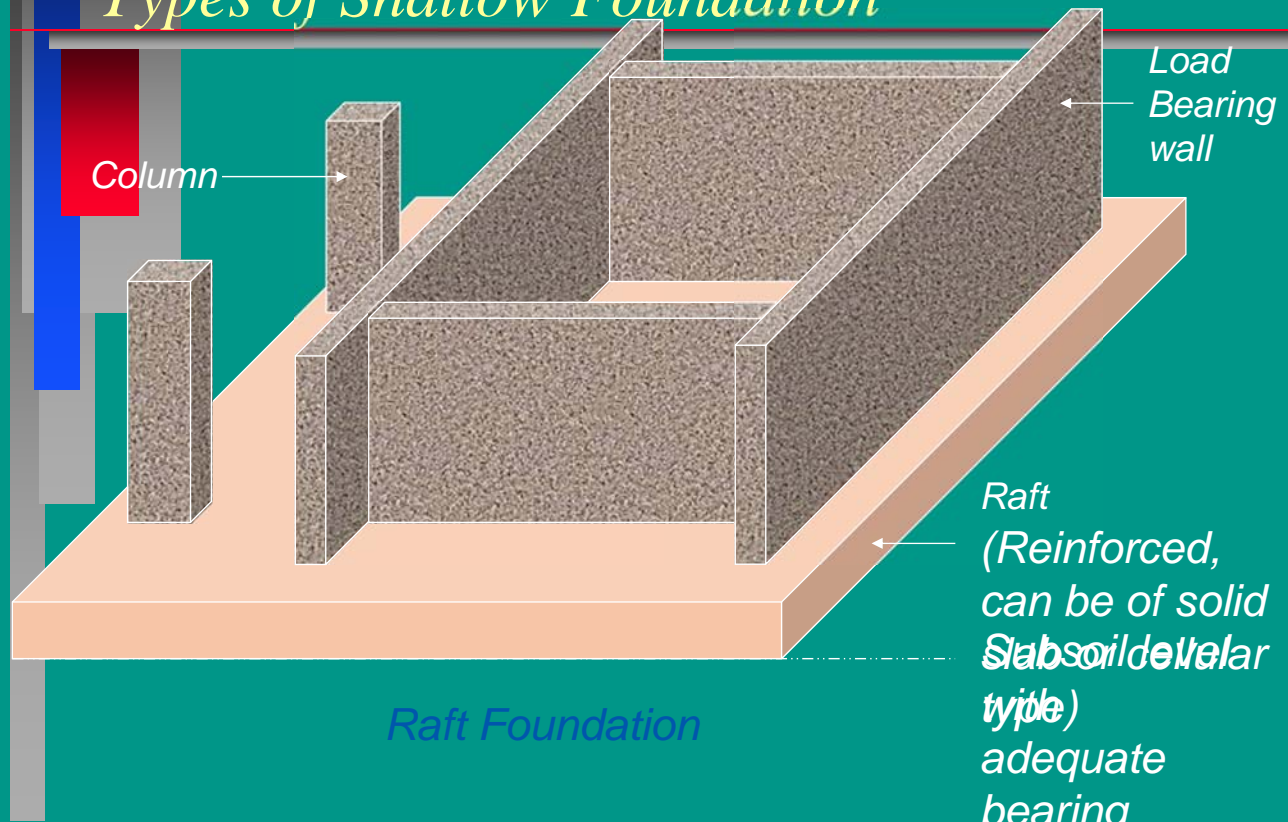
Shallow and Piled Foundation



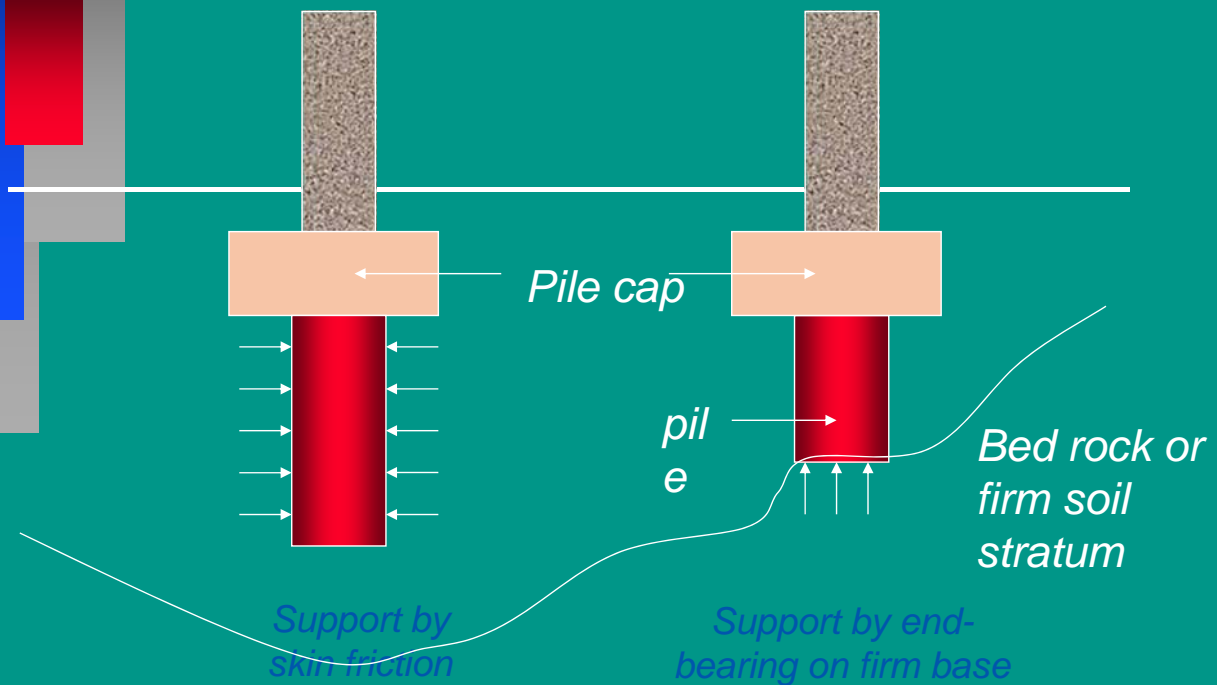
Types of Shallow Foundation



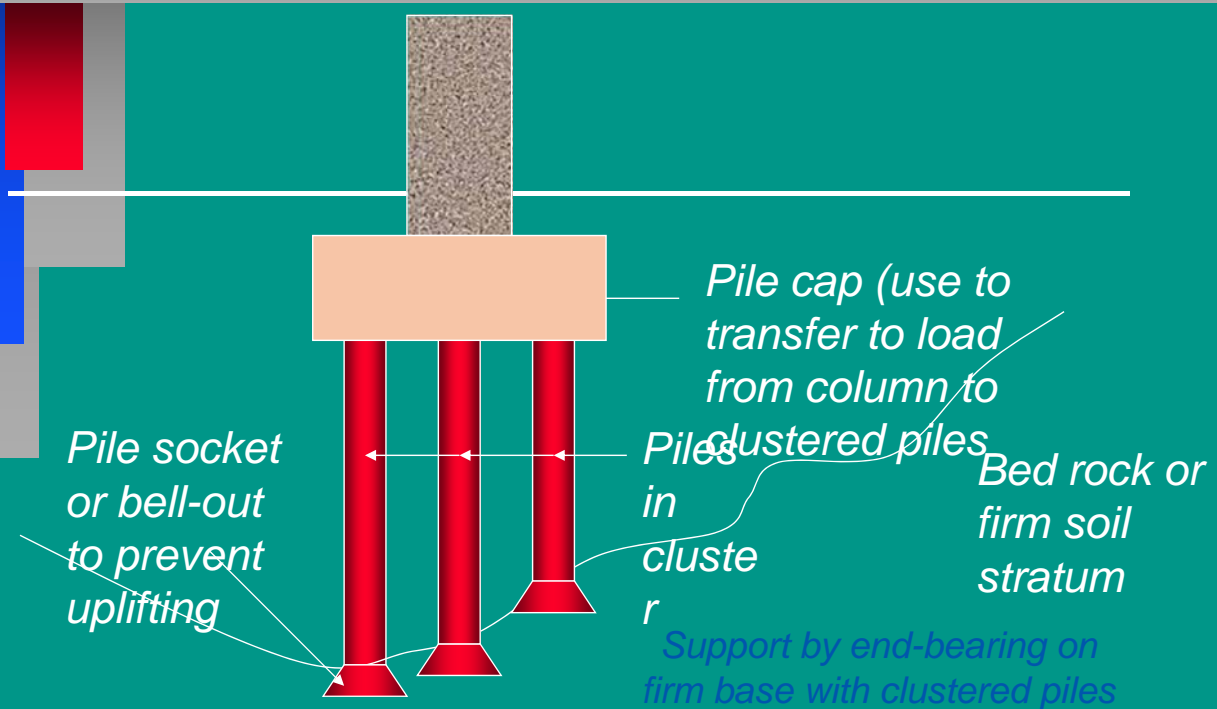
Types of Shallow Foundation



Loading Supports to Pile



Loading Supports to Pile



