

OPLEIDING DUURZAME GEBOUWEN

CIRCULAIRE EN OMKEERBARE ONTWERPEN

LENTE 2020

Feedback over ervaringen: Polikliniek-Ziekenhuis Bracops:
hoe de evaluatie van de technische en ruimtelijke
omkeerbaarheid de conceptie van een project beïnvloedt

Karol GAWLIK

archipelago



- ▶ Hoe een circulair project ontwerpen?
 - Welke middelen kunnen worden gebruikt?
 - Wat zijn de beperkingen?
- ▶ Evaluatie van het circulair ontwerpen met behulp van een aangepaste tool
 - RBD (Reversible Building Design Protocol) – E. Durmisevic
 - Implementaties van het project
- ▶ Andere kwalitatieve en kwantitatieve tools
 - Vergelijking van strategieën



PROJECT BRACOPS

- ▶ Voorstelling van het project
- ▶ Doelstellingen voor circulair ontwerpen

REVERSIBLE BUILDING DESIGN PROTOCOL

ANDERE TOOLS



Architectuur

archipelago

Stedenbouw en landschap

NU
architectuuratelier

Speciale technieken

ELLYPS

Duurzaamheid en EPB

MATRI
ciel

Stabiliteit

MC
CARRÉ

Planning en coördinatie

osep

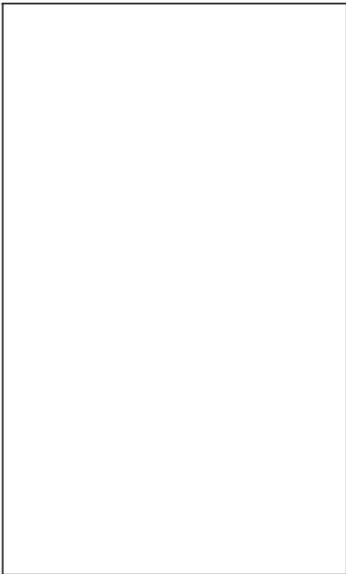






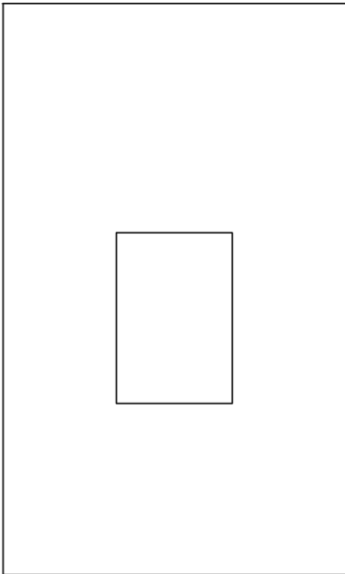
Schema 1: definitie van de buitenperimeter afhankelijk van:

- de inplanting van de site
- de oriëntatie van het project



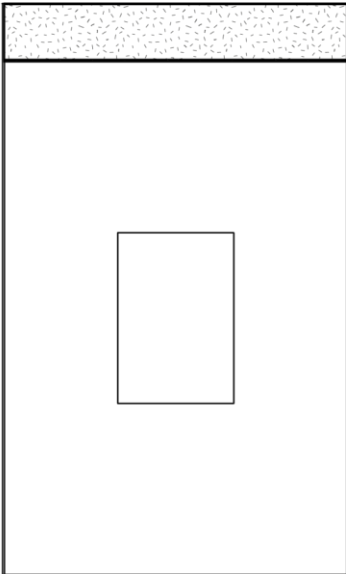
Schema 2: toevoeging van een centrale patio:

- natuurlijk licht
- buitenzichten



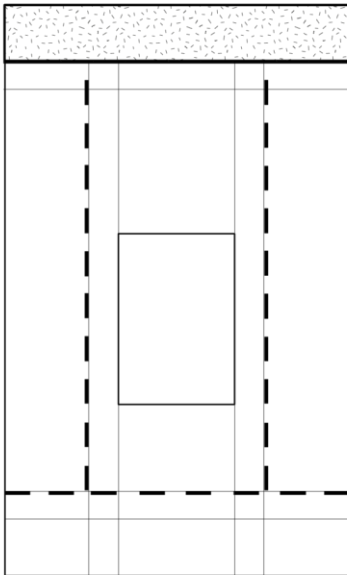
Schema 3: technisch en circulatiegedeelte

