In-situ reinforced concrete

- Basic elements of the technology
  - Formwork
  - Concrete
  - Reinforcement
  - Site planning
  - Transportation
  - Preparation/treating
  - Storing
  - Scheduling
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)
Formwork

- Wall 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

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

- 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

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

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

- **Formwork?**
  - Supplemental/not used parts

- **Concrete?**
  - Mixer-trucks, bucket, pump

- **Reinforcement**
  - Raw material in rolls/bars

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Storing

- **Formwork**
Storing

- Concrete
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?**

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Scheduling RC work

Main steps

- **Walls, pillars**
  - Assembling formwork
  - Placing reinforcement
  - Placing concrete
  - Disassembling formwork

- **Slabs, stairs**
  - Assembling formwork
  - Placing reinforcement
  - Placing concrete
  - Disassembling formwork

Time to set
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

### Diagram

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|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
```

## 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

### Diagram

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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