Construction Site Planning

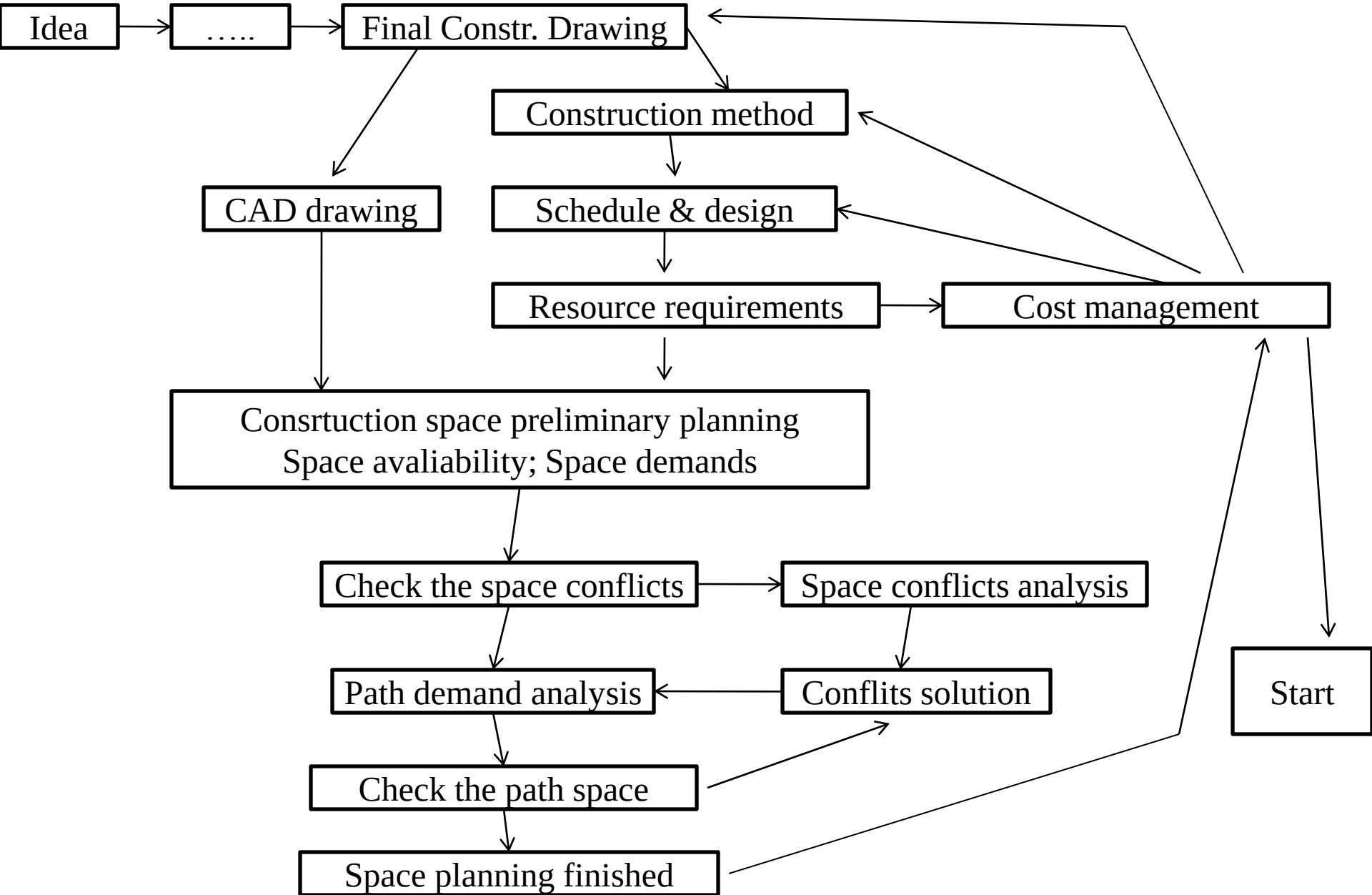
Why do we have to do this?
What is the purpose of it?

1) Decreasing the construction
   - Time
   - Resource
   - Cost
2) Labour safety

Is the construction site planning a flow or a statical design?

Is there any difference in CSP if it is a construction or a reconstruction?

Where would you place it in the flow of the building investment?
(if it starts with the idea, …. and ends with the FM


Idea
…..
Final Constr. Drawing
Construction method
CAD drawing
Schedule & design
Resource requirements
Cost management
Consrtuction space preliminary planning
Space avaliability; Space demands
Check the space conflicts
Space conflicts analysis
Path demand analysis
Conflits solution
Start
Check the path space
Space planning finished

Method of the site planning flow

in ths XXIth century, nowdays in the period of the computers

in Hungary

based on experience, desultory design flow

all around the world

Based on experience, desultory design flow

?