- overeenkomstig de hoofdcirculatie van het masterplan
- sluiting van de noordgevel



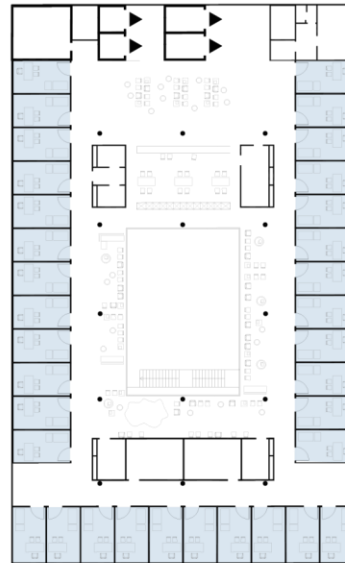
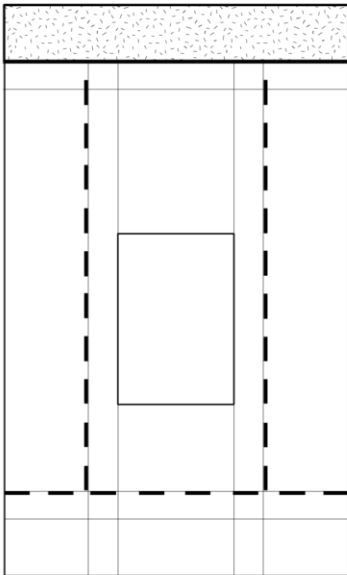
Schema 4: interne circulatiezones & verticale kokers

- circulatie overeenkomstig de diepte van de lokalen
- vooraf geïnstalleerde technische kokers voor toekomstig gebruik



Schema 5: definitie van potentiële functies

- initiële functie => raadplegingen
- definitie van de diepte van de lokalen
- inplanting van circulatie- en wachtzones

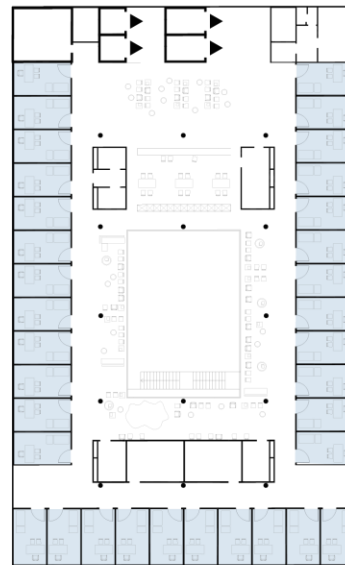
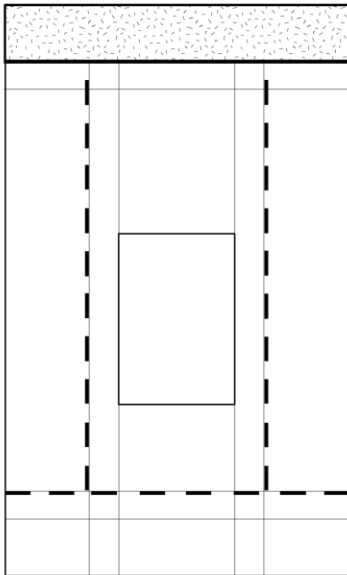


CONSULTATIONS

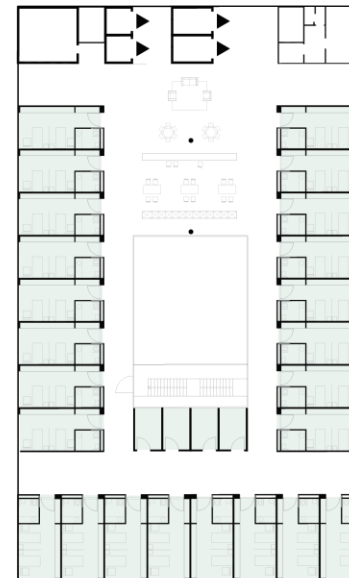


Schema 5: definitie van potentiële functies

- initiële functie => raadplegingen
- toekomstige functie(s) => hospitalisatie, serviceresidenties, ...
- impact op de diepte van de lokalen, sanitaire uitrustingen, ...



