HOME-MADE®

BOTTOM-UP REDEVELOPMENT OF VACANT OFFICE SPACE
IN MASS-CUSTOMIZED HOUSING SOLUTIONS
UTILIZING DIGITAL WOOD PROCESSING TECHNIQUES
THE CONCEPT
A bottom-up redevelopment strategy of (structurally) vacant office space in mass-customized housing solutions by using the potential of digital fabrication techniques

THE BASE
Preparing the building for a custom fit-out

THE COLLECTIVE
Social cohesion enhanced by shared interest and the human scale in a high-rise

THE FIT-OUT
A customized dwelling, based on generic principles

THE LOGIC
Construction and customization features, in combination with assembly strategies and a circular business strategy

BUSINESS PERSPECTIVE

WRAP-UP
A FASCINATION FOR INFORMAL VERTICAL COMMUNITIES
OFFICE VACANCY

TE HUUR
KANTOORRUIMTE
OFFICE VACANCY

2014: 8,000,000 m²

Source: vastgoedmarkt.nl
HIGH RECURRING EMBODIED ENERGY
FOR ENVELOPE, SERVICES AND FINISHES

source: Cole and Kernan, 1996
THE NEED FOR SPATIAL CUSTOMIZATION AND THE PRIVATE COMMISSIONING TREND

source: Hofman & Halman, 2006
OFFICE VACANCY

PRIVATE COMMISSIONING

ORCHESTRATED PRIVATE COMMISSIONING IN A PROVIDED BASE BUILDING

PROBLEM + TREND = CHANCE
ORCHESTRATED PRIVATE COMMISSIONING IN A PROVIDED BASE BUILDING
We should not try to forecast what will happen, but try to make provision for what cannot be foreseen

Habraken in Supports (1972)
Uniform or predetermined level of quality for all units in a project

Wasted quality - beyond users preference or demand
Unused purchasing power
Level of quality determined by the developer
Preferred level of quality of each household

Supply = demand using residential 'fit-out' systems
High uniform quality 'base building'

A growing city and a lack of space

From city expansion, thereby using valuable space

To the re-use of existing urban fabric

Using (structurally) vacant office space
A TOP-DOWN FRAMEWORK FACILITATING A CONSUMER-DRIVEN AND BOTTOM-UP APPROACH
**BASE BUILDING**

Developer owned.
Basic facilities & utilities.
Low durable investment.
Leasehold construction.

**FIT-OUT**

Individualized buildings.
Spatially, functionally & aesthetically.
Privately owned.

**CONSTRUCTIONAL LOGIC**

Unifying construction - modularity.
Lower building costs.
Speeds up building & designing process.

**PRODUCTION & ASSEMBLY**

How to build where also can be lived?

File2Factory.
Design For (Dis)Assembly.

**ORGANIC GROWTH PERMANENT TRANSFORMATION**

Adaptable to market conditions.
Growing project - evolution.
Blank canvas.

**NETWORK OF BASE BUILDINGS**

Exchangeability.
Your house moves with you.
Network of new urban typologies.
RESEARCH QUESTION

How can the mass customization potential of digital wood processing techniques be used in the bottom-up re-development of (structurally) vacant office space into custom housing solutions?
HOW CAN THE MASS CUSTOMIZATION POTENTIAL OF DIGITAL WOOD PROCESSING TECHNIQUES BE USED IN THE BOTTOM-UP REDEVELOPMENT OF (STRUCTURALLY) VACANT OFFICE SPACE INTO CUSTOM HOUSING SOLUTIONS?

