RECLAIMED NATURE
AN URBAN-ECOLOGICAL PLATFORM ABOVE ZEEBURG ISLAND

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Hyperbody Graduation Studio:
Climatic Ecologies
P5 Presentation
Dapeng Sun
Nature of west zeeburg island
Urbanisation---An Encroachment on Nature
LANDSCAPE AND ORGANISMS

Wetland
Frogs
Gulls
Bluethroat
Reeds
Marsh marigold
willows

Forest
Bats
Sparrows
Italian poplar
Black poplar
LANDSCAPE AND ORGANISMS

Grassland

Cityscape

Grass
Fern
Insects
MAIN ANIMAL SPECIES IN ZEEBURG ISLAND

ZEEBURG ISLAND
5 MAIN SPECIES

SPARROW
NATTERJACK
PIPISTRELLE
SEROTINE
BLUETHROAT
**TIMELINE OF ZEEBURG ISLAND**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>Zeeburg Island was reclaimed from east docklands and IJmeer.</td>
</tr>
<tr>
<td>1904</td>
<td>Two bridges were built for the connection between East Amsterdam and Amsterdamm-Nord.</td>
</tr>
<tr>
<td>1907</td>
<td>A new plant in the western harbor area was build replacing the one on the island.</td>
</tr>
<tr>
<td>1900</td>
<td>Before 1957, the island was in use as a military area with shooting and seaplane base.</td>
</tr>
<tr>
<td>1957</td>
<td>Zeeburgertunnel was constructed and made the island as part of the East Ring road of Amsterdam.</td>
</tr>
<tr>
<td>1990</td>
<td>The Piet Hein tunnel was constructed and made the island as part of the east ring road of Amsterdam.</td>
</tr>
<tr>
<td>1995</td>
<td>Tram began to pass Zeeburg Island.</td>
</tr>
<tr>
<td>2000</td>
<td>A new plant in the western harbor area was build replacing the one on the island.</td>
</tr>
<tr>
<td>2005</td>
<td>Development plan for Zeeburg Island.</td>
</tr>
<tr>
<td>2006</td>
<td>Development plan for Zeeburg Island.</td>
</tr>
</tbody>
</table>

**TIMELINE OF ZEEBURG ISLAND**

1. **1900**: Zeeburg Island was reclaimed from east docklands and IJmeer.
2. **1904**: Two bridges were built for the connection between East Amsterdam and Amsterdamm-Nord.
3. **1907**: A new plant in the western harbor area was built replacing the one on the island.
4. **1957**: Before 1957, the island was in use as a military area with shooting and seaplane base.
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7. **2000**: Tram began to pass Zeeburg Island.
8. **2005**: A new plant in the western harbor area was built replacing the one on the island.
10. **2010**: Development plan for Zeeburg Island.

**RECLAIMED NATURE**

**HYPERBODY GRADUATION STUDIO: CLIMATIC ECOCOIES**
DEVELOPMENT OF EAST-ZEEBURG
The Amsterdam Structure Vision 2040 identified key development areas and types of intervention for the years to come:
- Densification within the current city boundaries
- Improvements to the green spaces in urban areas and green links to the outer areas
- Waterfront developments along both banks of the IJ waterway

The south-west part of Zeeburg Island is planned as metropolitan region with high-rise buildings and office for creative industry. For other part residential and commercial mixed development are planned in the future ten years.
Ecological Structure of the Netherlands and Amsterdam

The island takes an important role in the Ecological plan of EHS -- Environment, Health and Safety, which tries to improve the ecological bottlenecks of the Netherlands.
The population growth in den-haag, Amsterdam, Rotterdam is three times as high as other regions in Netherlands.

The possibilities for the further expansion of Amsterdam within its municipal boundaries are limited. The city is wedged between the protected green zones of the Green Heart to the south and rural Waterland to the north. The city is also faced with the challenge of limited space within its current footprint. The noise-nuisance contours around Schiphol Airport limit the opportunities for urban expansion to the west.