CONSULTATIONS



HOSPITALISATION

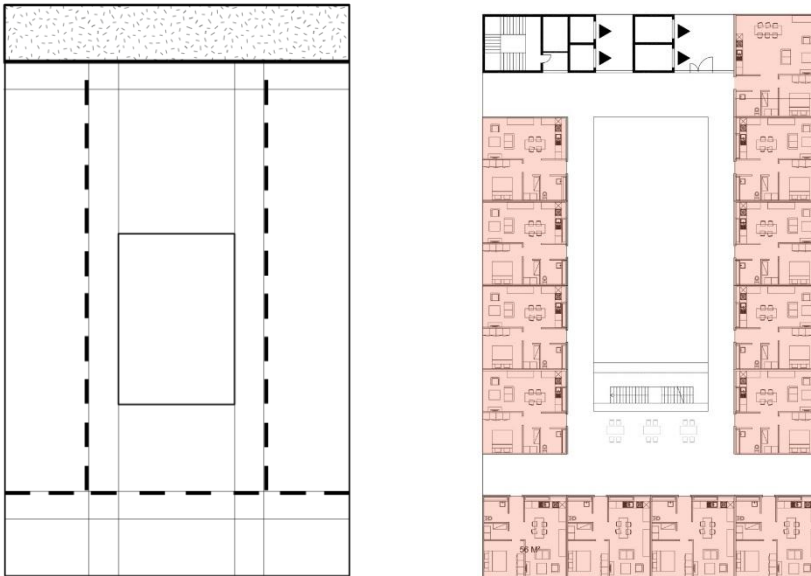


RÉSIDENCE SERVICES



Schema 5: definitie van potentiële functies

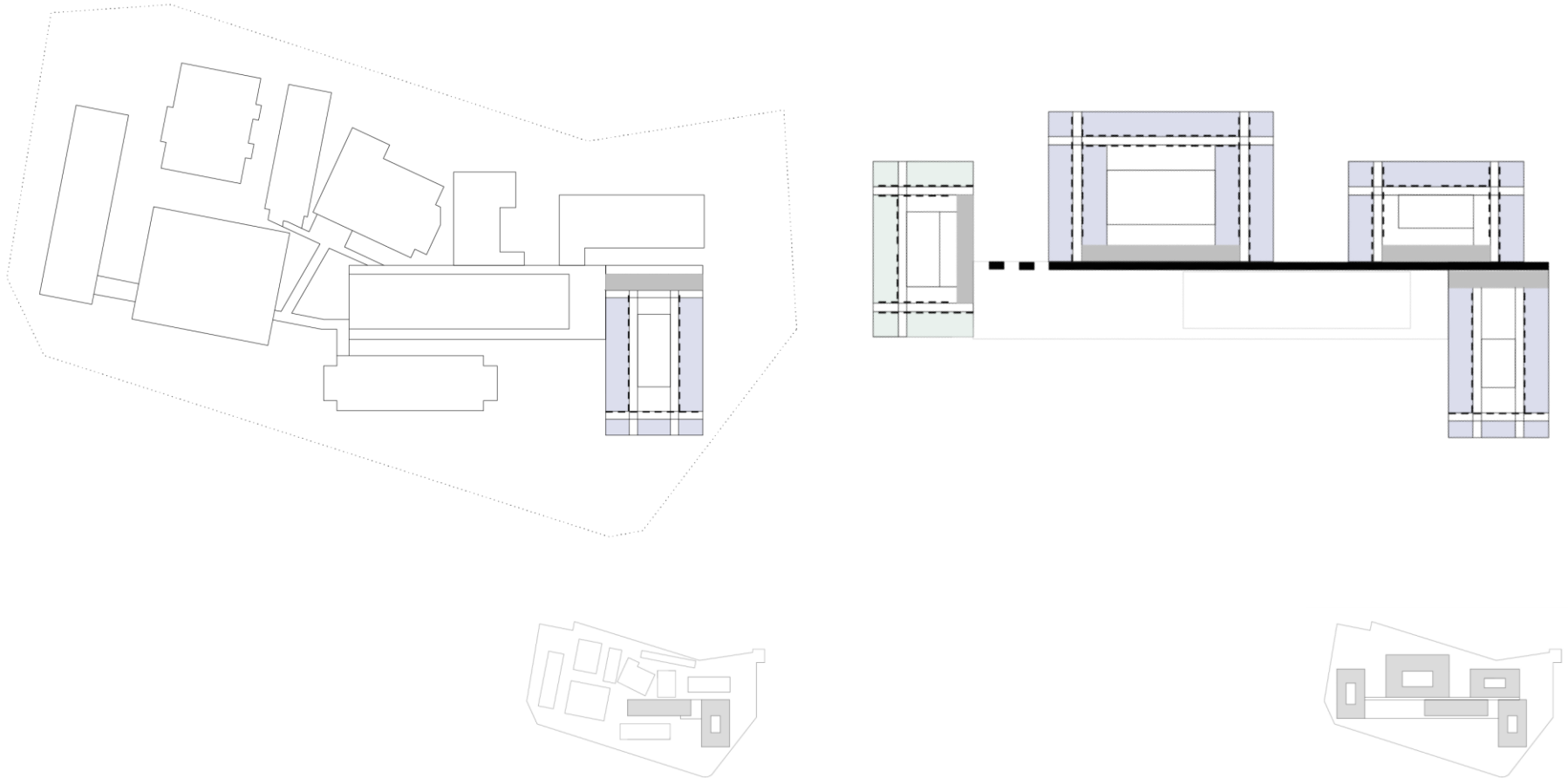
- mogelijkheid van verbouwing tot appartementsgebouw ?
- openingen in de gevel, inplanting van terrassen, ...



OMKEERBAAR ONTWERP

Schema 6: veralgemening van het concept op niveau van het masterplan

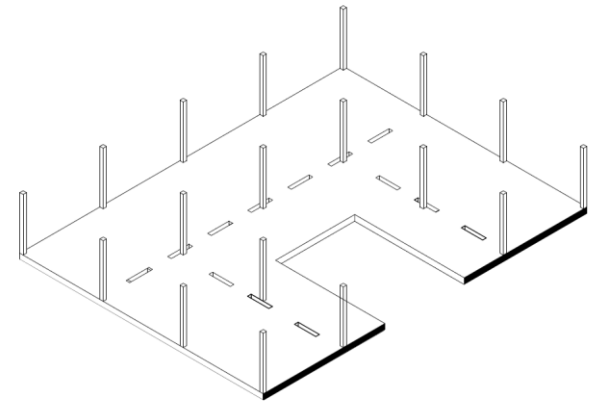
- valorisatie van de in de eerste fase opgebouwde ervaring