REGENERATION OF THE VACANT OFFICE BLOCK

MASS CUSTOMIZATION IN HOUSING SOLUTIONS

DIGITAL WOOD PROCESSING TECHNIQUES AND THEIR FABRICATION AND (DIS)ASSEMBLY

TECHNICAL DESIGN OF A CONSTRUCTIONAL SYSTEM WITH IMPLEMENTED MODULARITY

GENERIC DESIGN METHODOLOGY
FOR MASS CUSTOMIZED HOUSING SOLUTIONS IN VACANT OFFICE SPACE USING A CONSTRUCTION SYSTEM WITH IMPLEMENTED MODULARITY

CASE STUDY DESIGN

RECOMMENDATIONS FOR FURTHER RESEARCH
**Open Building Methodology**

**Initiative**

1. Identification of Project Building
2. Analysis of Neighbourhood and Viability of Transformation Potential

**Feasibility Assessment**

- Documentation and Structural and Spatial Inventarisation of Present State of Building
- Circulation and Accessibility Analysis
- Utility Analysis, Possible Service Cores and Coverage of Horizontal Shaftwork
- Zoning Analysis
- Plot Division
- Placement of Public and Communal Spaces, Identification & Urban Embedment
- Determination of Internal Zoning Plan and Building Rules

**Support Design**

- Physical Support Design
- Detailed 3D Model Using TLS Techniques
- Internal Zoning Plan

**Top Down**

- Project Developer and/or Architect
- Principal Architect

**Fit-Out Design**

- User Centered Design Process
  1. Activity Listing
  2. Activity Description
  3. Relational Diagrams
  4. Initial Floor Plan
  5. Final Design

- User-Centered Design Loop
- Digital Housing Configurator
- Climate Data
- Zoning Plan Test
- Constructional Logic
- Translation from the Digital to the Physical World
- Re-use & Recycling of Materials

**Bottom-Up**

- End-User
- (Architectural) Consultant

**Circumstances & Limits**

- Customized Dwelling
- Internal Zoning Plan
- Not Per Definition A Linear Process

**Transformation Potential Measurement Tool**
1. Identification of project building
2. a. Analysis of neighbourhood and viability of transformation potential
   b. Analysis of potential target groups
3. Building survey: inspection and detailed study of building structure and adaptability potential

- Documentation and structural and spatial inventarisation of present state of building
- Circulation and accessibility analysis
- Utility analysis, possible service cores and coverage of horizontal shaftwork
- Zoning analysis
- Plot division
- Placement of public and communal spaces, identification & urban embedment
- Determination of internal zoning plan and building rules

- Feasibility assessment

Building demolition or other purpose

Building approved for support design

Support design

- Digital housing configurator (architectural consultant)

Top down

User-centered design process

Transformative potential measurement tool

Transformation potential

User-centered design loop

Transfer from the digital to the physical world

Not per definition a linear process

Circumstances & limits

Customized dwelling constructional logic

Re-use & recycling of materials

Climate data
1. IDENTIFICATION OF PROJECT BUILDING
2. BUILDING SURVEY: INSPECTION AND DETAILED STUDY OF BUILDING STRUCTURE AND ADAPTABILITY POTENTIAL

- DOCUMENTATION AND STRUCTURAL AND SPATIAL INVENTARISATION OF PRESENT STATE OF BUILDING
- CIRCULATION AND ACCESSIBILITY ANALYSIS
- UTILITY ANALYSIS, POSSIBLE SERVICE CORES AND COVERAGE OF HORIZONTAL SHAFTWORK
- ZONING ANALYSIS
- PLOT DIVISION
- PLACEMENT OF PUBLIC AND COMMUNAL SPACES, IDENTIFICATION & URBAN EMBEDMENT
- DETERMINATION OF INTERNAL ZONING PLAN AND BUILDING RULES

1. ACTIVITY LISTING
2. ACTIVITY DESCRIPTION
3. RELATIONAL DIAGRAMS
4. INITIAL FLOOR PLAN
5. FINAL DESIGN

END-USER

ARCHITECTURAL CONSULTANT

CUSTOMIZED DWELLING

TRANSLATION FROM THE DIGITAL TO THE PHYSICAL WORLD

RE-USE & RECYCLING OF MATERIALS

CIRCUMSTANCES & LIMITS

CLIMATE DATA

DIGITAL HOUSING CONFIGURATOR

USER-CENTERED DESIGN LOOP

ZONING PLAN TEST

USER CENTERED DESIGN PROCESS

FIT-OUT DESIGN

BOTTOM-UP

TOP DOWN

PROJECT DEVELOPER AND/OR ARCHITECT

PRINCIPAL ARCHITECT

USER-CENTERED DESIGN LOOP

ZONING PLAN TEST
CONTEXT

THE REGENERATION OF THE VACANT OFFICE BLOCK
ABSO L U T E    A ND    R EL A T I V E    G RO W T H    O F
VAC A N C Y    IN    70’s & 80’s

source: Remoy, 2007
CONSIDERATIONS

DIMENSIONS / COLUMN GRID
- Free plan due to loadbearing facade or grid dimensions

