BUTE Department of Construction Management and Technology

Basics of time scheduling

08.11.2016

What is a time schedule?

- Why?
  - There are lots of processes during a construction project
  - Some hundreds of people are involved
  - These have to be harmonised in space and in time
- Types of processes
  - Design processes
  - Realisation processes (purchase/preparation of materials)
  - Authority procedures
  - Handover-takeover procedure, permission of use…

What is a time schedule?

- Affecting factors:
  - Law, regulation;
  - Financing;
  - Technology;
  - Resources…
- Time and…
  - Money: Financial schedule, cash-flow
  - Quality: Quality control plan
  - Resources: human, machine, material, money…

What is a time schedule?

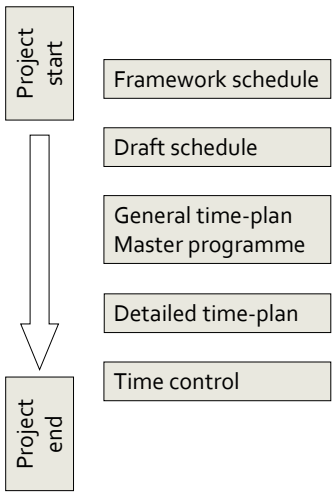
- Purposes and aims
  - To give the duration of a project/construction
  - To expose likely difficulties of the future, and help to solve them
  - To minimize the unproductive time of men and machines
  - To use as a control tool

Plan → Organise → Manage → Control

The time plan has to be detailed (and accurate) enough for the actual use – project manager, construction manager, general foreman, skilled workers, etc.

What is a time schedule?

- Types of schedules – according to elaboration (during a building project)
  - The later it is made, the more accurate and detailed it can be
  - Time scale >
  - Number of activities <

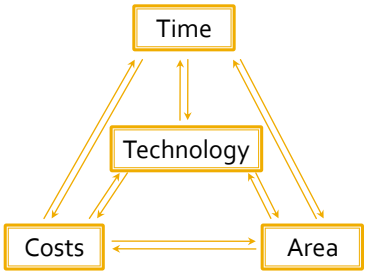


„Time planning"

„Time planning"

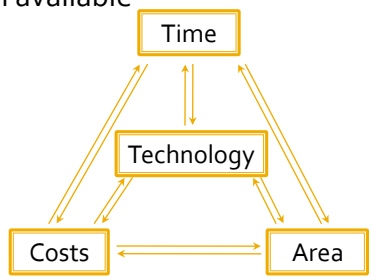
Information needed

- What to do?
  - Operations, activities;
  - Events;
  - Quality and quantity.
- How to do it?
  - Technology;
  - Type of labour (trades);
  - Type of machine, equipment;
  - Subcontractors.
- Costs?



„Time planning"

- Information incorporated:
  - Duration of activities or time span available
  - Contents on technology (how?)
  - Time-Space correspondence
  - Sequence based on technologies
  - Milestones: starting and finishing dates → whole duration
  - Partial payments, cash-flow



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Standards: tools for estimating time required for the processes

- Performance standard [time/unit] (h/m³, h/m²…)
- Standard output [unit/time] (m³/h, pcs/h)
- The standards are determined by statistical/ technical analysis, by measuring and comparing former performance.
- The standards have to be adjusted to the actual circumstances (location, resources, …)

„Time planning"

Example: partition making (ceramic blocks) 27m²

Volume [unit] x Performance standard [time/unit] = Work [time]

27m2 x **0,56**h/m2 = **15,12** h

Work: time of process for one unit of resource

$$\frac{\text{Work [time]}}{\text{Allocated resource [unit]}} = \text{Duration [time]}$$

$$\frac{\textbf{15,12}\text{h}}{\textbf{3} \text{ workers}} = \textbf{5,04} \text{ h} \rightarrow \textbf{1} \text{ day (8h/day)}$$

Duration: time of process for the allocated units of resource

Result information:

- Operation (task), Quantity
- Labour / equipment, quantity
- Duration

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Example: partition making (ceramic blocks) 27m²

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Result information:

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- Labour / equipment, quantity
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„Time planning"

From these results

- the time-plan,
- the labour schedule,
- the equipment (plant) schedule,
- the material schedule,
- and the payment schedule can be made.

