The ERA of sustainable housing transformation

P5 - Erik Dral - 8 April 2014

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Introduction

Content
Problem statement
Framework
Motivation
Research question
Relation research and design

Architecture
Building Technology
Process

Content
Architecture - living quality

Urban scale
  ground level design
  connection building - ground level

Building scale
  routing
  appearance
  social cohesion

Dwelling scale
  interior arrangement
  skin
Building Technology - energy neutrality

Defining the energy flows
Energy concept
Structural concept
Detailing
Process - *Occupied state*

Proposed renovation process
Problem statement
Problem statement

Dutch energy consumption

25%
Problem statement

Dutch energy consumption

25% 33%

Intro Arch BT Pr
Problem statement

Dutch energy consumption

25%

33%

D

E
Problem statement

Dutch energy consumption

25%

33%

D

E

50 years
Problem statement

Dutch energy consumption

25%

33%

50 years
1963 - 2013
Problem statement

Dutch energy consumption

25%

33%

D

E

50 years

1963 - 2013

0.25%
10 years

energy price
Problem statement

Fuel poverty
10% of net income

10 years

Energy price
Framework

introduction
Gallery flat

born out necessity
Gallery flat

born out necessity

the decay of an ideal

framework
Gallery flat

- born out necessity
- the decay of an ideal
- unfinished business
framework
Research question
“What are the design principles for the renovation of an occupied ERA gallery flat to an energy neutral building of modern standards and adjust the dwelling to the demand of (future) target groups?”
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Goals:
- energy neutral
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Goals:
- energy neutral
- modern standards
“What are the design principles for the renovation of an occupied ERA gallery flat to an energy neutral building of modern standards and adjust the dwelling to the **demand of (future) target groups**?”

**Goals:**
- energy neutral
- modern standards
- greater variety of dwellings
“What are the design principles for the renovation of an occupied ERA gallery flat to an energy neutral building of modern standards and adjust the dwelling to the demand of (future) target groups?”

**Goals:**
- energy neutral
- modern standards
- greater variety of dwellings

**Condition:**
- occupied state
“What are the **design principles** for the renovation of an occupied ERA gallery flat to an energy neutral building of modern standards and adjust the dwelling to the demand of (future) target groups?”

**Goals:**
- energy neutral
- modern standards
- greater variety of dwellings

**Condition:**
- occupied state

**Product:**
- Design principles
research to design

introduction
existing problems and imperfections

design principles

design
Architecture

Living quality
design principles

urban scale

building scale

dwelling scale
Urban scale

Ground level design
ground level design
ground level design
ground level design
ground level design
ground level design
ground level design
ground level design
entrance area should be less dominated by the car

the (green) outdoor should be better defined to increase usability
ground level design
ground level design
ground level design
ground level design
ground level design
ground level design
Urban scale

Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
the building should not be a barrier.

the entrance area should be well marked.

eliminate the disconnection of the storage level.
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Connection ground level and building
Building scale

Routing
Routing
Entrance should have more grandeur.

Elevators should serve every floor.

Gallery should have more depth.

Gallery could be protected for the weather.

Recognition of front door by giving room for self expression.

Reducing the so-called “by pass” effect.
Routing - entrance hall

existing entrance hall

new entrance hall
Routing - entrance hall

existing entrance hall

new entrance hall
Routing - entrance hall

existing entrance hall

new entrance hall
existing entrance hall

new entrance hall
dwellings without the “pass by” effect
Routing - gallery

existing routing scheme

route
dwellings without the “pass by” effect
dwelling
vertical access point
Routing - gallery
Building scale
Appearance
no blind wall of the storage level

entrance should be well marked

facade should be less anonymous and monotonous

increase the own identity of every flat
Appearance
Building scale

social cohesion
some problem like noise nuisance, littering in public places and other irritations can be prevented by a better social cohesion.

Architecture can not force people to get along, but it can create the opportunity to get to know each other.
community room
Social cohesion
Dwelling scale

interior arrangement
skin
interior arrangement
interior arrangement

Finishing

size of the dwelling
balcony depth
balcony depth

weather influence
balcony depth
weather influence
insulating properties facade

skin
minimum renovation
intro
arch
bt
pr

interior arrangement

minimum renovation
interior arrangement

minimum renovation

medium renovation

Arch
minimum renovation

medium renovation
interior arrangement

minimum renovation

medium renovation
interior arrangement

minimum renovation

medium renovation

maximum renovation
interior arrangement

minimum renovation

medium renovation

maximum renovation
creation of a variaty of dwellings
lower ceiling in bedroom

sound insulation
Building technology

energy neutral
Defining the energy flows
"How does one create an energy neutral building?"

Total energy consumption
- Building
- Building use
- User
- Construction

Define energy flows
- Reduce the energy demand
- Reuse existing energy flows

Apply trias energetica

Remaining demand that needs to be generated using sustainable sources
“What is the current energy consumption of an ERA flat?“

<table>
<thead>
<tr>
<th>Type</th>
<th>building related kWh/year</th>
<th>building use related kWh/year</th>
<th>user related kWh/year</th>
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<tbody>
<tr>
<td>20°C</td>
<td>23668</td>
<td>659</td>
<td>2600</td>
</tr>
<tr>
<td>65°C</td>
<td>88%</td>
<td>2.5%</td>
<td>9.5%</td>
</tr>
</tbody>
</table>

Energy concept
Energy concept
Energy concept
Energy concept
Energy concept
Energy concept

Climarad basic
(465 x 1240 x 135 mm)

Climarad Verti
(2100 x 650 x 150 mm)
Energy concept

Energy Meter

- Building-use related
- User related
- Building related
Energy concept

Energy Meter

Building-use related

User related

Building related

Intro

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Energy concept
Energy concept

Intro

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Energy Meter

Building-use related

User related

Building related
Energy concept

Building-use related

User related

Building related
Energy concept

Energy Meter

Building-use related
User related
Building related

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Energy concept
Energy concept

Energy Meter

Building-use related
User related
Building related
Energy concept

Energy Meter

Building-use related
User related
Building related
Energy concept

- Building-use related
- User related
- Building related

Energy Meter
structural concept
existing static scheme

structural concept
existing static scheme

new proposal static scheme

structural concept
Reserve load capacity

existing calculated load = 105 kN

proposed calculated load = 95 kN

maximum surface balcony = 3,5 m²
new proposal static scheme

structural concept
new proposal static scheme

load distribution
new proposal static scheme

load distribution

stability
Detailing

Building Technology
detailing - balcony facade
detailing - balcony facade
detailing - balcony facade

1:20 section balcony facade
detail G 1
detail G 2
detail G 3
detailing - balcony facade
detailing - balcony facade
detailing - balcony facade
Building process
renovation of the balcony facade
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
building process
economic feasibility
upgrading the dwelling

- balcony extension
- new gallery facade
- additional entrance
- semi public square

536 euro /m² dwelling

additional energy components

200 - 500 euro /m² dwelling
renovation:

upgrading the dwelling

- balcony extension
- new gallery facade
- additional entrance
- semi public square

536 euro /m² dwelling

additional energy components

200 - 500 euro /m² dwelling

Build new:

1000 euro /m² dwelling
renovation:

- minimum of nuisance
- saving in moving costs
- no destruction of existing social structures
- no wast of material
Questions?