CONDITION OF FACADE
- Outdated or suitable for refurbishment

VERTICAL TRANSPORTATION
- Sufficient for new use
- Other functions for existing shafts
- Extra space for transportation needed

EXISTING UTILITIES
- Suitable for refurbishment?
- Are existing shafts big enough

DAYLIGHT ENTRANCE
- How far does daylight penetrate?
- Allowed functions according to regulations

CLIMATE
- Sub-climate
- Climatised
- Outside conditions

FIRE SAFETY
- Sufficiency of existing escape routes
- Fire safety regulations applied to housing

LOGISTICS
- Waste management
- Extra utilities

modified floor plan of the Parool tower, Wibautstraat, Amsterdam
<table>
<thead>
<tr>
<th><strong>CONSTRUCTION</strong></th>
<th><strong>BENEFICIAL</strong></th>
<th><strong>OBSTRUCTIVE</strong></th>
<th><strong>SOLUTIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Modular grid sizing of 5.4 or 7.2m, applicable to housing</td>
<td>Locally lowered ceilings due to beams</td>
<td>Separate placement of units ensures acoustical quality and fire safety standards</td>
</tr>
<tr>
<td></td>
<td>High ceilings, lowest net heights 2.8m</td>
<td>Grid structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columns, free floor fields</td>
<td>Fire safety issues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Appropriate depth</td>
<td>Columns oppose obstructions (acoustic, thermal and moisture)</td>
<td></td>
</tr>
<tr>
<td><strong>FLOORS</strong></td>
<td>Designed for high floor loads, 300 kg/m². Normative for housing is 175 kg/m².</td>
<td>Post tension bars; often low flexibility for vertical shaftwork</td>
<td>Use existing elevators as utility shafts</td>
</tr>
<tr>
<td></td>
<td>Low mass. Raised floor and lowered ceiling needed to comply to building regulations.</td>
<td>Low mass. Raised floor and lowered ceiling needed to comply to building regulations.</td>
<td>New box-in-box construction</td>
</tr>
<tr>
<td></td>
<td>Deflection of floors</td>
<td></td>
<td>3D scanning to map the deflections and deviations for digital fabrication input</td>
</tr>
<tr>
<td><strong>ENVELOPE</strong></td>
<td>Modular grid sizing of 1.8m and loadbearing walls. Good connections possible.</td>
<td>Curtain walls; bad technical conditions. No connections possible for function separating walls.</td>
<td>A new façade is needed in order to properly redevelop into housing solutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cantilevered floors; applicability of balconies is difficult.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>New façade is expensive.</td>
<td></td>
</tr>
<tr>
<td><strong>VERTICAL ACCESSIBILITY</strong></td>
<td>Elevators are oversized for housing purposes.</td>
<td>Often not enough escape routes.</td>
<td>Possibility of adding extra stairs inside or outside the building</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stairs and elevators account for relatively much space.</td>
<td></td>
</tr>
</tbody>
</table>

