United Nations Headquarters for Sustainability

P5 Strategic Architectural Design Development studio
TU Delft Faculty of Architecture

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UN birth of Sustainability

- 1983 The United Nations first concern about the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development.

Increasing population, increasing consumption, increasing energy use
UN and Sustainability

Sustainable programs fragmented over all the UN councils

UN, Sustainable Headquarters NY SADD, TU Delft Faculty of Architecture and Building technology by Menno Engel
UN and Sustainability

USA, New York, Manhattan

UN campus
East cost 1st Ave, 46th st
- General assembly
- Security council
- Economic and Social council
- Secretariat
UN and Sustainability
Assignment

Design a building for a world authority on the subject sustainability. The United Nations Headquarters for Sustainability
Context

New York, Manhattan
Context

Central park to the UN campus 1.7km
Context
Design objectives

1 The organization has to be transparent, as the building.

2 The building has to be anchored in the location, it can’t be an autonomous object.

3 The building has to be seen as one volume.

4 The building will be sustainable
   - In energy use
   - In water use and water recycling
   - Energy generating

5 Green will be made more public and easier to access. The green space will connect the people with the UN HQ for sustainability and vice versa.
Program

- Collect  collecting material and virtual data (library)
- Produce  producing missing knowledge by researchers
- Propagate communicating to the world (exposition)
- Exchange  exchange of knowledge, active communication (conference hall)

UN council for sustainability

1 The organization has to be transparent, as the building.
The organization has to be transparent, as the building.
New situation

2 The building has to be anchored in the location, it can’t be an autonomous object.
New situation

The building has to be anchored in the location, it can’t be an autonomous object.
Strategic models

3 The building has to be transparent and has to be seen as one volume.
Sketches
3 The building has to be transparent and has to be seen as one volume.
Sketches

3 The building has to be transparent and has to be seen as one volume.

Inspiration

Left: 2 pictures, M van der Rohe
Up: picture formal UN O Niemeyer
Morphology

3 The building has to be transparent and has to be seen as one volume.
Morphology

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Morphology

The building has to be transparent and has to be seen as one volume.
**Morphology**

3 The building has to be transparent and has to be seen as one volume.
Sustainability concept
The building will be sustainable

Sketch, section of office

- Double face providing natural ventilation
- Working places near green landscaping
- Indoor living machine
- Double face providing natural ventilation
- Energy generating, transparent for light facade/roof

PV cells
- Integrated in the design.
- Revering to the blue facade of the former UN facade.

Double window facade
- Air corridor, reduces heatproduction and heatloss in the officespace.
- Avoidance of sick building syndrome due to better opportunities to realise user-controlled natural ventilation.

Water use and recycling
- Tidal wetland living machine
- No service water ponding
- Indoor system, providing indoor green
- Relative small service needed for recycling
Green will be made more public and easier to access.
Impression UN HQ for Sustainability
Impression UN public park
Impression public entrance
Impression rose garden
Entrance hall public
Impression Exposition
Impression Conference hall entrance
Section ground floor public

Peil+9700
2de b.k. vloer

Peil+5700
1ste b.k. vloer

Peil+1700
BG b.k. vloer

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Detail ground floor public
Floor structure
- computer floor 30mm
- hollow floor it cables and for ring mains cooling and heating water system 300mm
- concrete steel floor with concrete core conditioning 300mm
- suspended ceiling for returned air

- suspended ceiling, recycled wood

Peil+9700
2de b.k. vloer
pyrobex fireproof laminated glass 60mm
floor convector air outlet

set option windowframe structural glazing

Peil+5700
2de b.k. vloer
- H beam for structural glazing window frame
- LED luminaire
- steel shoe for glass fin
- profilled aluminium (text perforated)
- profilled aluminium 2mm
glass fin 400x30mm

Peil+1700
1ste b.k. vloer

Bamboo floor on floor damping layer
- floor battens
- convector air outlet
- concrete steel floor 300mm
- gutter
- insulation 200mm

formar floor constr UN square
1st floor library looking at the lobby
Water and energy use

Living machine
1: waste water
2: Flow equalization
3: Tidal wetland 42 m²
4: Disinfection system (UV)
5: Reuse storage tank

Rainwater
6: collecting water (10% water transmittance to storage)
7: storage
8: emergency backup to East river