Piles formed by percussion methods



*H-pile driven
using gravity drop
hammer*



*Precast circular-
section pile driven by
diesel hammer*

Constructing the foundation

Other forms of foundation systems suitable for
larger projects



Precast concrete pile

Constructing the foundation

Other forms of foundation systems suitable for larger projects



Small diameter bored- pile

Constructing the foundation

Other forms of foundation systems for larger projects



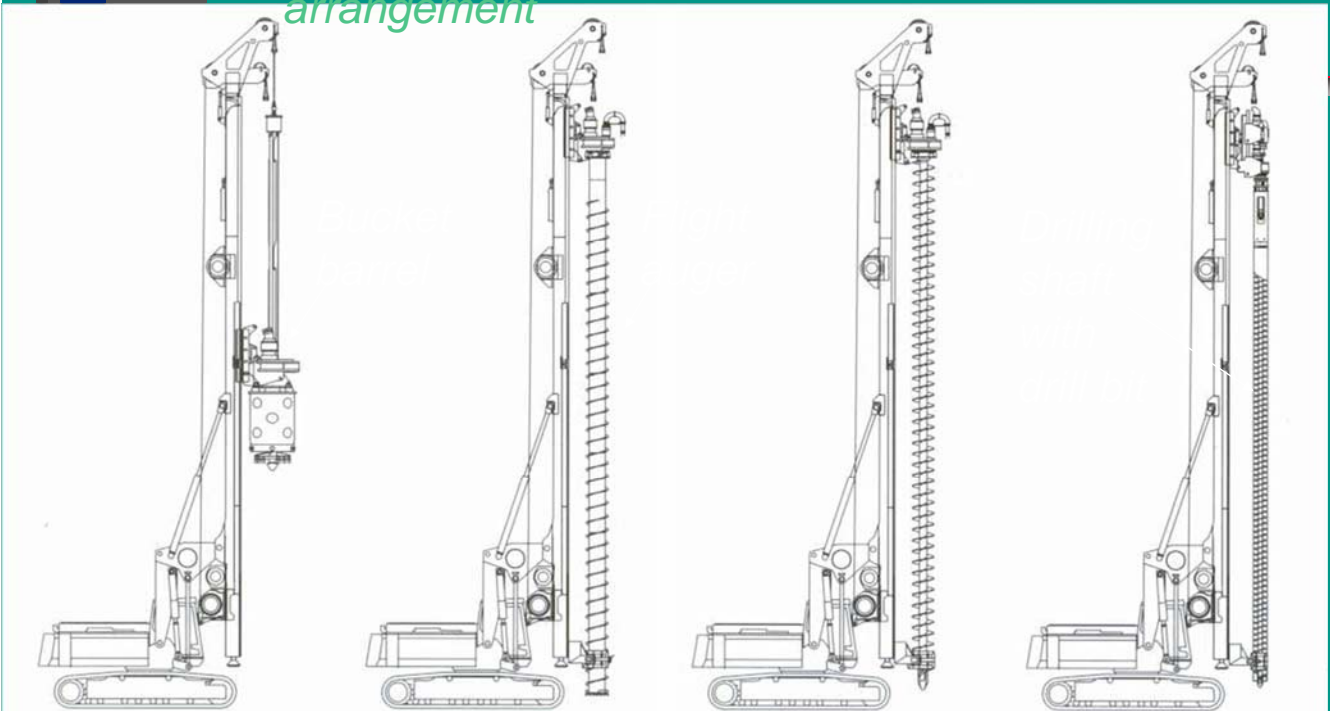
In-situ concrete pile (formed by drilling a bored-hole into ground using a steel casing)