=

Based on math models, using PC, optimizing

Is CSP optimizable just like a factory of a serial standardized product?

Frank & Lillian Gilbreth

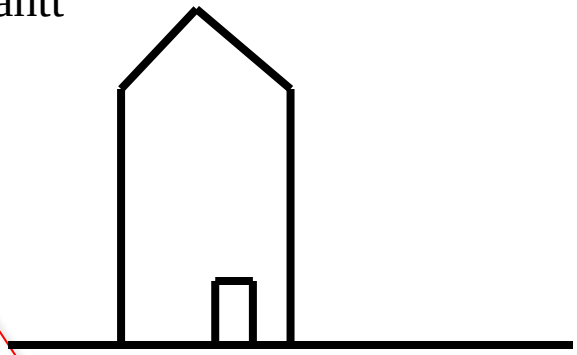
Frederick Winslow
Frederick Taylor
Gantt Chart
Henry Gantt

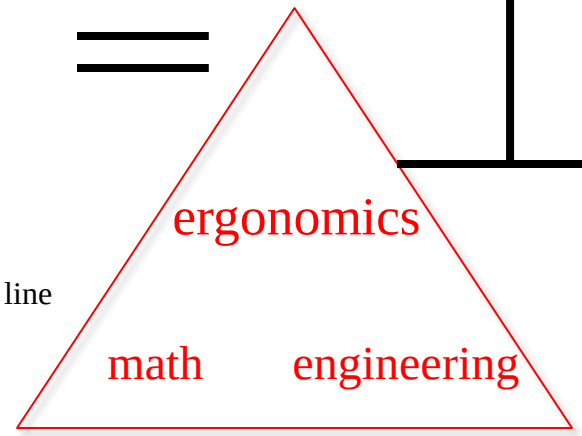
Till the skilled workers uprised (1910, Waterford Arsenal)

Henry Ford

Conveyert belt = production line

=





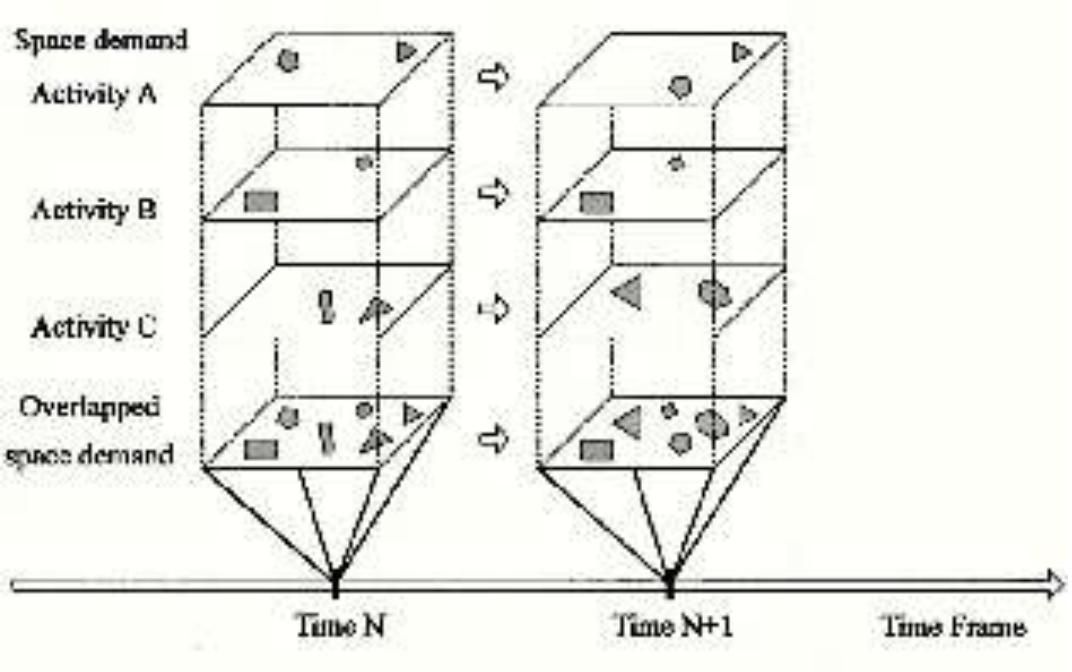
This is the unnecessary work! = waste of time, resource & cost

The known models

The *site manager's* solution of the problem: ⟶ **First-come-first served**

Researchers: **2 basic methods**

1) place everything (is needed) to everywhere, then choose the best (knap-sack model)
2) grade the different type of stuffs by sg (weight, volume, size, cost, shape, …) then arrange them one at a time to their best place



computer-based site layout systems mostly use one of these

-AI (artifficial intelligence) techniques
-Generic algorithm
-Fuzzy logic systems
-Neural Network

All of them calculates ba **Euclidean distance** or **„rectilinear distance".**

How it starts?

