In-situ reinforced concrete

Basic elements of the technology
- Formwork
- Concrete
- Reinforcement

Site planning
- Transportation
- Preparation/treating
- Storing
- Scheduling
In-situ reinforced concrete

- **Basic elements**

In-situ reinforced concrete

- **Basic steps of technology**
  1. Checking the structures existing/done before and site
  2. Layout of the planned structure
  3. Preparation of the formwork (concrete, reinforcement)
  4. Assembling the formwork
  5. Placing the reinforcement
  6. Placing the concrete
  7. Consolidating and curing the concrete
  8. Disassembling of the formwork (striking)
  9. Removing props (horizontal structures)
Elements

Formwork

- Vertical formworks
  - Framed formwork (panel formwork)
  - Timber-beam formwork
  - Special elements, e.g. column formwork

- Slab formworks
  - Panel formwork
  - Timber-beam formwork
  - Special formwork systems, e.g. drophead system, table system

- Special formworks
  - Climbing-, gliding-, tunnel- formw., fair-faced concrete
Formwork

- Vertical formworks
  - One-sided / Two sided wall formwork
  - Framed formwork (panel formwork)
    - Heavy weight
    - Light weight
  - Timber-beam formwork
  - Column formwork

Formwork

- Slab formworks
  - Panel formwork (light / heavy)
  - Timber-beam formwork
  - Drophead system
  - Table system
Concrete

- Material:
  - Binder material, usually Portland Cement
  - Water
  - Aggregate, e.g. sand, gravel or crushed stone
  - Admixtures, e.g. accelerators, retarders, pigments, pumping aids

- Characteristics
  - Consistency, setting time…
  - Strength, loadbearing capacity
  - Spec. characteristics, e.g. colour

- Mixing concrete:
  - Ready-mixed concrete (off site);
  - On-site mixing

Reinforcement

- Traditional reinforced concrete
  - Steel – reinforcing bars, mesh – cut, bent and assembled
  - Size:
    - length 6m (12m),
    - diameter 6mm –
    - mesh 5x2,15m

- Special reinforcement
  - Pre-stressed reinforcement
  - Steel/plastic/glass fibres
  - Special materials, e.g. bamboo, hemp…
Site planning

Transportation

- To the site
  - Formwork, reinforcing bars: trucks
  - Components of the concrete: trucks or silos
  - Ready-mixed concrete: mixer trucks
Transportation

- On site – Placing concrete:
  - Buckets;
  - Hand / power buggies, wheelbarrows;
  - Chutes and drop pipes;
  - Belt conveyors;
  - Concrete pumps

Transportation

- On site – formwork and reinforcement
  - Hand / power buggies: timber-beam formwork parts, elements of reinforcement
  - Crane: panel formwork, pre-assembled formworks, assembled reinforcement
Transportation

- On site Tower-crane

Preparation/treating

- Formwork – before using
  - (Planning the formwork)
  - Spraying release agent on the facing
  - Preparation of supplemental elements (size adjustment)
  - Pre-assembly of the formwork

- After using
  - Removing supplemental elements
  - Cleaning all surfaces (water!)
  - Disassembly to transportable size
Preparation/treating

Concrete

- Receiving concrete: checking quality certificate
- Problem sources before placing: over-mixing, adding water
- After placing: consolidating (removing bubbles by vibrating or self-consolidating concrete)
- Curing = keeping concrete under controlled temperature and humidity, e.g. spraying/sprinkling water, covering with PE sheets, spraying a plastic membrane
- Setting, hardening, drying…

Preparation/treating

Concrete
Preparation/treating

- **Reinforcement**
  - Cutting, bending, assembly
  - In factory/on site – 12 m long place required!

Preparation/treating

- **Reinforcement**
Storing

- Formwork?
  - Supplemental/not used parts

- Concrete?
  - Mixer-trucks, bucket, pump

- Reinforcement
  - Raw material in rolls/bars
Storing

- Concrete

Storing
Scheduling RC work

Information needed

- **What to do?**
  - Quality and quantity – formwork area, surface, concrete and reinforcement volume

- **How to do it?**
  - Technology – formwork
  - Type of labour (trades)
  - Type of machine, equipment

- **Costs?**

---

**Main steps**

- **Walls, pillars**
  - Assembling formwork (one side)
  - Placing reinforcement
  - Assembling formwork (other side)
  - Placing concrete
  - Disassembling formwork

- **Slabs, stairs**
  - Assembling formwork
  - Placing reinforcement
  - Placing concrete
  - Disassembling formwork
Scheduling RC work

- **Quantity**
  - Slab: 480m²
  - Wall: 297m²
  - Pillars: 3pcs

- **Technology**
  - Slab: framed formwork
  - Walls: framed formwork
  - Concreting equipment: pump

---

Scheduling RC work

- **RC work**
  - Assembling formwork W
  - Placing reinforcement W
  - Placing concrete W
  - Disassembling formwork W
  - Assembling formwork S
  - Placing reinforcement S
  - Placing concrete S
  - Disassembling formwork S
Scheduling RC work

- RC work
  - Ass. formwork W
  - Reinforcement W
  - Concrete W
  - Dis. formwork W
  - Ass. formwork S
  - Reinforcement S
  - Concrete S
  - Dis. formwork S

Scheduling RC work

- RC work
  - Assembling formwork W
  - Placing reinforcement W
  - Placing concrete W
  - Disassembling formwork W
  - Assembling formwork S
  - Placing reinforcement S
  - Placing concrete S
  - Disassembling formwork S
Scheduling RC work

- RC work
  - Ass. formwork W
  - Reinforcement W
  - Concrete W
  - Dis. formwork W
  - Ass. formwork S
  - Reinforcement S
  - Concrete S
  - Dis. formwork S

Scheduling RC work

- RC work
  - Assembling formwork W
  - Placing reinforcement W
  - Placing concrete W
  - Disassembling formwork W
  - Assembling formwork S
  - Placing reinforcement S
  - Placing concrete S
  - Disassembling formwork S