Attempts to turn parts of the Western Harbour District into a more diverse area are hindered by restrictions imposed by industrial activities.
URBAN STRATEGY

CHALLENGE:
THE CITY OF AMSTERDAM:
GROWING POPULATION AND LIMITED SPACE

THE ZEEBURG ISLAND:
DESTROY OF THE ECOLOGICAL ENVIRONMENT BY
FUTURE LARGE-SCALE, HIGH-DENSITY DEVELOPMENT.
URBAN STRATEGY

RECLAIMED FROM URBAN INFRASTRUCTURE, SURVE THE NATURE AND PEOPLE

COMpared with the vertical develop of buildings in big cities, many urban infrastructure expand horizontally and have great potential to give more space and service to the city.

The idea of recaimation from urban infrastructure can be achieved here by reuse the space above the entrance of the tunnel and P+R.
URBAN STRATEGY

- Entrance of Piet Heint Tunnel
- Link Eco-center with green belt
- Link Eco-center with local eco-patch
- Zuid IJdijk: Eco-conservation Belt
- Land for urban development
- Urban Connections
- Reclaimed Eco-center
FUTURE PROSPECTS

NEAR FUTURE 2020
DURING THE CONSTRUCTION PERIOD, THE BUILDING WILL BECOME THE ONLY REFUGE FOR LOCAL SPECIES OF ZEEBURGE ISLAND.

FUTURE 2040
Animal habitat
Climatic Data, inclination data collection
Classification of animal preferences
Information superposition

Human habitat
Study of programatic relations
Study of geometric relations
Study of space qualities

Space formation
Landscape formation
Architecture space formation
Space series
Animal habitat
MAIN ANIMAL SPECIES IN ZEEBURG ISLAND

SPARROW
NATTERJACK
PIPISTRELLE
SEROTINE
BLUETHROAT

ZEEBURG ISLAND
5 MAIN SPECIES
NATTERJACK

Spring
- Reproduction
  - Shallow waterside with slight slope and vegetation on bank

Summer, autumn
- Forage
  - Warm Sandy soil with vegetation

Winter
- Torpor
  - Bottom of water

Period
Behaviors
- Sunlight
- Sensitivity to noise pollution
- Inclination
SPARROW

Spring
- Reproduction & Forage
  - Nesting in wall crevices, under roof tiles and other cavities
  - Prey on insects in Forest with dense shrub

Summer, autumn
- Forage
  - Seeds of corns, wheat in Cornfield

Winter
- Forage
  - Household waste

Period | Behaviors
--- | ---
Sunlight | Sensitivity to noise pollution | Inclination
BLUETHROAT

Period

Spring
- Nesting, Reproduction
  Shrubby swamp

Summer, autumn
- Forage
  Open space with low vegetation

Winter
- Migration
  Fly to south Spanish

Behaviors

Sunlight
Sensitivity to noise-pollution
Inclination

HYPERBODY GRADUATION  STUDIO: CLIMATIC ECOLOGIES
RECLAIMED NATURE
PIPISTRELLE & SEROTINE

Spring, Summer
Reproduction
2-6 months of pregnancy

Autumn
Forage
Forest, parks and gardens

Winter
Hibernation
Bats cave

Period
Behaviors

Sunlight
Sensitivity to noise
Inclination

RECLAIMED NATURE
HYPERBODY GRADUATION STUDIO: CLIMATIC ECOLOGIES
SIMULATION OF SUN RADIATION

EXISTING BUILDINGS

TREES

TEST REGION

SPRING

WINTER

ANNURAL

HYPERBODY GRADUATION STUDIO: CLIMATIC ECOLOGIES

RECLAIMED NATURE
SIMULATION OF INCLINATION, NOISE POLLUTION LEVEL

INCLINATION LEVEL

HIGH INCLINATION

LOW INCLINATION

NOISE POLLUTION LEVEL

MAIN POLLUTION SOURCE

---

RECLAIMED NATURE

HYPERBODY GRADUATION STUDIO: CLIMATIC ECOLOGIES
### INFORMATION CLASSIFICATION

<table>
<thead>
<tr>
<th>Levels of Sunlight (Annumal)</th>
<th>Levels of Inclination</th>
<th>Levels of Noise Pollution</th>
<th>Reverse Distance Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>880-940KWH/M²</td>
<td>STEEP</td>
<td>15°</td>
</tr>
<tr>
<td>HIGN MEDIUM</td>
<td>820-880KWH/M²</td>
<td>NORMAL</td>
<td>5-15°</td>
</tr>
<tr>
<td>LOW MEDIUM</td>
<td>760-820KWH/M²</td>
<td>SLOW</td>
<td>3-5°</td>
</tr>
<tr>
<td>LOW</td>
<td>700-760KWH/M²</td>
<td>FLAT</td>
<td>&lt;3°</td>
</tr>
</tbody>
</table>
INFORMATION SUPERPOSITION