Project (function, size, levels, design, structures, materials, sizes, weights)

Building site avaliability vs construction site demands (size, slopes, infrastructure, etc)

Environmet possibilaties and capabilities (neighbors, accessability)

Regional capabilities (mines, factories, stores, hospitals, etc.)

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What kind of construction site drawings are exists?

Construction site map

General construction drawing

Detailed construction drawing

Detailed construction state drawing (for a technology or a machine)

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What kind of construction site drawings are exists?	Functions?
Construction site map	~Feasibility, just in case, transportation
General construction drawing	~Feasibility in the site
Detailed construction drawing	~by main structures or technologies
Detailed construction state drawing	~ by main machnines or technologies

Construction site map (M1:1000, M1:5000)

Must mark at least:

Environment (estates, properties, buildings, under construction facilities)

Transportation possibilities (railway, highway, road, street;

directions, material, widths and gradiation of slopes of roads, etc)

Accessibility (roads, parking places, public transportation)

Material supply (mines, factories in the neighbourhood)

Infrastructure (at least electric (high and low), water, wastewater supply)

Labor safety (nearest hospitals)

General construction site drawing (M1:500, M1:1000)

Must mark at least (with dimensions and levels):

Property (own site, entrances, neighbours and their buildings with hights)

Defenced stuffes on the site (building, tree, etc)

Roads near by the site (directions, widths, turning radius, gradiation of slopes, materials)

The contour of the structure

Place of the main equipments and machines (tower crane, auto crane, pump, temporary track parking lots, etc)

Main depots and working space (of the main technologies (pre-erecting on the site) (steel, timber, scaffolding, etc)

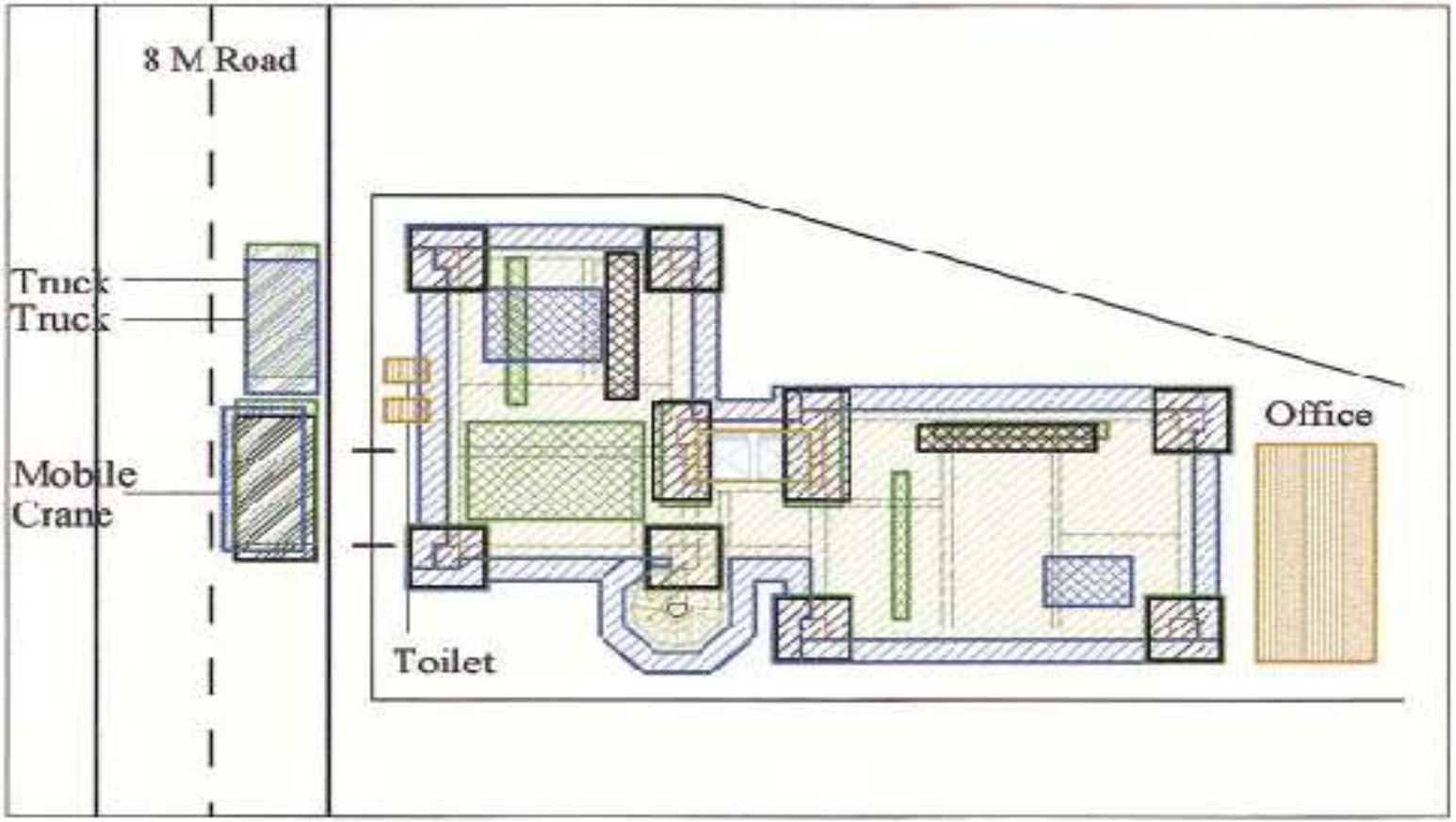
Temporary and final roads, streets on the site