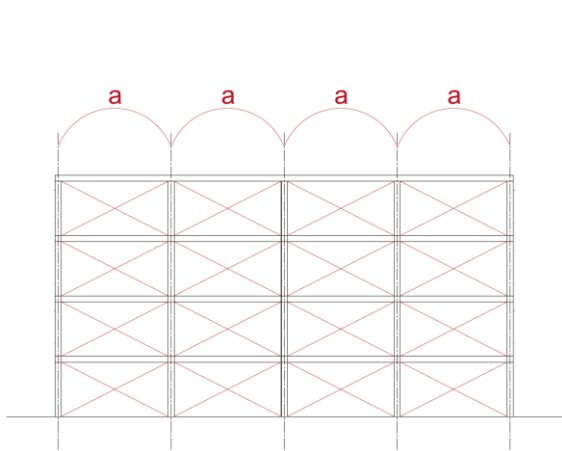


STABILITEIT - FLEXIBELE PLATEAUS

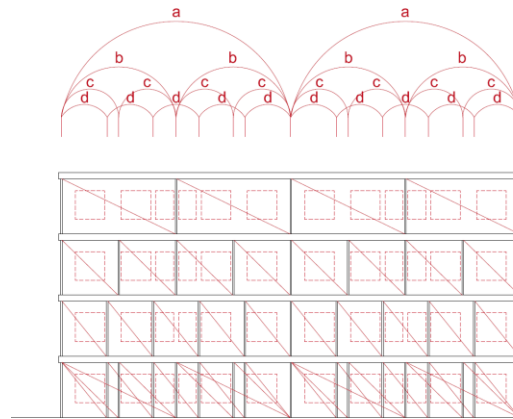
Paddestoelvloeren:

- snelheid van uitvoering
- totale afwezigheid van balken en kapitelen op de kolommen
- vrijheid van uitvoering in verlaagde plafonds

