HOUSING THE UNKNOWN FUTURE
TOWARDS ADAPTABILITY IN OFFICE TRANSFORMATION

ARCHITECTURAL ENGINEERING
GRADUATION STUDIO

P5 PRESENTATIE
DINS Dag 27 JUNI 2017

niels buring
4089049
Technische Universiteit Delft

N. Buring

Kaartnr. 200011782

Student

4089049

Als collegekaart alleen geldig met bewijs van inschrijving

TU Delft

Delft University of Technology

Challenge the future
INTRODUCTIE
“YOU CANNOT STEP TWICE INTO THE SAME RIVER”

HERACLITUS C., 544-483 V.CHR.
FASCINATIE
PROBLEEMSTELLING
KANTORENLEEGSTAND

Oppervlakte en leegstand van kantoren

<table>
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<tr>
<th>Totaal</th>
<th>Aandeel leegstand</th>
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<tr>
<td>miljoen m² verhuurbare vloeroppervlakte</td>
<td>%</td>
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<td>1995</td>
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Peildatum 1 januari

Leegstand
In gebruik

Bron: Bak; bewerking PBL

PBL/jun15
www.clo.nl/nl215203

ARCHITECTURAL ENGINEERING GRADUATION STUDIO
BEVOLKINGSGROEI

World population growth, 1750-2100

Annual growth rate of the world population

World population


Licensed under CC-BY-SA by the author Max Roser.

SOURCE: HTTPS://OURWORLDINDATA.ORG/WORLD-POPULATION-GROWTH/
‘TREK NAAR DE STAD’
80% decarbonization overall means nearly full decarbonization in power, road transport and buildings

GtCO$_2$e per year

DUURZAAMHEID

PROBLEEMSTELLING

SOURCE: ROADMAP TO 2050, HTTP://WWW.ROADMAP2050.EU/REPORTS

Abatement estimates within sector based on the McKinsey Global GHG Cost Curve
1 Large efficiency improvements are already included in the baseline based on the IEA WEO 2008, especially for industry
2 CCS applied to 50% of large industry (cement, chemistry, iron and steel, petroleum and gas, not applied to other industries)
INTERVENTIE IS NODIG!
ONDERZOEKSVRAAG
Onderzoeksvraag

Hoe kan een leegstaand kantoorpand worden transformeerd tot een gebouw dat zich kan aanpassen aan toekomstige behoeften en verschillende functies kan huisvesten, op dusdanige manier dat het de energie-efficiëntie van het gebouw verbeterd?
CASE STUDY
LOCATIE BINNEN ROTTERDAM
COOLSE POORT

CASE STUDY
‘RIGHT IN THE CENTRE’
NIEUWE COOLSINGEL

CASE STUDY

SOURCE: WEST8

P5 PRESENTATIE

27-06-2017

ARCHITECTURAL ENGINEERING GRADUATION STUDIO
... OF PUBLIC TRANSPORTATION
GEBOUWMASSA

CASE STUDY
DESIGN CONCEPT
ONDERZOEKSTHEMA’S

FLEXIBILITEIT

MIX VAN FUNCTIES

GEBOUW EN CONTEXT

DUURZAAMHEID

DESIGN CONCEPT
ONDERZOEKSTHEMA’S

FLEXIBILITEIT

MIX VAN FUNCTIES

Housing the unknown future
Towards adaptability in vacant office transformation

Niels Buring, 4089049
Architectural Engineering Graduation Studio
GEBOUWDELEN
HORIZONTALE CONNECTIE
FLEXIBELE UITBREIDING
VERTICALE STAD