**SPECIES:** Natterjack

**BEHAVIOR:** Reproduction in spring

**ENVIRONMENTAL REQUIREMENT**

- Sunlight
- Sensitivity to noise
- Inclination

- Slow slope
- Low pollution
- High sunlight level

Habitat of natterjack
## OTHER BEHAVIORAL PLACES

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>NATTERJACK</th>
<th>SPARROW</th>
<th>BLUETHROAT</th>
<th>PIPISTRELLE &amp; SEROTINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEHAVIORS</td>
<td>N1</td>
<td>N2</td>
<td>N3</td>
<td>S1</td>
</tr>
<tr>
<td>REQUIREMENT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUNLIGHT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIR QUALITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INCLINATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Species
- Natterjack
- Sparrow
- Bluethroat
- Pipistrelle & Serotine
NATTERJECK:
N1 REPRODUCTION
N2 FORAGE
N3 TORPOR

SPARROW:
S1 FORAGE & REPRODUCTION
S2 FORAGE
S3 FORAGE IN WINTER

BLUETHROAT:
B1 NESTING & REPRODUCTION
B2 FORAGE
B3 MIGRATION

PIPISTRELLE & SEROTINE
P1 REPRODUCTION
P2 FORAGE
P3 HIBERNATION
Human habitat
There are four different levels relationship between the human space and animal habitat: embedded, vicinity, close and distance.
**PROGRAM CONFIGURATION**

<table>
<thead>
<tr>
<th>Geometric properties</th>
<th>Ecological properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>Stable environment with typical animal behavior and Good observation point easily cover the whole habitat</td>
</tr>
<tr>
<td>Internal</td>
<td>Inside the habitat Relatively stable environment</td>
</tr>
<tr>
<td>Mono border</td>
<td>Border of single habitat Unstable environment with outside intervention</td>
</tr>
<tr>
<td>Binary border</td>
<td>Shared border between habitats Unstable environment with intervention from other habitat and the most intense exchange of materials and energy High ability to resist outside interference</td>
</tr>
<tr>
<td>External</td>
<td>Outside of habitats Outside with minimal interference to habitat</td>
</tr>
<tr>
<td>Space beside borders</td>
<td></td>
</tr>
<tr>
<td>A:concave corner</td>
<td>Embedded into habitats</td>
</tr>
<tr>
<td>B:convex corner</td>
<td>Good links with habitats</td>
</tr>
</tbody>
</table>

**Habitats**
- Habitat 1
- Habitat 2
- Habitat 3
- Habitat 4

**Borders**
- Mono border
- Binary border
- Concave border
- Convex border

**Spaces**
- Core
- Internal
- External
PROGRAM CONFIGURATION

Habitat 1
- Mono border
- Convex border
- Core
- External

Habitat 2
- Multi-border
- Concave border
- Core
- External

Distance
- Close
- Inside
- Vicinity
- Distance

Programs:
- Program of lobby, exhibition
- Program of eco-studio, cafe
- Program of observatory
- Program of research experience zone
The program configuration is based on the relationship between habitats and functions.
## PROGRAM CONFIGURATION