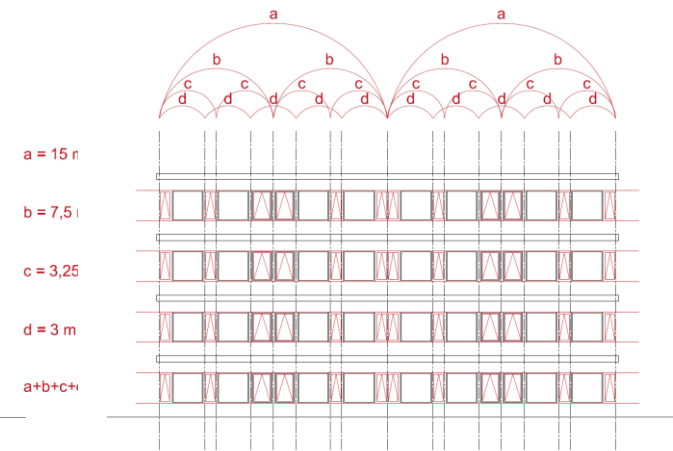




niet-dragende gevel
structurele module 7,5 m



modulariteit van de
binnenwandindeling



$a = 15 \text{ m}$

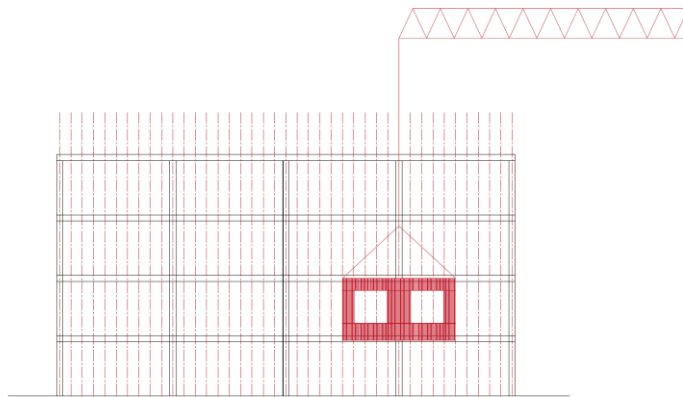
$b = 7,5 \text{ m}$

$c = 3,25 \text{ m}$

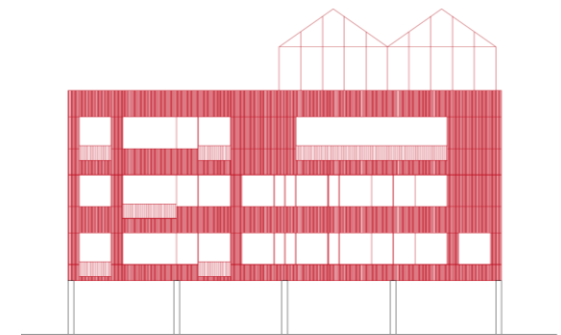
$d = 3 \text{ m}$

$a+b+c+d$

opening voorzien om de 3 m
voor natuurlijke ventilatie



raster van 75 cm & prefabricatie