*based on literature research*
<table>
<thead>
<tr>
<th><strong>ASPECT</strong></th>
<th><strong>CRITERION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOCATION</strong></td>
<td></td>
</tr>
<tr>
<td>Urban situation</td>
<td>Office on remote industrial zone</td>
</tr>
<tr>
<td></td>
<td>Office in the middle of an office park</td>
</tr>
<tr>
<td></td>
<td>Office in area defined as priority area for offices</td>
</tr>
<tr>
<td>Land property</td>
<td>Land rent</td>
</tr>
<tr>
<td>Vacancy</td>
<td>Vacant for more than a year</td>
</tr>
<tr>
<td></td>
<td>Vacancy of surrounding buildings</td>
</tr>
<tr>
<td>Character of urban situation</td>
<td>Location on or near city edge, ring roads</td>
</tr>
<tr>
<td></td>
<td>Desolated area</td>
</tr>
<tr>
<td></td>
<td>No greenery in the neighbourhood</td>
</tr>
<tr>
<td></td>
<td>Social depreciation, vandalism</td>
</tr>
<tr>
<td></td>
<td>Pollution; smell, noise, view</td>
</tr>
<tr>
<td>Distance and quality of facilities</td>
<td>Shop for daily errands &gt; 1km</td>
</tr>
<tr>
<td></td>
<td>Meeting place (café, snackbar, etc.) &gt; 500m</td>
</tr>
<tr>
<td></td>
<td>Bank/post office &gt; 2km</td>
</tr>
<tr>
<td></td>
<td>Basic medical facilities (doctor, pharmacy) &gt; 5km</td>
</tr>
<tr>
<td></td>
<td>Sport facilities (fitness, swimming pool, sports park) &gt; 2km</td>
</tr>
<tr>
<td></td>
<td>Educational facilities (nursery, school, university) &gt; 2km</td>
</tr>
<tr>
<td>Accessibility by public transport</td>
<td>Distance to station &gt; 2km</td>
</tr>
<tr>
<td></td>
<td>Distance to bus, metro or tram stop &gt; 1km</td>
</tr>
<tr>
<td>Accessibility by car; parking</td>
<td>Many obstacles, limitations, poor flow</td>
</tr>
<tr>
<td></td>
<td>Distance to parking place &gt; 250m</td>
</tr>
<tr>
<td></td>
<td>&lt; 1 parking place / 100m² dwellings reasonable</td>
</tr>
<tr>
<td><strong>BUILDING</strong></td>
<td></td>
</tr>
<tr>
<td>Year of construction</td>
<td>Building was built or renovated recently (three years)</td>
</tr>
<tr>
<td>Character of the building</td>
<td>Unrecognisable, non-eloquent*</td>
</tr>
<tr>
<td></td>
<td>Poor maintenance</td>
</tr>
<tr>
<td>Extensibility</td>
<td>Not extensible horizontally</td>
</tr>
<tr>
<td></td>
<td>Not extensible vertically</td>
</tr>
<tr>
<td>Structure</td>
<td>Structure in technically bad condition</td>
</tr>
<tr>
<td></td>
<td>Dense structural grid, &lt; 3.6m</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Net story height &lt; 2.6m</td>
</tr>
<tr>
<td>Façade*</td>
<td>Façade openings not adaptable</td>
</tr>
<tr>
<td></td>
<td>Impossible to create windows which can be opened manually</td>
</tr>
<tr>
<td></td>
<td>Daylight entry &lt; 10 percent of the living area</td>
</tr>
<tr>
<td>Entrance (building, dwelling)</td>
<td>Impossible to create a socially secure entrance</td>
</tr>
<tr>
<td></td>
<td>Impossible to realise elevator in the building (if more than four floors)</td>
</tr>
<tr>
<td></td>
<td>Distance from dwelling to stairs/电梯 &gt; 50m</td>
</tr>
<tr>
<td></td>
<td>Impossible to realise escape stairs according to escape demands</td>
</tr>
<tr>
<td>Installations*</td>
<td>No or insufficient conduits realisable</td>
</tr>
<tr>
<td>Environment</td>
<td>Noise level at the façade &gt; 50dB</td>
</tr>
<tr>
<td></td>
<td>Sufficient insulation between dwellings impossible</td>
</tr>
<tr>
<td></td>
<td>Sufficient insulation of façade impossible</td>
</tr>
<tr>
<td></td>
<td>Presence of dangerous materials in construction</td>
</tr>
<tr>
<td></td>
<td>No or little sunlight</td>
</tr>
</tbody>
</table>
VOID OPTIONS
The Merger of Interest