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>OPEN/ENCLOSED SPACE</th>
<th>HEIGHT OF SPACE</th>
<th>ERQUIREMENT OF LIGHT</th>
<th>AREA</th>
<th>DEPTH OF SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOBBY WITH LOUNGE</td>
<td>OPEN</td>
<td>8M</td>
<td>DIRECT LIGHT</td>
<td>400</td>
<td>&gt;15M</td>
</tr>
<tr>
<td>ECO-STUDIO</td>
<td>OPEN</td>
<td>4M</td>
<td>DIRECT LIGHT</td>
<td>1300</td>
<td>&gt;15M</td>
</tr>
<tr>
<td>EXHIBITION</td>
<td>OPEN</td>
<td>6M</td>
<td>NO LIGHT</td>
<td>1000</td>
<td>&gt;15M</td>
</tr>
<tr>
<td>CAFE</td>
<td>SEMI-OPEN</td>
<td>4M</td>
<td>INDIRECT LIGHT</td>
<td>500</td>
<td>&gt;8M</td>
</tr>
<tr>
<td>STUDIO ROOM</td>
<td>SEMI-ENCLOSED</td>
<td>6M</td>
<td>DIRECT LIGHT</td>
<td>200</td>
<td>&gt;8M</td>
</tr>
<tr>
<td>LECTURE ROOM</td>
<td>SEMI-OPEN</td>
<td>6M</td>
<td>INDIRECT LIGHT</td>
<td>200</td>
<td>&gt;8M</td>
</tr>
<tr>
<td>RESEARCH</td>
<td>ENCLOSED</td>
<td>4M</td>
<td>INDIRECT LIGHT</td>
<td>1300</td>
<td>&gt;8M</td>
</tr>
<tr>
<td>EXPERIENCE ZONE</td>
<td>OPEN</td>
<td>6M</td>
<td>INDIRECT LIGHT</td>
<td>400</td>
<td>&gt;15M</td>
</tr>
</tbody>
</table>
PROGRAM CONFIGURATION

More space needed for studio

Fold studio space on exhibition

Except studio space, also more research space are needed and the solution is double layer the research space.
## Observation Loop

<table>
<thead>
<tr>
<th>Number of habitat</th>
<th>Species</th>
<th>Behavior</th>
<th>Area of habitats</th>
<th>Landscape</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Natterjack</td>
<td>Reproduction &amp; Torpor</td>
<td>833</td>
<td>shallow water with vegetation</td>
</tr>
<tr>
<td>B</td>
<td>Natterjack</td>
<td>Forage</td>
<td>779</td>
<td>shrubbery on sandy soil</td>
</tr>
<tr>
<td>C</td>
<td>Natterjack</td>
<td>Reproduction &amp; Torpor</td>
<td>110</td>
<td>shallow water</td>
</tr>
<tr>
<td>D</td>
<td>Sparrow</td>
<td>Forage &amp; Reproduction</td>
<td>1231</td>
<td>forest</td>
</tr>
<tr>
<td>E</td>
<td>Sparrow</td>
<td>Forage</td>
<td>1203</td>
<td>cornfield</td>
</tr>
<tr>
<td>F</td>
<td>Sparrow</td>
<td>Forage</td>
<td>389</td>
<td>cornfield</td>
</tr>
<tr>
<td>G</td>
<td>Bluethroat</td>
<td>Nesting &amp; Reproduction</td>
<td>390</td>
<td>shrubbery</td>
</tr>
<tr>
<td>H</td>
<td>Bluethroat</td>
<td>Forage</td>
<td>860</td>
<td>shallow water with vegetation</td>
</tr>
<tr>
<td>I</td>
<td>Pipistrelle &amp; Serotine</td>
<td>Production &amp; Hibernation</td>
<td>761</td>
<td>forest</td>
</tr>
<tr>
<td>J</td>
<td>Pipistrelle &amp; Serotine</td>
<td>Forage</td>
<td>570</td>
<td>bats cave</td>
</tr>
<tr>
<td>K</td>
<td>Pipistrelle &amp; Serotine</td>
<td>Forage</td>
<td>141</td>
<td>forest</td>
</tr>
<tr>
<td>L</td>
<td>Pipistrelle &amp; Serotine</td>
<td>Forage</td>
<td>434</td>
<td>forest</td>
</tr>
</tbody>
</table>

- Habits smaller than 500m²
- Adjacent habitats with similar landscape
OBSERVATION LOOP

Each axis concerns only one (or two) animal species, including the observatory space and information space which can provide professional information on biological behaviors.