van gevelmodules

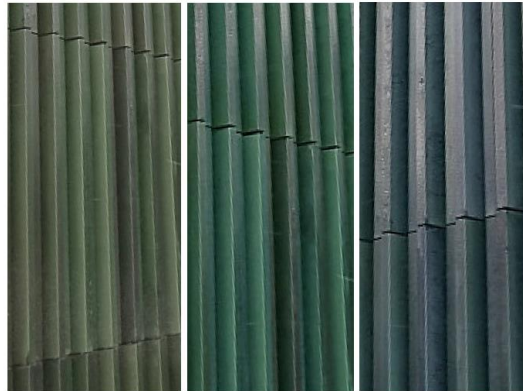
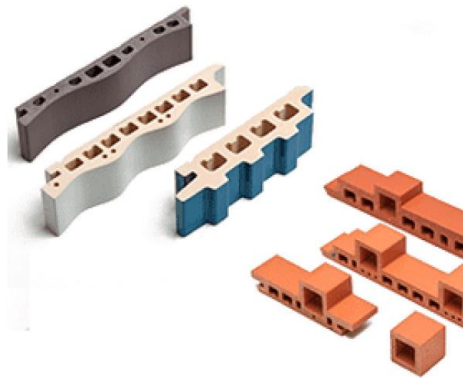


flexibiliteit voor toekomstige
aanpassingen



Keramische gevelafwerking:

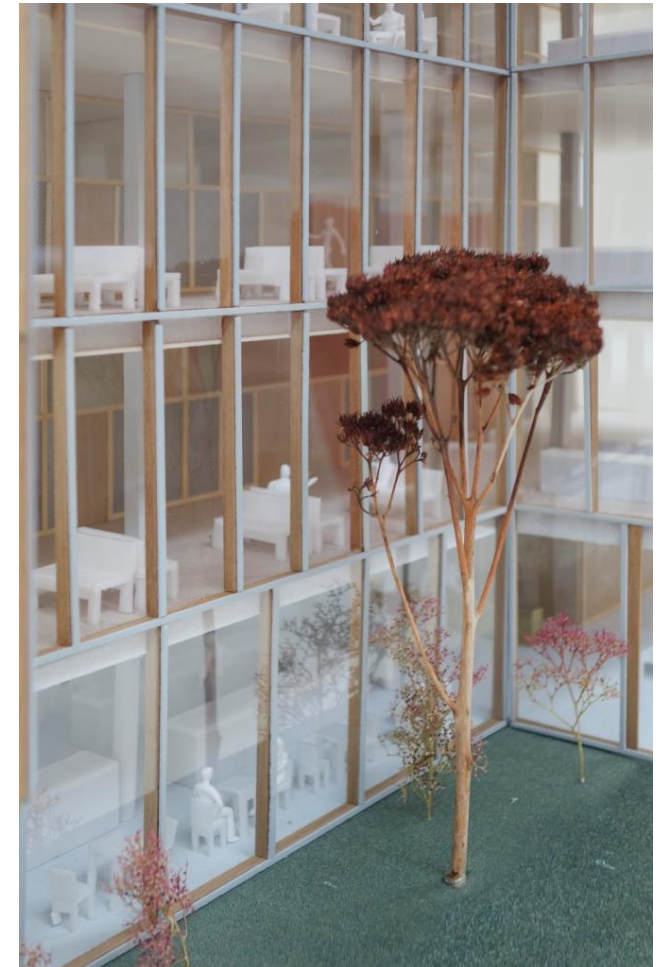
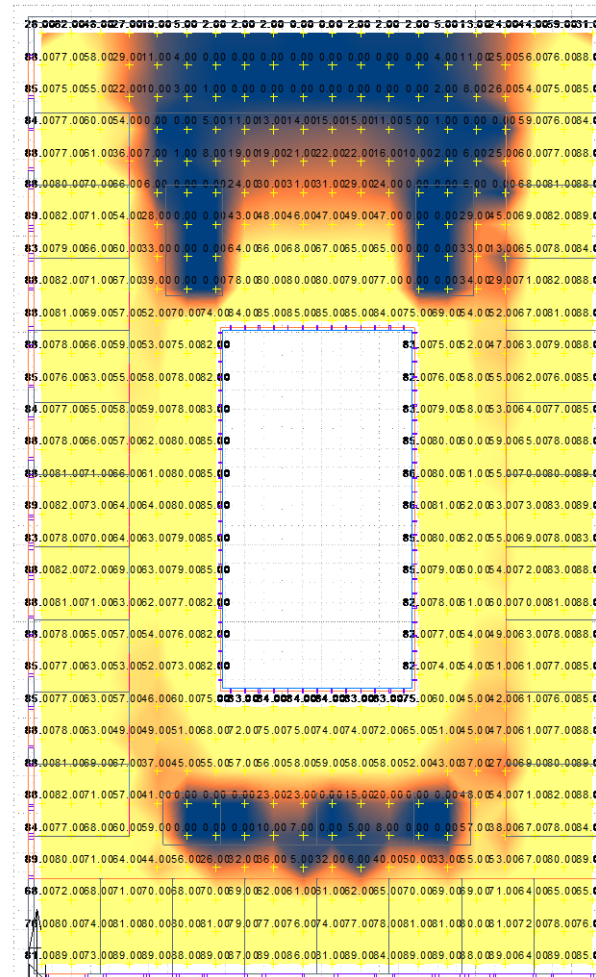
- duurzaam
- beperkt onderhoud
- makkelijk demonteerbaar (droge >< gelijmde bevestiging)
- integratie in begroeiing