DESIGN CONCEPT
POCKETS

DESIGN CONCEPT
HORIZONTALE CONNECTIE
STEDENBOUWKUNDIGE SITUATIE
BESTAAND

HORIZONTALE CONNECTIE
STEDENBOUWKUNDIGE SITUATIE

HORIZONTALE CONNECTIE

BESTAANDE STEDENBOUWKUNDIGE SITUATIE

SOURCE: LOCATION VISIT
STEDENBOUWKUNDIGE SITUATIE
BESTAAND

SOURCE: LOCATION VISIT
MASSACONCEPT

HORizontale connectie
HORIZONTALE CONNECTIE

STEDENBOUWKUNDIGE SITUATIE
NIEUW
ROUTE DOOR DE CONNECTIE
KELDER -1

HORIZONTALE CONNECTIE
BEGANE GROND

HORIZONTALE CONNECTIE
EERSTE VERDIEPING

HORIZONTALE CONNECTIE
TWEEDE VERDIEPING

HORIZONTALE CONNECTIE
DOORSNEDE

HORIZONTALE CONNECTIE
FLEXIBELE UITBREIDING
GEBOUWLAGEN

FLEXIBELE UITBREIDING

SITE

SURROUNDS

SKIN

STRUCTURE

SERVICE

SPACE

STUFF

DAILY-MONTHLY

3-30 YEARS

7-15 YEARS

30-300

20 YEARS

SOCIAL

3-30 YEARS

7-15 YEARS

30-300

20 YEARS
TYPOISCHE PLATTEGROND BESTAAND
CONCEPT
SCHACHTEN

FLEXIBELE UITBREIDING
CONCEPT

SCHACHTEN

FLEXIBELE UITBREIDING
CONCEPT
SCHACHTEN

FLEXIBELE UITBREIDING
CONCEPT

FLEXIBELE UITBREIDING
FLEXIBELE UITBREIDING
Project delivery through the standardization of building components focused on the initial use (a kit-of-parts approach). In contrast, re-configuration represented the spatial geometry and interior furnishings focused on the prolonged use or re-use of the building ameliorating whole life cost. This particular distinction is not always helpful since both strategies are inclusive to initial design decisions and if successful both will accommodate or ease some form of change after initial occupation.

However, there is another distinction which can be more helpful and lies in the distinctively different design approaches. Newways represents a systems approach, a hard approach; where Multispace embodies a set of strategies to design, a soft approach. The distinction in this sense is clear. Newways is a technically determinant system looking to (re)invent the way buildings are delivered and assembled through product innovation offering a specific solution (i.e. kit of parts). Control of that said adaptability remains in the hands of the designer. Multispace, not tied to any specific solution or project delivery, offers a set of rules or specifications as guidance for the designer’s decision making to enable the building to accommodate an appropriate range of uses through a broader understanding of the requirements various functions demand. This indeterminate approach embodies a social process between designer and user over time and demands a greater response from its users due to the greater ambiguity of the space. Such a distinction between approaches is not new (Schneider 2007), but is important because most guidance on adaptability tends to mix the two approaches without a conscious understanding of the difference or simply focuses at one extreme.

Perception of Adaptability

Through our pursuit into understanding adaptability, the most common perception has brought with it an expensive and negative connotation. For many people, it has been branded as costly, an ‘extra’, rarely used, and involves state-of-the-art gadgetry which only works half the time. This is all in an effort to safe-guard the end user against unpredictable changes in organizational structure, functional use, spatial arrangements, technological advances, and so on. This perceived view has been driven by technical attempts at future proofing buildings through the application of specific solutions (i.e. movable partitions, drop ceilings, raised floors); while other buildings, which have stood the test of time have been coined accidental adaptability or just simply good design (e.g. Georgian terrace houses, Dutch canal houses, industrial warehouses, etc.).

Figure 1. Summary of approaches towards adaptable design

---

GELAAGDE FACADE

FLEXIBELE UITBREIDING
SCHACHTEN

FLEXIBELE UITBREIDING
CONSTRUCTIE
DETAIL BESTAAND-NIEUW

- Accoya wood gallery
- Water sealing
- Isokor RKS14
- Accoya wood cladding

Floor finish
Dry floor heating system
Existing floor slab

Accoya wood gallery
Water sealing
Isokor RKS14
Accoya wood cladding

Cavity (to be filled with insulation if necessary)

Water drainage

Floor finish
Dry floor heating system
Existing floor slab
DETAIL BUITENZIJDE

- Water drainage
- Water sealing
- Steel railing
  - Frameless glass (single)
  - Accoya wood louvre
- Accoya wood
  - Extruded aluminium profile
  - Drainage grill
- Timber frame
  - UNP280 profile
  - Steel connection
  - Aluminium finish
- Accoya wood
  - Extruded aluminium profile
- Cavity (to be filled with insulation if necessary)