- Sparrow Axis
- Bats Axis
- Natterjack/Bluethroat Axis

- Visitor’s loop
- Observer’s loop

- Observatory
- Information space

- Connection between axis
- Extra connections to facilitate multi-observations

link with circulation system
### SPACE PROPERTIES OF OBSERVATORY

<table>
<thead>
<tr>
<th>Number of Observatory</th>
<th>Animal</th>
<th>Habitat</th>
<th>Animal behaviors for observation</th>
<th>Alertness of animals</th>
<th>Tools for observation</th>
<th>Range of animal behaviors</th>
<th>Range of observation platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Woods</td>
<td>Shrubby swamp</td>
<td>Prey habits, Eating habits, Means of locomotion, Sleeping and Hibernation</td>
<td>Normal</td>
<td>Naked eyes, Binoculars, Infrared telescope</td>
<td>2m to 10m</td>
<td>1m to 6m</td>
</tr>
<tr>
<td>2</td>
<td>Caves</td>
<td>Woods</td>
<td>Means of locomotion: Flight, hopping, Feeding habits, Eating habits</td>
<td>Normal</td>
<td>Naked eyes, Binoculars</td>
<td>2m to 10m</td>
<td>1m to 6m</td>
</tr>
<tr>
<td>3</td>
<td>Woods</td>
<td>Woods</td>
<td>Means of locomotion: Flight, hopping, Feeding habits, Eating habits</td>
<td>Low</td>
<td>Naked eyes, Binoculars, Infrared telescope</td>
<td>2m to 10m</td>
<td>1m to 6m</td>
</tr>
<tr>
<td>4</td>
<td>Corn Field</td>
<td>Woods</td>
<td>Means of locomotion: Flight, hopping, Feeding habits, Eating habits</td>
<td>Low</td>
<td>Naked eyes, Binoculars</td>
<td>2m to 10m</td>
<td>1m to 6m</td>
</tr>
<tr>
<td>5</td>
<td>Shrubby Swamp</td>
<td>Shrubby Swamp</td>
<td>Nesting habits, Feeding habits, Eating habits, Sound</td>
<td>High</td>
<td>Naked eyes, Binoculars, Infrared telescope</td>
<td>1m to 3m</td>
<td>1m to 3m</td>
</tr>
<tr>
<td>6</td>
<td>Sandy ground</td>
<td>Woods</td>
<td>Means of locomotion: Flight, hopping, Feeding habits, Eating habits</td>
<td>High</td>
<td>Binoculars, Naked eyes, Infrared telescope</td>
<td>1m to 3m</td>
<td>1m to 3m</td>
</tr>
</tbody>
</table>
SPACE PROPERTIES OF OBSERVATORY

Observatory A
H = 6m

Observatory B
H = 4m

Observatory C
H = 6m

Observatory D
H = 6m

Observatory E
H = 2m

Observatory F
H = 6m

Above-landscape
Enclosed space

Above-landscape
Open space

Above-landscape
Open space

Semi-underlandscape
Enclosed space

Enclosed space

Open space

Enclosed space

Inside space
URBAN AND HABITAT CONNECTIONS

- Urban connections
- Connections with greenbelt habitat
- Water habitat connections
- Connections with local habitat
- Animal habitats with connections

smooth the profile
Space Formation
LANDSCAPE FORMATION

A Shrubby sand land
B Broadleaf forests
C Stone cave
D Wheat field
E Shrubby swamp
Natterjack has very poor jumping ability, so choose soft profile curve with similar curvature in points on the curve.
Cut area is an indicator of the cave volume, and the curvature of the roof can ensure smooth drainage to keep the inside dry.

A  Cut area  B  Range of Curvature
LANDSCAPE FORMATION

A bats hill

B swamp

1 landscape defined by one side curve

2 landscape defined by two sides curve
CURVES FOR ARCHITECTURE

- Ramp
- Ramp + Terrace
- Space with different openness
- Space with ramp
CURVES FOR ARCHITECTURE