High-Rise | Individuality

The Merger of Interest
Collective Grouping

Garden
Playground
Sports
BBQ / Recreational
Elderly
COLOURED ON FUNCTIONAL ORGANIZATION, NOT ON AESTHETICS
HOUSING BLOCK WITH COLLECTIVE INTERIOR

HIGH RISE TOWER WITH COLLECTIVE INTERIORS

HIGH RISE TOWER WITH PROGRAMMATIC COLLECTIVE INTERIORS
THE FIT-OUT

A CUSTOMIZED DWELLING, BASED ON GENERIC PRINCIPLES
CUSTOMIZATION CATEGORISATION & ANALYSIS

CLASSIFICATION ON: DESIGN FREEDOM, USER INFLUENCE, UNIQUENESS, MASS PRODUCTION POTENTIAL AND PROCESS EFFICIENCY.
1. ACTIVITY LISTING
2. ACTIVITY DESCRIPTION
3. RELATIONAL DIAGRAMS
4. INITIAL FLOOR PLAN
5. FINAL DESIGN

DIGITAL HOUSING CONFIGURATOR

USER-CENTERED DESIGN LOOP

(ARCHITECTURAL) CONSULTANT
Longitudinal section, 1:50
STRUCTURAL PRINCIPLES
ASTRUCTURAL INSULATED PANEL CONSTRUCTION

TREATED PLYWOOD SHEETING

MILLED GROOVE PATTERN

BIOFOAM INJECTED INSULATION

UNIFORM DISPERSED MOLDING

CAM LOCK

EACH 600MM IN PANEL

REINFORCED TRUSS CONSTRUCTION

MILLED OUT OF OSB

IF USED SHEETING IS NOT STRUCTURALLY SOUND OR IN CASE OF HIGH STRUCTURAL LOADINGS

FERMACELL INTERIOR SHEETING

FINISHED OFF WITH STUCCO

DOUBLE HEIGHT ANCHORING

SUSPENDED INSULATED CEILING: FREE FLOOR FIELD

CORNER ELEMENTS: RIGID STRUCTURAL MEMBERS

TREATED PLYWOOD SKIN

MILLED GROOVE PATTERN

BIOFOAM INJECTED INSULATION

UNIFORM DISPERSED MOLDING

FERMACELL INTERIOR SHEETING

FINISHED OFF WITH STUCCO

BOX-IN-BOX

INTINTEGRATED ASSEMBLY

CURTAIN RAILING

WINDOW/SHEL/BOOKSHELF
1 CONTINUOUS INSULATION

2 PLUG & PLAY, UTILITY LOOP

3 INTEGRATED VENTILATION & HEATING WITH HEAT RECOVERY

4 MODULAR ELECTRIC FLOOR HEATING

5 RAISED FLOOR
THE LOGIC

CONSTRUCTION AND CUSTOMIZATION FEATURES, IN COMBINATION WITH ASSEMBLY STRATEGIES AND A CIRCULAR BUSINESS STRATEGY
KEY DFMA PRINCIPLES

<table>
<thead>
<tr>
<th>PRECEDE NTS</th>
<th>Minimize part count</th>
<th>Standardized parts &amp; materials</th>
<th>Modular assemblies</th>
<th>Efficient joining</th>
<th>Minimize reorientation of parts during assembly and/or machining</th>
<th>Simplify &amp; reduce number of machining operations</th>
<th>DFMA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKAGED HOUSE SYSTEM</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>Due to the fact that there are many different components, machinery and assembly is still quite labor intensive.</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>INSTANT CABIN</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>Gropius and Wachsmann designed 1 universal connector for every joint.</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>LINA TRANSITIONAL SHELTER</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>Not the amount of connectors, but the friction-fit joining makes it efficient.</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>BAMBOO MICRO HOUSING</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>During machining no reorientation. Assembly is like a small puzzle.</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td>JAPANESE JOINERY</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>During machining quite a lot. During assembly practically none.</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
</tbody>
</table>

There are still a lot of parts present in the system, efficiency is achieved through the joining method.

Everything is factory made. Though, there are still a lot of different components present.

Every assembly is the same due to the fact that there is 1 joint.