Main facilities and staging buildings (management, social container, medical room)

Infrastructures (incoming places, temporary and final places)

Guarding system

General construction site drawing (M1:500, M1:1000) Main Conflicts Identification



Construction Space Type	Survey	Reinforce Steel	Plumb. & Elect.	Scaffold	Formwork	Concrete	Magmt.
Labor Work Space							
Equipment Work Space							
Material Storage Space							
TF Setup Space							

Available Space Type	
Exterior	
Interior	
Building	
Temp	

Detailed construction site drawing (M1:100, M1:500)

Must mark at least (with dimensions and levels):

General construction site drawing +

Exact places, moving directions and ways of the main machines

Exact places of the prework places (even in the building)

Exact places of the deposits

Exact places of the facilities, the staging buildings, medical & social (eat, dress, rest) rooms (with sizes…)

Roads inside the site (entrances, parking lots, directions, materials, sizes, radiuses)

Electricity (lighting, high and low voltage, levels and directions of the lines and the supply places)

Water supply exact places

Waste and demolished materials collecting ways and places

Guarding system (fences, gates, rooms for the guard, etc)

Detailed construction state drawing (M1:100, M1:50)

By technology (example: sequential plan for placing the prefabricated columns)

Each column will be lift up where from?

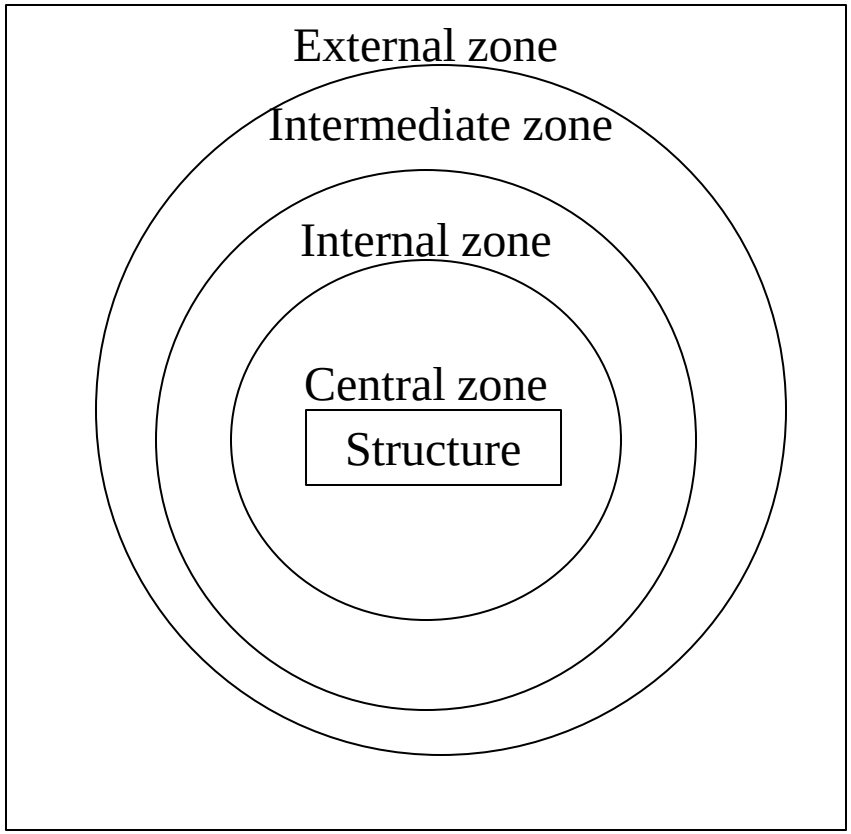
Will be temporary depot be or place it from the truck?