Connections between operations:

- Consecutive
- Parallel
- Overlapping

Activities

Time schedule representation

Time schedule representation

Timetable (tabular or alpha-numerical schedule)

- Data given with numbers - dates
- Exact, but difficult to see the current status

Example: a retaining wall

ID	Activity	Time	Start	Finish	Labour	Machine	Cost	Remark
1	Demolish top soil	2 d	02-04-10	03-04-10		1 bulld.	€...	
2	Excavating trench	2 d	04-04-10	05-04-10	3 labr.	1 backh.	€...	15% labr.
3	Blinding	3 d	06-04-10	08-04-10	5 labr.		€...	
4	Formwork (foundation slab)	3 d	08-04-10	10-04-10	2 carp.		€...	
5	Reinforcement (foundation slab)	5 d	08-04-10	12-04-10	4 steel.		€...	35% prefabr.

Time schedule representation

Bar chart – Gantt chart

- Most widely used technique
- A list of project elements (+other information) – duration visualised
- Easy to see the current status – „today"

ID	Activity	Time	Labour	1	2	3	4	5	6	7	8	9	10	11	12
1	Demolish top soil	2 d													
2	Excavating trench	2 d	3 labr.												
3	Blinding	3 d	5 labr.												
4	Formwork (foundation slab)	3 d	2 carp.												
5	Reinforcement (foundation slab)	5 d	4 steel.												

Time schedule representation

Bar chart – Gantt chart

- Resource management: workers, equipment

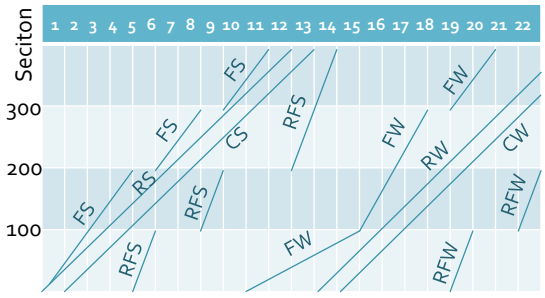
ID	Activity	Time	Labour	1	2	3	4	5	6	7	8	9	10	11	12
1	Demolish top soil	2 d	1 labr.												
2	Excavating trench	2 d	3 labr.												
3	Blinding	3 d	5 labr.												
4	Formwork (foundation slab)	3 d	2 carp.												
5	Reinforcement (foundation slab)	5 d	4 steel.												
	Bulldozer	2 d													
	Backhoe	2 d													
	Labour			1	1	3	3	5	5	11	6	6	4	4	

Time schedule representation

Linear schedule – Cyclogram

- It shows progress: space and time
- It consists of two scales – one for time (e. g. days, weeks,…) and one for space (+tabular info)

ID	Activity	Time
1	Formwork - slab	8 d
2	Reinforcement - s	12 d
3	Concrete - s	12 d
4	Remove formwork - s	4 d
5	Formwork - wall	8 d
6	Reinforcement - w	12 d
7	Concrete - w	12 d
8	Remove formwork - w	4 d



Time schedule representation

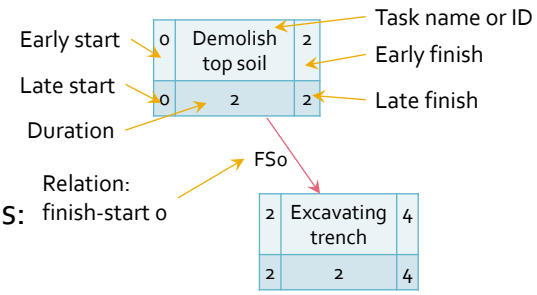
Network diagram

- It contains information about relations of activities
- Easy to see the activities that affect the finishing time of the whole project (critical path), and activities that can have lag (delay).
- Two types of network diagrams:
  - activity on arrow (AOA) CPM
  - activity on node (AON) – these are generally easier to create and interpret. (MPM)

Time schedule representation

Network diagram – MPM network

- Information about activities
  - Starting date(s)
  - Finishing date(s)
  - Float (slack)
- Information about relations of activities:
  - Finish-Start
  - Start-Start
  - Finish-Finish…



Time schedule representation

Network diagram

- Activity on node (AON) network