Steel case to facilitate drilling



Various forms of drilling rig

Drilling rig able to adopt to various boring arrangement



Various forms of the drilling rig for pile max up to 900mm dia.

Constructing the sub-structure

Continued with previous school example



Constructing ground beams as the simplest form of substructure

Constructing the sub-structure



Ground beams detail



Placing concrete to form the ground floor slab

Constructing the superstructure



Detail of the beams and slab formwork

Construct the beams and floor slab of ground floor

Constructing the superstructure

Beams and slab formwork for upper floor being erected



Floor slab being concreted, form panels are ready for erecting the wall formwork

Constructing the sub-structure

Example of more complicated cases

Excavation down to the formation level. At this level, the pile heads were located and prepared for the receiving of the pile cap or raft foundation for the core wall



Street level

Formation level for raft foundation



Excavated pit for the forming of the building raft/sub-structure

Raymond Wong, CityU

45



*Construction/forming of the raft,
lift pit and the core wall structure*



46

*Excavation to form the
Phase 1 of the pile cap*



Raymond Wong, CityU

47



Raymond Wong, CityU

48



Raymond Wong, CityU

49



Raymond Wong, CityU



50



Close-up detail in the Phase 3 – steel fixing for the pile caps⁵¹ and ground beams



Phase 3 after concreting, signifying the basic completion of the entire substructure construction⁵²



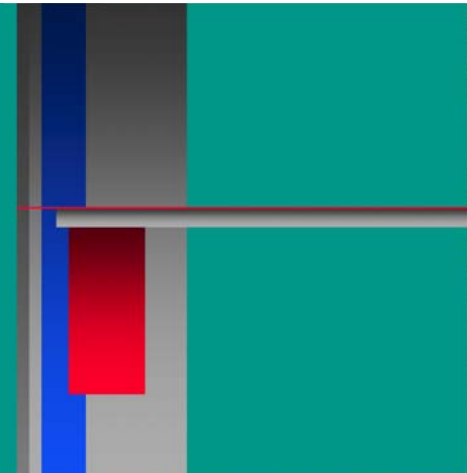
Other example for sub-structure works – City University new Administration Building



Raymond Wong, CityU

Forming the pile cap for the building core

53



Raymond Wong, CityU

Other example for sub-structure works – City University new Administration Building

54



Raymond Wong, CityU

Other example for sub-structure works – City University new Administration Building



Raymond Wong, CityU



Site formation almost completed ready for the handling over for superstructure⁵⁷ construction

Constructing the superstructure

Building superstructure can be very huge in size and complex, below are some examples

Constructing a large scaled building project using traditional timber formwork



Constructing a large scaled building project using traditional timber formwork



Constructing the superstructure

Other examples



Constructing a superstructure using steel formwork

Constructing the superstructure

Other examples



Constructing a superstructure using mechanical formwork

Constructing the superstructure

Other examples



Constructing a superstructure using prefabricated concept



Constructing a super-structure
using prefabricated concept
(precast construction)

Constructing the superstructure

Other examples



Constructing a superstructure
using structural steel

Other examples (Cheung Kong Center)

Constructing a superstructure using structural steel and reinforced concrete



Other examples (ICC)

Constructing a superstructure using concrete and structural steel and reinforced concrete