FLEXIBELE UITBREIDING
FLEXIBILITEIT IN OPTIES

APPARTEMENT

UITBREIDING WOONKAMER

WINTERTUIN

COMPLETE UITBREIDING

UITBREIDING WOONKAMER

WINTERTUIN

FLEXIBLE UITBREIDING
FLEXIBILITEIT IN OPTIES

MAISONNETTE

UITBREIDING WOONKAMER EN SLAAPKAMER

UITBREIDING WOONKAMER

DUBBELHOOG BALKON

COMPLETE UITBREIDING
VERTICALE STAD
ROTTERDAMSE WIJKEN
ROTTERDAM ZONES
ROTTERDAMSE WIJKEN

VERTICALE STAD CONCEPT
GEBOUWZONES

WONINGEN
ONTSPANNING EN VRIJE TIJD
KANTOOR
HORECA
HOTEL
CULTUUR
COMMERCEEL
In order to make a building adapt, there are multiple strategies that can help to achieve this. The discussed strategies all have a different influence on the building's layers, the physical scale, and the timespan. This means that these strategies will never be used in isolation. It is the combination of different strategies that can be applied to a single building, in order to make it adaptable.

To get an overview, the strategies will be given a specific type of change and will be linked to Brand's building layers to establish an overview of where the specific strategies apply most to the elements of the building. The aspect of scale will also be considered.

One major conclusion that came forward studying the different strategies is that it is almost the opposite of what the modernists visions on buildings were. The 'form follows function' approach, where the shape and form of the building has to fit the functions as tight as possible, reduces the building's ability to embrace any type of change to an absolute minimum. Something that is too fixed, offering no 'stretch', will eventually break apart. One might say that, to overcome this, buildings should be offering this manoeuvring space. From a functional point of view, this is a very decent approach, but by overdoing this, buildings will end up as big impersonal, or neutral containers.

While building for change, it is important to keep in mind that the building still has to offer significant timeless qualities for it to keep on existing (Kronenburg, 2007). Architecture needs to be responding to change in a balanced way.

Of the previously described strategies in order to create adaptability in architecture, not all are useful or applicable in the transformation of an existing building. The most obvious one is the movable strategy. Although as a concept for new architecture, the idea of a changing site can be an interesting way of dealing with the fitness of a building within its context, when confronted with the challenge of an existing building, which as a given has that the site is something that is fixed, ruling out this concept for transformation.

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### Table: Mapping Strategies Against Brand's Layers and Scale

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<tr>
<th>Strategy</th>
<th>Change of task/ Climate</th>
<th>Furniture, façade elements</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>Component</th>
<th>Hourly to daily</th>
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<td>Change of use</td>
<td>Spatial layout</td>
<td>X</td>
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<td></td>
<td>Component</td>
<td>Daily to monthly</td>
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<td>Refitible</td>
<td>Change of performance</td>
<td>Building component</td>
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<td>Component</td>
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<td>Change of function</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>Building</td>
<td>1-15 years</td>
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<td>Change of size</td>
<td>Size</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Building</td>
<td>5-30 years</td>
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<td>Moveable</td>
<td>Change of location</td>
<td>Location</td>
<td>X</td>
<td></td>
<td></td>
<td>Building</td>
<td>Weekly to yearly</td>
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</table>
SCHALEN VAN VERANDERING

**STRATEGY**
- SCALEABLE 5-30 YEARS

**MAIN ACTION**
- ADD OR REMOVE FLOOR FROM ZONE
- CHANGE BUILDING FLOORS FUNCTION
- CHANGE UNIT PERFORMANCE
- (RE)PLACE OR (RE)MOVE INTERIOR WALLS

