“Implementing urban mining as a tool to transform vacant office buildings, reusing 100% of the existing building components.”
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1) Research
- Upcycle Amstel
- Urban mining
- Component reuse

2) Analysis
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- Site
- Inventory

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- Proposal
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RESEARCH
1) Research

- Upcycle Amstel
- Urban mining
- Component reuse
“We will explore the **urban mining** of **construction waste streams** by mapping and analysing these waste streams in the **Amstel III** area. This will provide a palette of **resources** from which to **synthesize new architecture**.”
Consumption

- **Raw Materials**: 50%
- **Energy**: 40%
- **Water**: 30%
Material depletion

- Ecosystems
- Fossil fuels
- Minerals

- Antimony
- Indium
- Silver
- Copper
- Titanium
- Tantalum
- Phosphorus
- Aluminium
- Gas
- Oil
- Coal
- Agricultural land
- Coral reefs
- Rainforests

Year markers:
- 2012
- 2062
- 2087
- 2037

Legend:
- Green: Ecosystems
- Blue: Fossil fuels
- Orange: Minerals
Construction waste

Raw Materials

- Plastic, wood and metal
  - 40%

Division

- Concrete, asphalt and brick
  - 90%
- Other (10%)

Raw Materials Division
Linear building chain

Initiative
Finance
Design
Distribution
Construction
Operation
Vacancy
Demolition
“To see urban areas, such as cities and buildings, as potential material mines, focussing on the recovery of these materials from the urban catabolism”
Phases

1. Inventory
Phases

1. Inventory
2. Harvest
Phases

1. Inventory
2. Harvest
3. Distribution
COMPONENT REUSE
Component reuse

Prolong or reuse 1:1
Component reuse

Prolong or reuse 1:1

Refurbish or recondition
Component reuse

Prolong or reuse 1:1

Refurbish or recondition

Recycle or downcycle
‘Good’ vs ‘less bad’

1. Prolong
2. Reuse 1:1
3. Refurbish/remanufacture
4. Recycle
5. Downcycle
Frequently reused components
Influences

Reusability
Influences

- Reusability
- Availability and demand
Influences

Reusability

Availability and demand

Benefits
Conclusions

1:1 reuse is most preferred
1:1 reuse is most preferred

Information is vital for urban mining
Conclusions

1:1 reuse is most preferred

Information is vital for urban mining

Buildings today are not meant for reuse
ANALYSIS
2) Analysis

- Context
- Site
- Inventory
CONTEXT
Almere (20 min)
A2
A9
Strandvliet
Amsterdam Central Station (10 min)
Bijlmer Arena
Bullewijk
Schiphol Airport (15 min)
Amsterdam Central Station (10 min)
Bijlmer Arena
Bullewijk
Holendrecht
Almere (20 min)
Municipal goal

“The goal is to make the area known as an attractive and versatile area of Amsterdam, where people live and work.”
Facts and figures

- 720,000 m² office space
- +15,000 dwellings
- Circular transformation

- High density
- 40% social housing
- Larger dwellings

40%
Harvest Locations
FSI = 2.7
(Zuid-As = 4.0)
Facade

- Brick facade
- Glasswool insulation
- Aluminum windowframes
  - Double pane glass
- Bitumen roofing
- PIR insulation
- Wood panel siding
Prefab concrete walls
Prefab concrete floor slabs
Prefab concrete columns
Prefab concrete beams
Material inventory

- Concrete: 71%
- Sand & ground: 21%
- Stone & ceramics: 4.4%
“Embodied energy is the energy consumed by all of the processes associated with the production of building.”
## Embodied energy and carbon

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<th>Component</th>
<th>Amount (tons)</th>
<th>Embodied energy (MJ)</th>
<th>Embodied carbon (kgCO₂)</th>
<th>Life expectancy (years)</th>
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Material amounts vs embodied energy

21% Sand & ground
71% Concrete
54% Concrete
Conclusions

1) Concrete and brick - high quantity, high impact
2) Aluminum and insulation - low quantity, high impact
3) Glass and bitumen - medium quantity, high impact
4) Wood - no significant impact
Conclusions