Section A-A  Ramp+terrace+enclosed space
35M

Section B-B  SEMI-OPEN SPACE
14M

T-Spline mesh based on two control curves
CURVES FOR ARCHITECTURE

Section C-C

multi-storeies space

Up:studio
Down:exhibition

D1
H1
D2
H2

C

4M
6M
47M

HYPERBODY GRADUATION STUDIO: CLIMATIC ECOLOGIES

RECLAIMED NATURE
SPACE SERIES

<table>
<thead>
<tr>
<th>SPACE</th>
<th>PROGRAM</th>
<th>HEIGHT</th>
<th>SPACE PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACE1</td>
<td>ECO-STUDIO</td>
<td>4M</td>
<td>OPEN SPACE</td>
</tr>
<tr>
<td>SPACE2</td>
<td>EXHIBITION</td>
<td>6M</td>
<td>OPEN SPACE</td>
</tr>
<tr>
<td>SPACE3</td>
<td>STUDIO-ROOM</td>
<td>4M</td>
<td>ENCLOSED SPACE</td>
</tr>
<tr>
<td>SPACE4</td>
<td>EXPERIENCE ZONE</td>
<td>4M</td>
<td>SEMI-OPEN SPACE</td>
</tr>
<tr>
<td>RAMP1</td>
<td>ENTRANCE RAMP</td>
<td>3M</td>
<td></td>
</tr>
<tr>
<td>RAMP2</td>
<td>RAMP TO FOREST</td>
<td>2M</td>
<td></td>
</tr>
<tr>
<td>FOREST</td>
<td>BAT’S HABITAT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECLAIMED NATURE
HYPERBODY GRADUATION
STUDIO: CLIMATIC ECOLOGIES
COMBINATION OF SPACE SERIES

RECLAIMED NATURE

HYPERBODY GRADUATION STUDIO: CLIMATIC ECOLOGIES
FINAL GEOMETRY

Experience zone

observatory for sparrow

part roof

Entrance of exhibition&studio
PROCESS EXPLANATION

Real geometry

Geometry optimisation

Approximation geometry

Structure

Openings

Green roof

Timber deck
STRCTURE SYSTEM AND OPENNINGS

Structure system

Main structure  Horizontal structure  Vertical structure  Sub-division

Openings

Structure system  planar triangle  Sub-division  Soft the corner

Opening combination  Different Offset
STRCTURE SYSTEM

1 smooth surface
2 quadrangle faces
3 main structure
4 vertical structure
5 bracings
6 sub-division
**STRUCTURE OPTIMISATION**

**1 SURFACE OPTIMISATION**
Optimise the curvature of surface to reduce stress concentration.

Kangaroo for grasshopper

**2 BEAM OPTIMISATION**
The dimension of beams are based on the inner force of the element.

Karamba for grasshopper
## OPENNINGS GENERATION

<table>
<thead>
<tr>
<th>A Category</th>
<th>B Program</th>
<th>C Amount of light</th>
<th>D Kind of light (Direct or indirect)</th>
<th>E Surface Inclination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 No light needed</td>
<td>Service space</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exhibition Space</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Observatory in bats cave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Indirect light</td>
<td>Cafe</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Direct light</td>
<td>Outdoor space</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Indirect light</td>
<td>Research space</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Direct light</td>
<td>Eco-studio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Studio room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Indirect Space</td>
<td>lecture-space</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Internet space</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OPENNINGS GENERATION

location: city of amsterdam
latitude: 52.30

1 Annual sun radiation
2 Inclination of surface
3 surface chosen for window generation
### OPENNINGS GENERATION

<table>
<thead>
<tr>
<th>Offset percentual of the length of the edge</th>
<th>Opening surface percentage</th>
<th>Application radiation requirement</th>
<th>Application space</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>69%</td>
<td></td>
<td>eco-studio</td>
</tr>
<tr>
<td>10%</td>
<td>51%</td>
<td></td>
<td>research</td>
</tr>
<tr>
<td>15%</td>
<td>24%</td>
<td></td>
<td>corridor</td>
</tr>
<tr>
<td>20%</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Different offset for different sunlight requirement
TIMBER SURFACE & LANDSCAPE

Construction of timber & planting surface

1. 30mm timber slats
   wood beams and bearers
   Waterproof layer
   100mm rigid thermal insulation
   Vapor barrier
   1.2mm galvanized sheet steel
   Steel structure

2. Planted roof construction:
   plants
   substrate with slip resistant system
   12.5 drainage mat
   Root-resistant layer and Waterproof layer
   100mm rigid thermal insulation
   Vapor barrier
   1.2mm galvanized sheet steel
   Steel structure