Gropius and Wachsmann designed 1 universal connector for every joint.

Due to the fact that there are many different components, machinery and assembly is still quite labor intensive.

The prefabrication of the parts was labour intensive.

The only machining operation is milling in 2D, so limited to 1.

Making SIPs in the factory requires more labor.

The bending of the bamboo straps makes the fabrication process unnecessarily complicated.

A lot of reorientation also ensures that the machining is quite time and labour intensive.
CONNECTION PRINCIPLE

- Universal Joint
- Ratchet Straps
- IKEA Cam-Locks
- Foamed-in-Place Cam-Lock Fasteners
CUSTOMIZATION FEATURES
BUILDING & LOCATION
PLOT LOCATION
PLOT SIZE
GRID MODULE

SPATIAL FREEDOM
INTEGRATED ASSEMBLY

CURTAIN RAILING

WINDOWSILL / BOOKSHELF
ASSEMBLED FLOOR MODULE
600x600mm floor plates snap into the protruded edges of the floor trusses underneath.

Perpendicular floor trusses, 600mm

Floor trusses, 1200mm, the squared openings function as an improved foam adhesion feature to maintain structural integrity when a panel is lifted in transport.

Floor top plate, with cutted out slots

BioFoam injected core, uniform dispersed molding

Floor bottom plate, with milled out grooves
FLOOR VIEW WITH DIAGONAL PARTITIONING
BUSINESS PERSPECTIVE
MUNICIPALITY

ZONING PLAN REQUIREMENTS

BASE BUILDING ADAPTABLE TO FUNCTIONAL CHANGE

OWNER / LANDLORD

BUILDING PLOT

FIT-OUT CONSTRUCTION

END-USER

RETURNING 2nd HAND COMPONENTS

FIT-OUT COMPANY

LEASING / RENTING NEW OR 2nd HAND FIT-OUT COMPONENTS

CONSORTIUM OF COMPANIES PROVIDING THE DIFFERENT FIT-OUT COMPONENTS NEEDED (SIP PANELS, PLYWOOD, PIPEWORK, KITCHEN FIT-OUTS AND OTHER WET UTILITIES)

EXTERNAL COMPANIES

SUPPLY OF FIT-OUT COMPONENTS AND MATERIALS

CONSULTANT

DIGITAL HOUSING CONFIGURATOR (ARCHITECTURAL)

CONSULTANT (ARCHITECTURAL)

USER-CENTERED DESIGN LOOP
CONVENTIONAL SUPPLY CHAIN

MANUFACTURER PRODUCTION
COMPONENTS

TRADERS DELIVERY
COMPONENTS

INSTALLATION
COMPONENTS

END-USERS (OWNERSHIP)

RECYCLING
DISPOSAL

SUPPLY & INVERSE SUPPLY CHAIN (LEASING OR RENTING MODEL)

MANUFACTURER PRODUCTION
COMPONENTS

LEASING / RENTING
COMPONENTS

INSTALLATION
COMPONENTS

END-USERS (UTILIZATION)

RE-RESOURCE
RE-USE
RE-RESOURCE

RE-USE
RE-RESOURCE

RE-LEASING / RENTAL
SOLD AS SECOND HAND PRODUCT

RE-COLLECTION

CIRCULAR ECONOMY

diagram adapted from Yashiro & Nishimoto (2002)
RELEVANCE

COALITION AGREEMENTS 2014

Gemeente Amsterdam

Flexible zoning plans
Space for ‘VrijHAVENS’, free zones for bottom-up experimentation
Higher production of social housing
More opportunities for the smaller housing corporations and initiatives in realising social housing
Greening of the city

source: architectenweb.nl

Gemeente Rotterdam

New solutions for vacancy, increasing possibilities for new vacancy approaches
More control and responsibility for the citizen
Continuation of the ‘KLUSWONINGEN’, self-build projects
New districts in the city centre for students and starters
Greening of the city

source: architectenweb.nl
THE COLLECTIVE
THE FIT-OUT
THE LOGIC
A CUSTOM HOME AVAILABLE FOR EVERYONE
THANK YOU