**AFFECT**
- ADD OR REMOVE FLOOR FROM ZONE
- CHANGE FLOOR LAYOUT
- MAINTAIN/UPGRADE BUILDING SERVICES

**FLOOR UNIT**
- FLEXIBLE/ADJUSTABLE HOURLY TO MONTHLY
BINNENWANDEN

FUNCTIESCHEIDENDE WAND
- CONVERTIBLE
- 1-15 JAAR
- ACOUSTISCHE GRENS
- VERVANGBAAR EN TE HERGEBRUIKEN PANELEN

SCHACHTENWAND
- REFITABLE
- 1-7 JAAR
- OPENABLE ON TWO SIDES WITH CENTRAL SERVICES CORE

BINNENWAND
- FLEXIBLE
- 6-12 MAANDEN
- ALLEEN ELEKTRA IN WAND
- PREFAB, HER TE GEBRUIKEN PANELEN

SCHUIFWAND
- ADJUSTABLE
- UURLIJKS-DAGELIJKS
- MASSIEF PANEEL, OPGEHANGEN AAN RAILS IN PLAFOND

VERTICALE STAD
SCHALEN VAN VERANDERING

HOTELKAMER - SHORT STAY - STUDENTENSTUDIO

LOFT - WOON-WERK UNIT - SENIORENWONING

KANTOOR - APPARTEMENT - WINKELRUIMTE
VOORGEVESTELD PROGRAMMA

VERTICALE STAD

- WONINGEN
- ONTSPANNING EN VRIJE TIJD
- KANTOOR
- HORECA
- HOTEL
- CULTUUR
- COMMERGIEEL
MEER VRAAG NAAR WONINGEN

VERTICALE STAD

- WONINGEN
- ONTSPANNING EN VRIJE TIJD
- KANTOOR
- HORECA
- HOTEL
- CULTUUR
- COMMERCEEL
MEER VRAAG NAAR KANTOOR

VERTICALE STAD

WONINGEN
ONTSPANNING EN VRIJE TIJD
KANTOOR
HORECA
HOTEL
CULTUUR
COMMERCEEL
MEER VRAAG NAAR COMMERCEIEEL EN HOTEL

VERTICALE STAD

- WONINGEN
- ONTSPANNING EN VRIJE TIJD
- KANTOOR
- HORECA
- HOTEL
- CULTUUR
- COMMERCEIEEL
HORECA ZONE
KANTOORZONE
ONTSPANNINGSZONE
WONINGZONE

VERTICALE STAD
DAKTUINEN
TOREN C
DAKTUINEN
TOREN B
DAKTUINEN
TOREN A
DAKBOS

VERTICALE STAD
POCKETS
POCKET CONCEPT
CONCEPT
ISOVIST STUDIE

POCKETS CONCEPT
CONCEPT

ROTTERDAM HIGHLIGHTS

- Erasmus Bridge
- Euromast
- Binnenweg
- Markthal
- Willemsbridge
- Noorderiland
- Maastriverdend
- Rotterdam Kop van Zuid
- Timmerhuis
- Weena

POCKETS CONCEPT
POCKETS CONCEPT
POCKET OPBOUW
CONSTRUCTIE
POCKET
INTERIEUR

POCKETS
POCKET MODI

A  INNER CIRCULATION

B  SUPPLY MODE

C  EXTERIOR CIRCULATION

D  EXHAUST MODE

E  INSULATION MODE
POCKET
VLOERDETAIL ZIJAANZICHT

- Cellulose insulation
- Air intake
- Aluminium finish
- Plywood board
- Wooden frame
- Cellulose insulation
- Accoya wooden cladding
- Interior finish
- Plywood board
- Wooden frame
- Cellulose insulation
- Accoya wooden cladding
Plaster finish
Plywood board
Timber frame
Cellulose insulation
Accoya wooden cladding

Valve
Ventilation grill
Air intake system
High-performance insulation
Ventilation grill
POCKET
DAKDETAIL ZIJAANZICHT

- RIEFA Green roof system
- Water sealing
- Plywood
- Cellulose insulation
- Timber frame and rainwater storage
- Plywood
- Interior finish

- Recycled PVC
- Plywood
- Timber frame
- Plywood
- Interior finish

- Valve
- Grill

- HEB380
- Cellulose insulation
- Exhaust system
- Ventilation void
- Aluminium finish

