factory of the future

drawing in space

Graduation project by Olav van der Doorn.
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Tutors:
Henriëtte Bier
Sina Mostafavi
Ferry Adema
(Karel Voilens)
Content

1. Introduction
2. Context
3. Approach
4. Macro design
5. Meso design
6. Detailing and construction
7. Robotic production
8. Development P5
Goals

Research aspects:

1. The logic of the factory of the future, regarding inputs, processes and outputs.
2. How a factory can be shaped to fit into the context of a contemporary western urban area, regarding the economic, environmental and spatial aspects.
3. The connection between processes within a factory and human life outside of the factory.
4. Research robotics as a production method regarding the parametric design process and industry developments.
Concept factory in the city

- Heavy pollution from industries
“Industrial sectors should be separated from residential sectors by an area of green open space.”

- Athens Charter, CIAM, 1933
Concept

factory in the city

• Functional separation of factories from the city from the 1850's onward
Concept
network factory

Blockhood Game, Plethora

- Mutual dependencies of quantitative and qualitative resources
Concept

network factory

New Babylon, Constant 1955-1975

- Network structure of city
- Completely automated means of production
Urban
network factory / city
Urban

network factory / city
Assembly line
routing & production
• Factory is combination of routing of material and production steps.
• Both have a different approach for automation
Context

Java-Eiland, Amsterdam

Java-Eiland
• Former industrial area
• Peninsula
• 5m walk to city center
Context
Java-Eiland, Amsterdam

- Former industrial area
- Peninsula
- 5m walk to city center
Context
Java-Eiland, Amsterdam
Context
Java-Eiland, Amsterdam
Spatial Layout
functions and connections
Spatial Layout

Factory of the Future

Takes into account:
- Space size
- Connections
- Boundary
- Anchors

- Factory
- Office
- Restaurant / Bar
- Exhibition / Lecture
- Other / Tech
Spatial Layout

Steps:
1. Create options
2. Test and save the better options
3. Manual interference

• factory
• office
• restaurant / bar
• exhibition / lecture
• other / tech
Spatial Layout

space syntax

Steps:
1. Create options
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• factory
• office
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factory of the future
Spatial Layout
space syntax
Spatial Layout
internal connections
Spatial Layout

basic shape of spaces
Spatial layout

Cell structure
Spatial layout
computational approach
Spatial layout
computational approach
Spatial layout
impression
Spatial layout plan
Spatial layout plan

factory
office
restaurant / bar
exhibition / lecture
other / tech
Spatial layout
plan

Central Staircase

factory path
public path
Spatial layout plan
Approach
computational framework
factory of the future

Environmental
rainwater flows
Openings
sun orientation and views

- Both the faces direct opposed to southern sunlight and floor faces are blocked from creating openings.
- Openings for views
Openings
views and sunlight
Structure
shell analysis

less displacement  more displacement
Structure

generated beam model
Structure

interior objects
Structure
final model
Structure
final model
Plan situation
Plan meso
factory of the future
factory of the future

Section
meso
Section zoom-in
Section details

- Interior Render ~3mm
- Concrete 250mm
- EPS 250mm
- Coating Polyurea
- EPS Caps 250mm
- Connection (frontview)
- 3d printed steel structure ø 20-40mm
- Glass 34mm
Section details

- welded profile 3mm
- 3d printed steel structure ø 20-40mm
- Steel plate bended 5mm
- EPS 250mm
- Windowframe cap, steel 3mm
- Glass 34mm

factory of the future
Interior impression
Components
3d build
Components

3d build
Components
3d build
Section

connections
References

robotic steel printing
3D printing of steel flanges:

• Printed on a steel surface (integrated in process)

• Combination of printing (step 1) and milling (step 2) to avoid cracks

• Controlled temperatures during printing process (lab environment)

• Material strength is comparable to traditional steel

Production

robotic steel printing
Production
steel base plate
Production
printing on surface
Production
printing process
Production finished printing
Production
milling of final geometry