PV cell roof supplying 4% of the annually energy demand

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Impression atrium/livingmachine
Impression atrium
Section office floor

North facade  South facade

Peil+25700
\[6\text{de b.k. vloer}\]

Peil+21700
\[5\text{de b.k. vloer}\]
Impression facade
Impression office
Detail office floor

Floor structure:
- computer floor 30mm
- hollow floor, for it cables and ring mains cooling and heating water system 300mm
- concrete steel floor with concrete core conditioning 300mm
- suspended ceiling for returned air

- pyrobel fireproof laminated glass 60mm
- electrically operated ventilation valve 15mm througheed single glazing
- floor convector air outlet
- stainless steel brushed
- profiled aluminium coffer
- solar shading
- set options windowframe structural glazing

1: Cast mold used for morphology and facade cladding
2: Cast-in-place concrete columns in rough board formwork

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Escape route and fire prevention

30m maximum distance to smoke-free space

Pyrobel fireproof laminated glass 30mm. 450mm high. Preventing fire spread horizontally. Additional sprinklers have to be installed.
Impression office
Section office/roof

b.k. dak

Peil+61700

15de b.k. vloer
Impression roof edge
Detail roof edge

- PV cell panels
- construction frame work support for the PV cell panels
- ventilated cavity watertight membrane
- plywood panels
- insulation 200mm
- plywood panels
- dovetail floor
- beam construction 300mm
- wooden battens
- bamboo ceiling panels/ white/ satin finishing

beam connected to primary construction
- metal frame construction
- bamboo fibreboard/ white satin finish

grating for roof maintenance

white glossy finish
Climate system

Double window facade. Accommodating an air corridor, this reduces heat production in the officespace. During the morning and evening the user can choose to ventilate natural by opening the window.

Chilled water from the East river is used in the concrete core conditioning office floors. Return warm water passes the heat exchanger.

Heat extracted, the chilled water is used in the exhibition space, conference hall and the auditorium.

Closed loop geothermal heat and cooling pump systems. Using constant temperature of the East river to cool and heat the building.

Summer
Outside temp: 18°C / 30°C

Heat exchanger extracts heat from the water descent from the East river.
Climate system
Summer

Double window facade. Accomodating an air corridor, this reduces the surface temperature of the inside of the facade. Enhances the comfort.

Concrete core conditioning. Accomodating a more stable inside climate. Floor convector air outlet. Produces extra cooling.
Climate system

Winter
Outside temp: -10 C/ 16 C

Double window facade. Accomodating an air corridor, this reduces heat loss.

Heated water from the East river is used in the concrete core conditioning office floors. Return chilled water passes the heat exchanger. Heat can be extracted again.

Extracted heat is used in the exhibition space, conference hall and the auditorium.

Heat exchanger extracts heat from the water descent from the East river.

Closed loop geothermal heat and cooling pump systems. Using constant temperature of the East river to cool and heat the building.
Climate system

Winter

- Double window facade.
- Accommodating an air corridor, this reduces heat loss.
- Enhanced comfort because of the higher surface temperature of the inside of the facade.

- Concrete core conditioning.
- Accommodating a more stable inside climate.
- Floor convective air outlet. Reducing cold downdraft.
Climate system

Double window facade. Accommodating an air corridor, this reduces heat production and heat loss in the office space. Avoidance of sick building syndrome due to better opportunities to realise user-controlled natural ventilation.

Extracted heat is used in the exhibition space, conference hall and the auditorium.

Closed loop geothermal heat and cooling pump systems. Using constant temperature of the East river to cool and heat the building.

Heat exchanger extracts heat from the water descent from the East river.

Chilled water from the East river is used in the concrete core conditioning office floors. Return warm water passes the heat exchanger.

Autumn/Spring
Outside temp: 16°C/18°C
Climate System
Autumn/ Spring

Double window facade.
Accomodating an air corridor, avoidance of sick building syndrome due to better opportunities to realise user-controlled natural ventilation.

Fresh air.

Concrete core conditioning.
Accomodating a more stable inside climate.

Floor convector air outlet. Produces extra cooling.
Construction
Construction

Ground floor
Construction

1st floor
Construction

Office floor structure

Office floors
Concrete steel floor with concrete core conditioning
Construction

Office floor structure

Concrete steel floor with concrete core conditioning
Construction
Roof structure
Concrete core and steel roof structure supplying a stable structure.

Construction
Stability
Questions