POCKETS
GEBOUWSYSTEMEN
LUCHTINLAAT VIA DAKBOS

ZOMER

GEBOUWSYSTEMEN
LUCHTINLAAT VIA DAKBOS

WINTER

GEBOUWSYSTEMEN
### Pocket Modis

#### Zomer

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# POCKET MODI

**WINTER**

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LONGEN VAN HET GEBOUW

AIR SUPPLY FROM ROOF FOREST

CLIMATE CASCADE

HEAT EXCHANGER FROM VENTILATION EXHAUST

GREEN POCKET

AIR SUPPLY TO CORRIDOR
ENERGIECONCEPT

PV PANELS COVERING ROOF FOREST

ROOF GARDENS AND ROOF FOREST AS RAINWATER BUFFER AND FILTER

PV PANELS ON SOUTH FACADE

NEW INSULATION LAYER

CORRIDOR AS BUFFER ZONE

LOW TEMPERATURE FLOOR HEATING

EXTRA INSULATION DSF (WHERE APPLICABLE)

ATRIUM AS BUFFER ZONE

RAINWATER STORAGE
USED FOR WASHING, FLUSHING AND SHOWERING
EEN PASSIEVE STRATEGIE

ZOMERSITUATIE

ARCHITECTURAL ENGINEERING GRADUATION STUDIOP5 PRESENTATIE 27-06-2017

GEBOUWSYSTEMEN

AIR PRE-COOLED BY ROOF FOREST
AIR COOLED AND HUMIDIFIED BY CLIMATE CASCADE
AIR DISTRIBUTION THROUGH CORRIDORS
HYBRID EXHAUST
EXHAUST VIA POCKETS
ATRIUM SPACE USED FOR EXTRA VENTILATION
COOL AIR FROM BASEMENT LEVEL

RESIDENTIAL ZONE
LEISURE ZONE
OFFICE ZONE
HORECA ZONE
COMMERCIAL ZONE

CORRIDOR/CAMPUS
EXHAUST THROUGH SHAFT
BUFFER ZONE
UNIT

DSF/GALLERY DSF
EXHAUST THROUGH SHAFT
BUFFER ZONE
UNIT

COOL AIR FROM NORTH FACED DOUBLE SKIN FACADE
FLOOR COOLING

ATRIUM
EXHAUST THROUGH ATRIUM ROOF
BUFFER ZONE
UNIT
EEN PASSIEVE STRATEGIE

WINTER

- Air pre-heated and filtered by roof forest greenhouse
- Heat recovery from exhaust air
- Air pre-heated and humidified by climate cascade
- Air distribution through corridors
- Hybrid exhaust
- Atrium space used for pre-heating
- Floor heating by personal electric boiler
- Heat recovery from grey water
- Extra insulation by DSF
- Buffer zone

RESIDENTIAL ZONE
LEISURE ZONE
OFFICE ZONE
HORECA ZONE
COMMERCIAL ZONE
ARCHITECTURAL ENGINEERING
“YOU CANNOT STEP TWICE INTO THE SAME RIVER”

HERACLITUS C., 544-483 V.CHR.
LAYERED FACADE
FACADE ZONES VERTICAL

FLEXIBELE UITBREIDING
LAYERED FACADE
FACADE ZONES HORIZONTAL
LAYERED FACADE

OUTER LAYER

FAMILY

TYPES

MATERIAL

PV MATERIAL

WOOD
(TREATED)

RECLAIMED
ALUMINIUM

FLEXIBLE UITBREIDING
LAYERED FACADE

ORIENTATION LAYER

FAMILY

TYPES

MATERIAL

WOOD

PV MATERIAL

WOOD (TREATED)

RECLAIMED

ALUMINIUM

RECYCLED

PLASTIC

FLEXIBLE EXPANSION
LAYERED FACADE

DOUBLE SKIN LAYER

FAMILY

TYPES

MATERIAL

GLASS
GLASS WITH ADVERTISING
STEEL MESH

PV MATERIAL
WOOD
RECLAIMED ALUMINIUM
WOOD (TREATED)
RECYCLED PLASTIC

ORIENTATION

DOUBLE SKIN LAYER

OUTER LAYER

FLEXIBELE UITBREIDING

P5 PRESENTATIE
27-06-2017
ARCHITECTURAL ENGINEERING GRADUATION STUDIO
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LAYERED FACADE