Finishing a building

External Finishes

- a) Finishing up the exterior by laying wall tile (mosaic, ceramic tile or stone slab)
- b) By the use of other covering (cladding) system
 - cladding panel
 - curtain wall

Finishing a building

external finishes - using wall tile



Finishing a building

external finishes

- using stone slab



Finishing a building

external finishes

- using curtain wall



External finishes - using curtain wall



External finishes - using curtain wall or other nice-looking finishes with other mounting-on materials



Finishing a building

Internal partitioning

- a) Material used – brick or block
- b) Other partitioning systems or products
 - timber panel
 - precast concrete panel
 - dry wall
 - demountable wall

Finishing a building

Internal partitioning using brickwork



Finishing a building

Internal partition using dry-wall system



Internal partition using dry-wall system



Finishing a building

Surface rendering - plaster

There are two types of plaster

- cement/sand plaster: floor, external wall or undercoat to internal walls
- cement/sand/lime plaster: to ceiling or surface coat to walls

Surface rendering – slab or tiled finish

- a) Ceramic tile – floor (thicker, heavy duty), wall (thinner but finer) & external wall (tougher)
- b) Stone slab – marble, granite or slate

Finishing a building

Surface rendering - plaster

Sharpen
corners

Stage 2 -
apply surface coat



Stage 1 -
apply
undercoat

Finishing - prepare plastering material

Mixing lime
plaster



Mixing cement
and sand

Finishing – tiled finish

Apply wall tile (mosaic)
to external wall



Applying wall tile
to internal wall

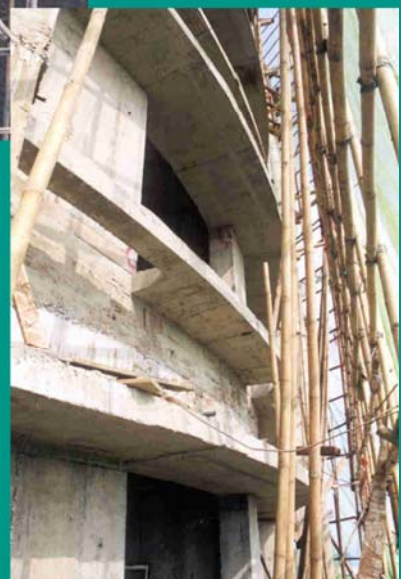
Finishing

- example of various kind of floor finish



Finishing

- external finishes



What will be involved in building finishes?

Provide proper finish and fitting out to a building, these include:

- a) provide internal partitioning
- b) seal up & decorate all exposed surfaces: to wall (both ext. & int.), floor & ceiling
- c) provide other functional elements in building: window, door, false ceiling, rails
- d) other essential interior fixture: sanitary appliances, bench, pantry, cupboard etc.

What will be involved in building services installation?

Provide the essential electrical & mechanical equipment to allow building to function conveniently & safely, these include:

- a) power supply and electrical installation
- b) fire service installation
- c) water supply and drainage
- d) lift service
- d) heating, ventilation and air-conditioning
- e) communication systems

Who will be involved in a typical construction project?

1. The architect, responsible for
 - a) design of the building (architectural)
 - b) represent client to perform all legal/statutory functions
 - c) as the chief coordinator and liaise with all the related parties for the required administration & construction works

Who will be involved in a typical construction project? (continue)

2. Consultant engineer, responsible for
 - a) design of the building (structural/ E&M)
 - b) supervise appointed contractors for the carrying out of the building services installation
 - c) check the completed E&M works for government inspection and handing over of the building back to client upon completion

Who will be involved in a typical construction project? (continue)

3. Quantity Surveyor, responsible for
 - a) cost advisor and account of a project
 - b) perform cost control and routine accounting functions
 - c) supervise and prepare payment of all involved construction works
 - d) prepare interim and final account at appropriate stage of the project

Construction processes –
from foundation to
completion of a building

Part B :
Technical Understanding

Finishing a building

Internal partitioning

- a) Material used – brick or block
- b) Other system or product
 - timber panel
 - precast concrete panel
 - dry wall
 - demountable wall

