MARCONI TOWERS
REDESIGN
Presentation Lay-Out

Introduction
Information about Rotterdam, the harbour, the Merwe-Vierhaven area and the Marconi towers

Theoretical Framework
Research into the Merwe-Vierhaven area, the Marconi towers, office vacancy and start-up companies

Design
Design in the Merwe-Vierhaven area, section, detail, plans, inside views

Reflection
Reflection on the design and steps to take for P5

Appendix
Additional information
INTRODUCTION
Why Hyperbody?
The studio offers the chance to design interactive processes that can help design buildings. These designs are capable of interacting with the changing environments that every building deals with sooner or later. This studio gives me the possibility to study this.

Problem statement
An analysis of the Skidmore, Owings & Merill (SOM) Marconi towers show that a lot of the floor area of these towers is empty at the moment and no longer in use.

Research question
How can a redesign of the Marconi towers give new life to the increasingly vacant office floors.
LOCATION - MERWE- VIERHAVEN, ROTTERDAM
LOCATION - MARCONI TOWERS, MERWE - VIERHAVEN
What began as an overblown design for a World Trade Centre in two towers at Leuvehaven in the city centre was eventually realized in a slightly modified form as the Europoint three-tower complex on Marconiplein. The two towers linked by a low entry block house the Urban Planning and Public Housing Agency; the third is let. The elevations of white travertine cladding and tinted glass in bronze-coloured frames look rational and abstract yet have been given every aesthetic consideration. Each successive storey widens by just a few centimetres as a perspective-correcting device.

Source: architectuurguide.nl
THEORETICAL FRAMEWORK
• Currently 15% of the office area in the Netherlands (and Rotterdam) is vacant and this percentage is increasing.
• Not all empty space can be transformed into (student) housing.
• New office buildings are still being build.

Source: Plan Bureau voor de Lefomgeving
CLIMATIC CONDITIONS MARCONI TOWERS

Sun path diagram - yearly

Wind rose - yearly
START-UP COMPANIES

Only 50% of the Start-Ups is still operable after four years.

Differentiation in Start-Ups, some orientated to the public and some not.

Education and training helps Start-Ups in their way to success.

Collaboration between Start-Ups is crucial if they want to succeed.

Source: Global Entrepreneurship Monitor and YESDelft!
Office tower mostly filled with one big company or government institution. In the case of the Marconi towers this is the Urban planning and Public housing agency. The core of the building houses elevators, staircases and toilets and is only used for transportation between the floors.
The tower becomes (partly) vacant and the municipality has a hard time filling the building again. Multiple (smaller) companies go into the tower but collaboration between these companies is not happening.
A more open and dynamic core that houses connecting functions can be a solution. This will make the core collaborative with the companies, the public but also the local weather conditions.
DESIGN
FUNCTIONS

- Lobby
  - Main entrance
  - Connection three towers
- Meeting
  - Coffee corners
- Food
  - Restaurant / Bar
  - Food corner
- Energy Production
  - Algae farm show case
- Exposition
  - Retail areas
- Work space
  - Manufacturing hall / Machinery
- Back office
- Hotel
  - Short / long stay
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<th>Restaurant</th>
<th>Bar</th>
<th>Food Corner</th>
<th>Coffee Corner</th>
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Functions are placed inside the centre tower. The relations between the functions and the climatic conditions don’t play a role yet.
The relations between all the functions, the tower and the climatic conditions act as rules for a parametric system. With this system the functions find their ideal place inside the tower and around the elevator core.
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When all the functions are in place a geometry is formed. This is done by using the volumes of all the functions and the connections between them. If the connection is more public, it will generate more volume.
With the geometry formed, the actual structural core is generated. This core will connect the small companies with each other and with the new functions. This structural core also makes natural ventilation possible for these new functions.
Since the new structural core is bigger than the old core, the existing concrete floor beams will be cut so they rest upon the new structural core. The new structural core also perpetuates the existing facade so the facade columns and beams also rest upon the new core.
With all the loads and supports in place, the stresslines can be calculated which inform the tessellation of the shape.
When the tessellation is designed, the deformation can be calculated. With the size of the deformation the thickness of each module and the size of the openings is set.
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Shared (public) functions have a location in the new core of the building. Public and companies can meet here.

Space between shared functions and existing offices acts as a connection and a transition space.

Appendix 01 - Transition space

Space between the shared functions and the existing offices is used for natural ventilation of the cores.

Appendix 02 - Ventilation
NEW FUNCTIONS
OUTER MODULES
LOCATION
TRANSITION 01 - START UP, COFFEE CORNER
TRANSITION 03 - START UP, MEETING AREA
INTERIOR - CONNECTION
INTERIOR - CONNECTION
INTERIOR - RESTAURANT
## Glass
Glass panels cover the inner-structure. Some of these panels have operable parts so the space inside can be naturally ventilated.