Where and how many times will the autocrane stop?

etc.

or By a period of time (example: structural work)

Zones:



Central zone:

Structure and it's closest place around (usually tower crane, lifting equipment, scaffolding)

Internal zone:

Uploading places, active depots, like formwork, prefabricated elements, etc)

Intermediate zone:

The tower crane still reaches this zone. Facilities of prefabrication, inactive depots

External zone:

The tower crane does not reaches this zone. Staging buildings, parking places, small machine container, etc

Staging (buildings, containers, facilities) areas, needed space:

Covered, closed and heatable! (container: 2,44 x 6,05)

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Management office

Documentation and back-up (archivation) office

Meeting room

Toilet (restroom)

Buffet, at least automat

Dressing room

Subcontractor's offices

Medical room

Porter's lodge

Covered, closed! (container: 2,44 x 6,05)

Small machines, hand-tool storage

Material depot (by technologies and by subcontractors)

Covered!

Material depots (by technologies and by subcontractors, if the material is „weather proof" (UV, heat, freeze, rain, wind)

Streets, roads in the site (temporary or final?)

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Gradient of the slopes <10% (<15%)

One track lane: 3,00m

Two track lane: 5,50-6,00m

Stop lane: min +2,50m

Material: compressioned dirt, broken stone, concrete, asphalt, etc

Turning radius: depends of the machines, trucks are using it (figuring out it: ~cut the cabin)

If there is any way not to make the drivers to drive reverse, then you must choose that!

Parking places for the workers and managers should be placed

Entrance (decrease the number of it to the minimal (1 for people, 1 for tracks))

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Size depends: (could we cut the project to more then 1 part? For decreasing money….)

- The size of the material standard transportation package
- The needed volume of this material (transportation volume, building-in volume, scheduling, costs)
- Is that possible to place one onto the other?
- Replacing the depot, or the material package (cost, resource, time)
- the type of technology

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Storage:

- Attribution of the material (place it in the same position as it was delivered)
- Is it lumpy or bulk?
- Which element of the weather cause bad effect to the material? (wind, sun = UV, temperature, rain)
- the cost of the material (guarding)

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To the final place, or to a temporary place, temporary deposit?

- The cost of the replacing, the needed time of replacing it, the needed resource of replacing it
- Schedule, resource plan, cost management
- The market (ordering time)

Storing the materials, material depots

How can I, or how should I move the package of the material, the material in the site? = ZONE

- by workers (manpower)
- elevator and pushcart
- crane (grab and lifting spots) (if it is possible, the crane handler should see the element and the place where he lifts it up to and where he drops it off)
- minimize the elements movement in the site

Prefabrication in the site, and the erection-area

- possibilities:
  - no need
  - nearby the material deposit
  - somewhere else
  - next to the final place
- the crane should reach it!
- the finished, prefabricated element should not decrease the productivity!

Renting or not renting areas

If it is not necessary do you want to rent?

	to the authority & extra money
Side walk?	traffic drawing!
One lane?	traffic drawing!
All lanes?	traffic drawing!
Entire road?	Depends, if it is possible-traffic drawing!
Neighbour's area?	-

ALL THE USED BUILDINGS MUST STAY USEABLE AROUND THE SITE!

Example:

Hall

Corvin project, brick laying

Prefabricated home construction

Flat roof waterproofing work (resource-machine-time-cost)

Counting the cost decreasing effect of the material storages arrangement

Guess how much?:

1) Impossible to tell, because everybody would arrange the deposits in different way.
   So it saves money but how much?
   The optimized arrangement is better then what?

2) After the construction, or if someone makes a drawing, then we can count it exactly.

Your turn! Example

- Make the general site layout drawing of the appartement house (shown on the received sheets) for the main structure
- Main structure: monolith concrete, foundation and basement is done, first floor and the upper floors are coming

Your turn!