Finishing a building

Internal partitioning



Finishing a building

- example of internal partition

Dry wall system



Finishing a building

Surface rendering - plaster

a) Kind of plaster

- cement/sand plaster: floor, external wall or undercoat to internal walls
- cement/sand/lime plaster: to ceiling or surface coat to walls

Surface rendering – slab or tiled finish

- a) Kind of tile – floor (thicker, heavy duty), wall (thinner but finer) & external wall (tougher)
- b) Stone slab – marble, granite or slate

Finishing a building

Surface rendering - plaster

Sharpen
corners

Apply
surface coat



Stage 1 –
apply
undercoat

Finishing - prepare plastering material

Mixing lime
plaster



Mixing cement
and sand

Finishing – tiled finish

Apply wall tile (mosaic)
to external wall



Applying wall tile
to internal wall

Finishing

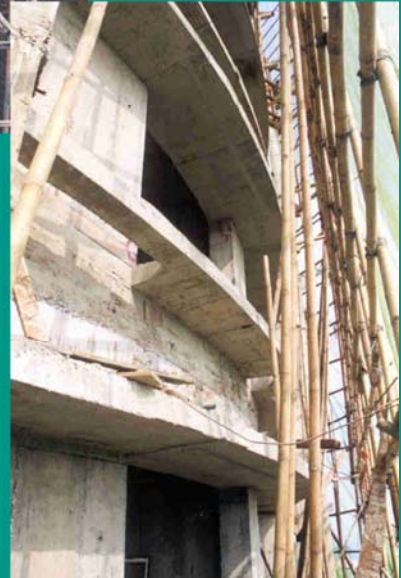
– example of various
kind of floor finish





Finishing

– external finishes



Finishing – slab finish

(marble or granite slab)



Fixing the
slab to wall



Finishing a building

Other function elements

a) Window

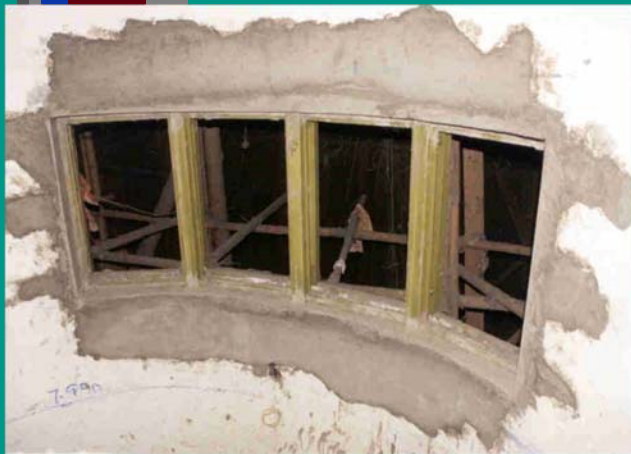
- type: unit type, curtain wall or glass wall
- material: cast iron, steel, aluminum or plastic

b) door

- type: single/double leafed, single/double swing, hollow/solid, flushed/paneled
- metal: timber, iron/steel/stainless steel or aluminum

Finishing a building

- other function elements: Window



Grouting the window



Fixing a window into an opening

Finishing a building

- other function elements: Window



Fixing a window unit onto the building frame

Finishing a building

Other function elements

c) False ceiling

- function: decorative, serviceable, fire resisting, accommodate and conceal ceiling services (e.g. light, a/c and ducts)
- type : grid, panel, jointless system
- functional :
- material: timber, plastic board, laminated metal, aluminum, mineral fiber, or glass wool