Brick facade
Glasswool insulation
Aluminum windowframes
Double pane glass

Bitumen roofing
PIR insulation

Wood panel siding

Recycle and reuse 1:1
Prolong or reuse 1:1
Prolong
Refurbish and recycle
Conclusions

Prefab concrete walls
Prefab concrete floor slabs
Prefab concrete beams
Prefab concrete columns
Additional harvest locations
Additional harvest locations

- Hoogoorddreef 60 + 62
  - 1988
  - 12,600 m²

- Hogehilweg 5 + 7
  - 1984
  - 5,400 m²

- Hettenheuvelweg 8
  - 1987
  - 2,400 m²

Demo year: 2019-2020
Hettenheuvelweg 8
Building components
Component reuse

- Gypsum wall board: refurbish
- Interior doors: reuse 1:1
- Insulation: refurbish and reuse 1:1
- Wires, pipes, and ducts: recycle
- Bitumen roofing: recycle
- Concrete columns: recycle and reuse 1:1
- Concrete beams: recycle and reuse 1:1
- Concrete floors: recycle and reuse 1:1
- Concrete walls: recycle and reuse 1:1
- Aluminum window frames: recycle and reuse 1:1
- Reflective glass: recycle and reuse 1:1
3) Design

- Goals & principles
- Proposal
- Scenario
GOALS & PRINCIPLES
1. The building will be transformed where the office spaces make place for dwellings and public functions.
Goals

1. The building will be transformed where the office spaces make place for dwellings and public functions.

2. All existing building components shall be reused.
Goals

1. The building will be transformed where the office spaces make place for dwellings and public functions.

2. All existing building components shall be reused in some way.

3. The process of urban mining shall be used as a tool to make the reuse of components possible.
Design Principles

Reuse existing building components for 100%
Design Principles

Reuse existing building components for 100%

Additional materials are to be harvested locally
Design Principles

- Reuse existing building components for 100%
- Additional materials are to be harvested locally
- Design for disassembly
PROPOSAL
Urban fabric
Existing and proposed
Existing and proposed

Extract

Addition

Extensions
Ground Floor - Proposed Situation

Extensions

Ground Floor

Shops + Bars

Dwellings
Public side
Extension

Floor structure:
- Finish floor
- Floor heating 50 mm
- Insulation (isovlas) 90 mm
- CLT element 180 mm

Floor structure:
- Finish floor
- Floor heating 50 mm
- Insulation (isovlas) 90 mm
- Concrete floor (recycled) 200 mm
- Insulation (isovlas) 100 mm

Floor structure:
- Finish floor
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Extension

Floor structure:
Finish floor
Floor heating 50 mm
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CLT element 180 mm

Floor structure:
Finish floor
Floor heating 50 mm
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Insulation (isovlas) 100 mm

Existing brick facade
New glass facade
Floor structure:
- Finish floor
- Floor heating 50 mm
- Insulation (isovlas) 90 mm
- CLT element 180 mm

Recycled concrete floor

Floor structure:
- Finish floor
- Floor heating 50 mm
- Insulation (isovlas) 90 mm
- Concrete floor (recycled) 200 mm
- Insulation (isovlas) 100 mm

New CLT floor

Extension

Floor structure:
- Finish floor
- Floor heating 50 mm
- Insulation (isovlas) 90 mm
- Concrete floor (existing) 200 mm
- Insulation (existing) 100 mm
Interior

Existing brick wall

New CLT timber

Reused timber

Existing brick wall
Exterior
Exterior

Reused concrete structure

Reused timber
Extraction

Ground Floor - Proposed Situation
Courtyard
Existing concrete structure

Courtyard

Green facade
Reused mirror glass

Courtyard
Mirror glass
Overview

CLT framing designed for disassembly

recycled bitumen + insulation

reused glass

reused concrete structure
refurbished gypsum wallboard

reused glass in reclaimed timber frames

recycled concrete and brick terrazzo floor tiles

recycled concrete floor

recycled concrete floor

refurbished wood
Phase 1

Connecting “the dots”

Material storage

Temporary factory

Harvest location

Redevelopment

Store harvested materials until needed

Direct reuse

Reuse

Component recycling

New materials

Hessenbergweg 109-119

Store recycled materials until needed
AM
STEL III
THE REUSE CITY
“Introducing the architectural language of imperfection.”