<table>
<thead>
<tr>
<th>Plants</th>
<th>Soil thickness</th>
<th>Plant species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep-rooted trees</td>
<td>&gt;150cm</td>
<td>Poplar, willow, acacia</td>
</tr>
<tr>
<td>Woody plants</td>
<td>&gt;100cm</td>
<td>willow, acacia</td>
</tr>
<tr>
<td>Small shrub</td>
<td>&gt;45cm</td>
<td>Hibiscus, wheat</td>
</tr>
<tr>
<td>Big shrub</td>
<td>&gt;60cm</td>
<td></td>
</tr>
<tr>
<td>Herbaceous plants</td>
<td>&gt;30cm</td>
<td>Sedum</td>
</tr>
</tbody>
</table>
TIMBER SURFACE

30mm timber deck
Glulam curved beams and bearers
Waterproof layer

100mm rigid thermal insulation with profile steel@1500
(Waterproof layer on top)

1.2mm galvanized sheet steel
(Vapor barrier on top)

Steel structure

Construction model of timber deck
FABRICATION OF TIMBER PURLINS

Nicks in beams to match timber planks

Data available from computational process

When the surface changes, the shape of these beams changes accordingly through computational process.

Reference photo
CIRCULATIONS

- Research loop
- Fast cross route
- Education loop
- Visit loop
- Stroll route
BATS CAVE

Position of bats cave
Level 5.5m
ECO-STUDIO

Position of eco-studio
Level 10.9m
EXPERIENCE ZONE

Position of experience zone
Level 5.5m
LECTURE SPACE

Position of lecture space
Level 5.5m
DETAILS

30mm timber deck
wood bearers
Waterproof layer
100mm rigid thermal insulation
Vapor barrier
1.2mm galvanized sheet steel
Steel profile

Double glazing:
Safety glass with solar coating

Interior timber wall:
20mm timber slats on wood bearers

Support, steel angle

Steel plate
50mm thermal insulation

Detail A  1:15

Wood slats ceiling

Interior timber floor:
20mm timber slats on bearers

Steel supporter
Steel facade sections

Detail B  1:15

Interior timber acoustic panel

wood bearers
100mm thermal insulation
1.2mm galvanized sheet steel
Steel profile

Double glazing

Interior timber floor

Sandwich panel
Convector

Detail C  1:15

Detail D

Drainage gutter:
1.2mm Foil Seal adhesive
60mm rigid thermal insulation
compression resistant
20mm welded steel section

Rainwater Pipes

Detail D  1:15

Steel purlin@1500mm

Connector fix purlins with structure
DETAILS

**Detail A** 1:15
- 30mm timber deck
- Wood bearers
- Waterproof layer
- 100mm rigid thermal insulation
- Vapor barrier
- 1.2mm galvanized sheet steel
- Steel profile
- Wood slats ceiling
- Interior timber wall:
  - 20mm timber slats on bearers
  - Support, steel angle
  - Steel plate
  - 50mm thermal insulation
- Double glazing:
  - Safety glass with solar coating

**Detail B** 1:15
- 30mm timber deck
- Wood bearers
- Waterproof layer
- 100mm rigid thermal insulation
- Vapor barrier
- 1.2mm galvanized sheet steel
- Steel profile
- Wood slats ceiling
- Interior timber floor:
  - 20mm timber slats on bearers
  - Support, steel angle
  - Steel plate
  - Steel facade sections
- Double glazing:
  - Safety glass with solar coating

**Detail C** 1:15
- 30mm timber deck
- Wood bearers
- Waterproof layer
- 100mm rigid thermal insulation
- Vapor barrier
- 1.2mm galvanized sheet steel
- Steel profile
- InteriorExterior
  - Timber acoustic panel
  - Wood bearers
  - 100mm thermal insulation
- Double glazing
- Interior timber floor
  - 20mm timber slats on bearers
  - Sandwich panel
  - Convector

**Detail D** 1:15
- Drainage gutter:
  - 1.2mm Foil Seal adhesive
  - 60mm rigid thermal insulation
  - Compression resistant
- 20mm welded steel section
- Rainwater Pipes
- Connector fix purlins with structure
  - Steel purlin @ 1500mm
  - Connector fix purlins with structure
  - Steel purlin @ 1500mm
  - Steel purlin @ 1500mm
  - Steel purlin @ 1500mm
Thanks.