SERVICE ZONE

FAMILY

TYPES

MATERIAL

WOOD

CLADDING

SERVICE ZONE

THERMAL LAYER

FLEXIBILITY LAYER

RAILING

DOUBLE SKIN LAYER

ORIENTATION

OUTER LAYER

FLEXIBLE UITBREIDING
DAYLIGHT
EXISTING
DAYLIGHT
PROPOSED
FLEXIBLE FACADE
FLEXIBLE FACADE
POCKET
SIDE ROOF DETAIL

RIEFA Green roof system
Water sealing
Plywood
Cellulose insulation
frame and rainwater storage
Plywood
Interior finish

Wooden frame
HEB300
Cellulose insulation
Accoya cladding

HEB360

Plaster finish
Plywood board
Wooden frame
Cellulose insulation
Accoya wooden cladding
CLIMATE CONCEPT ZONES

SUMMER

BUILDING SYSTEMS
CLIMATE CONCEPT ZONES

WINTER

BUILDING SYSTEMS

CLIMATE CASCADE

AIR PRE-HEATED AND FILTERED BY ROOF FOREST GREENHOUSE

CORRIDOR

EXHAUST THROUGH SHAFT

BUFFER ZONE

UNIT UNIT

UNIT

FLOOR HEATING BY PERSONAL ELECTRIC BOILER

HEAT RECOVERY FROM GREY WATER

AIR DISTRIBUTION THROUGH CORRIDORS

HYBRID EXHAUST

ATRIUM SPACE USED FOR PRE-HEATING

PRE-HEATED AIR BY POCKETS

RESIDENTIAL ZONE

LEISURE ZONE

OFFICE ZONE

HORECA ZONE

COMMERCIAL ZONE

DSF/GALLERY

EXTRA INSULATION BY DSF

BUFFER ZONE

UNIT

FLOOR HEATING BY COLLECTIVE ELECTRIC BOILER

HEAT RECOVERY FROM GREY WATER

EXHAUST THROUGH SHAFT

BUFFER ZONE

PRE-HEATED AIR BY POCKETS (DSF/GALLERY)

FLOOR HEATING BY COLLECTIVE ELECTRIC BOILER

HEAT RECOVERY FROM GREY WATER

PRE-HEATED AIR BY POCKETS (ATRIUM)

FLOOR HEATING BY COLLECTIVE ELECTRIC BOILER

HEAT RECOVERY FROM GREY WATER

FLOOR HEATING BY COLLECTIVE ELECTRIC BOILER

HEAT RECOVERY FROM GREY WATER

FLOOR HEATING BY COLLECTIVE ELECTRIC BOILER

HEAT RECOVERY FROM GREY WATER

Dwell EXPANSION

INTER-LEVEL CONNECTION
CONSTRUCTION SCHEME

EXISTING CONSTRUCTION
EXISTING CONSTRUCTION REINFORCED WITH CARBON FIBRE
EXTENSION ATTACHED TO EXISTING FLOOR BY ISOKORF
LAMINATED TIMBER CONSTRUCTION

BEAM TO HANG EXTENSION
EXTENSION HUNG BY CABLES
EXTENSION HUNG BY CABLES

BUILDING SYSTEMS
CLIMATE ZONES

BACKGROUND

- ROOF FOREST
  - MICROCLIMATE
  - OPENABLE SINGLE GLASS
  - 20°C
  - 11°C

- CORRIDOR
  - HALLWAY
  - 25°C
  - 13°C

- GREEN POCKET
  - MICROCLIMATE
  - SINGLE GLASS WITH VENTS
  - 28°C
  - 13°C

- FLEXIBLE EXPANSION
  - WINTERGARDEN/BALCONY
  - SINGLE GLASS
  - 28°C
  - 12°C
  - -1°C

- HALLWAY
  - 28°C
  - 12°C

- CORRIDOR
  - 25°C
  - 10°C

- GREEN POCKET
  - 30°C
  - 10°C

- WINTERGARDEN/BALCONY
  - 30°C
  - 2°C

- HALLWAY
  - 28°C
  - 15°C
CLIMATE ZONES

THERMAL BOUNDARY
CLIMATE ZONES
THERMAL BOUNDARY EXPANSION

BACKGROUND

DWELLING EXPANSION
INTER-LEVEL CONNECTION
UNITS
HEATED AREA

22°C
18°C