Finishing a building - false ceiling



false ceiling with interior design quality

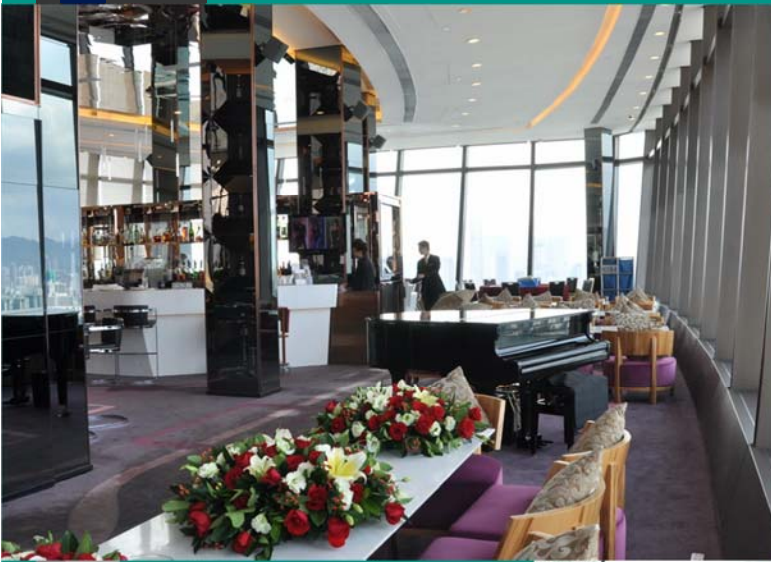


Well-finished interior of residential building



Well-finished interior for other functional space – lecture hall





Well-finished interior for
other functional space –
nice restaurant



Well-finished interior for
other functional space –
shopping mall



Finishing a building

Other function elements

c) False ceiling

- function: to accommodate and conceal ceiling services (e.g. light, a/c and ducts)
- type-usual : grid, panel, jointless system
- type-functional : decorative, serviceable, or fire resistant
- material: timber, plastic board, laminated metal, aluminium, mineral fiber, or glass wool

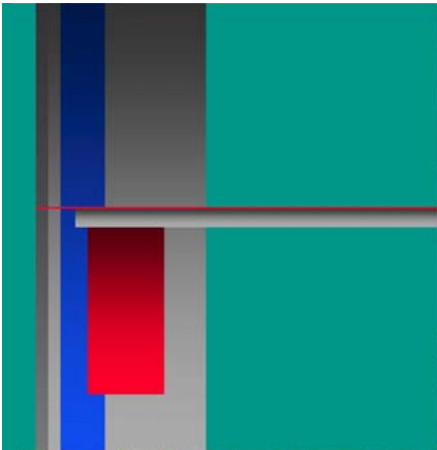
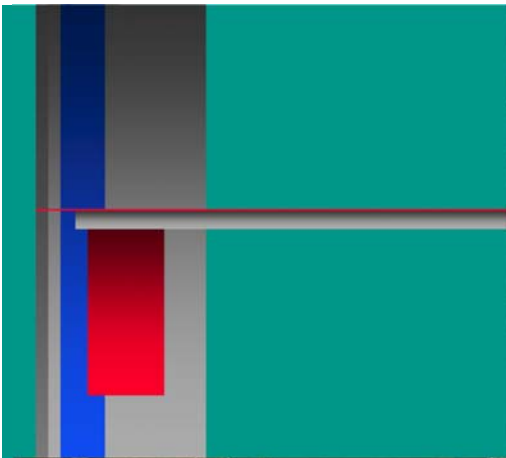
Finishing a building

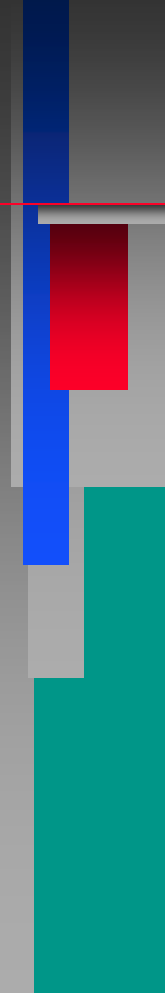
- false ceiling



- Finishing a building
- - Electrical and Mechanical installation, provide the building services:
 - This includes – provision of power supply, lighting, air conditioning, fire services, lift services, water supply, tele-communication.







This presentation is so designed to give students, who are not studying building construction as a major subject, a brief understanding how technology is involved and applied in a building process. Hoping that the information here can serve this basic purpose.