## Spiders
Spiders connect the glass panels to the joints. Every spider is unique but the design principle is the same.

## Joints
Unique joints connect the beam structure. Beams can be slide between two joints and will then be bolted into place. Connection pieces give room for tools.

## Frame
The framework is made of aluminium tubes. Some of the tubes also act as beams for the floors.

## Bubbledeck
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Bubbledeck
**Module**
The structural skin is built from concrete modules. The openings and the thickness of these modules is divined by the calculated deformation.

**Floor plates**
The existing floor plates will be cut. These are prefabricated concrete plates that span 1.5 meters.

**Floor beams**
The existing floor beams will also be cut. These beams are prefabricated and smaller near the top of the building.

**Facade beams**
The existing facade beam is made of pored concrete and the beams near the ground floor are bigger.

**Facade columns**
The facade columns are also pored and carry the weight of the floor beams and the facade beams.
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EXTERIOR RENDER
REFLECTION
REFLECTIONS

Design is very extreme.
Demolishing the building is also an option but I chose to use a parametric system to give the building a new life. In this way the old building is still visible and there, while you can also see the addition and the new life the building breathes.

Marconi towers are iconic for Rotterdam and the harbour area in general.
A second life is designed for the harbour of Rotterdam so the Marconi towers should upgrade with it.

Structural core of the design shows that this can be more then just transportation.

Other methods of natural ventilation of office towers are also an option and could still be exploited in this design. Appendix 02 - Ventilation
THANK YOU.
APPENDIX 01 - TRANSITION SPACE

**The Cooper Union, NY**
Morphosis Architects, 2006
*Keywords: academic, laboratory, exhibition, auditorium, 16258 sqm*

**Simmons Hall, MIT**
Steven Holl, 1999-2002
*Keywords: dormitory, theatre, cafe, diner, 195000 sqm*

**Dominion - M, Moscow**
Zaha Hadid, 2015
*Keywords: start-up offices, restaurant, conferences, meeting spaces, 25700 sqm*

### Vertical Piazza
- 20 foot wide staircase
- 4 stories
- social heart of the building
- impromptu & planned meetings

### Student Lounge
- glazed, double high
- overlooking the city

### Sky Bridges
- span the entire atrium
- connection between informal spaces

### Skip-Stop
- elevator stop at certain floors, not all
- encouraging people to use the sky bridges

### Design
- building as a sponge, soaks up light
- cuts that would work as longs: bringing light down in the building circulating air up
- cuts would be the main interactive spaces for students

### Built
- final design has smaller openings and some of the openings are removed
- lungs are scattered throughout the building with a dynamic organic geometry

### Interaction
Atrium becomes a shared space over multiple levels that encourages interaction between the employees of different companies.

### Integration
Encourages collaboration between companies of different services and disciplines.
APPENDIX 02 - VENTILATION

Commerzbank, Frankfurt
Norman foster, 1997
Keywords: ecological office tower, 50% energy consumption, 53 stories

Ventilation
• 85% of the year natural
• stack effect
• venturi effect
• cross ventilation
• “sky gardens”

Summer
• in-between space used for natural ventilation
• offices ventilate their air through the in-between space
• venturi effect and stack effect create a natural air flow

Winter

Current design

Reflected design
• “sky gardens” on particular levels to create cross ventilation
• in-between space is used as an atrium
• connects the intervention with the existing building in a climatic way
• Absorbing carbon dioxide.
• Producing oxygen.
• Passive cooling.
• Shading.
• Producing biomass.

Expected energy gain:
Methane  Electricity: **30 kWh/sqm year**
Heat exch.  Electricity: **30 kWh/sqm year**

Expected CO₂ absorption:
**250 gr/sqm daily**

3 ways of using PBR (Photobioreactors)

01. As a double skin. Contribute to thermal, solar and acoustic performances.

02. As external shading. Dynamically regulating solar gains.

03. Ventilated rain system. External shell.
APPENDIX 04 - GEOMETRY & MATERIAL

The Cooper Union, NY
Morphosis Architects, 2006
Keywords: academic, laboratory, exhibition, auditorium, 16258 sqm

Geometry atrium:
- result of multiple boolean operations

Material atrium:
- balustrade on the inside of the atrium is more open and light. Giving the atrium an open and light view, energizing upper stories.
- overlapping surfaces that shift with every change in vantage point.
- entrance staircase has a double railing; large tubes to relate to the scale of the city and small ones that comfortably fit in your hand.

Rules / conclusion:
- functional and spatial booleans shape the geometry of the atrium. Every boolean has its own meaning and shape.
- light material used inside the atrium thus giving it an energizing feel.
- mesh connects all the floors together by using the same logic through the whole atrium. No matter on what floor you access the atrium, you know you’re part of the shared informal space.

Geometry atrium:
- result of space between two skins, open & light

Sky bridges:
- connection between offices and core functions

Transition:
- more faceted to less faceted
- concrete to steel
- private to public
- material and geometry transition