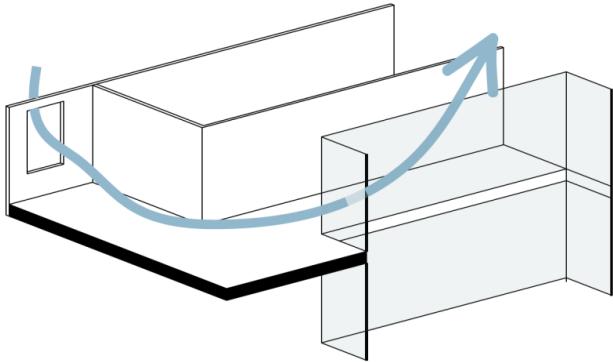
18 GEVELCONCEPTEN - NATUURLIJK LICHT

Prestatiegericht ontwerp: architecturaal ontwerp op basis van de resultaten van de onderzoeken met behulp van ontwerptools

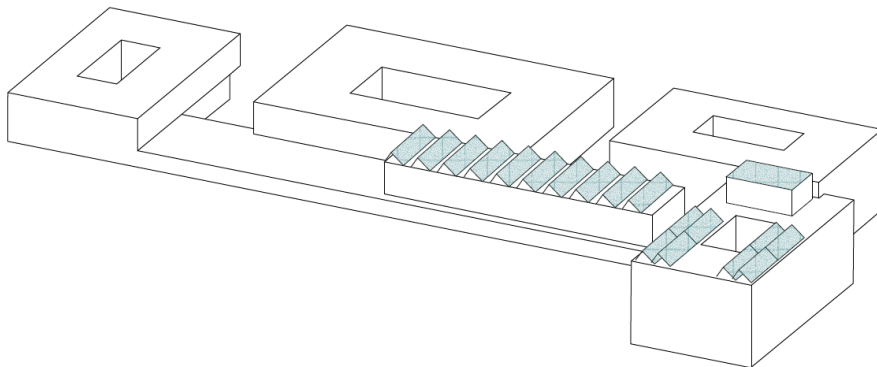
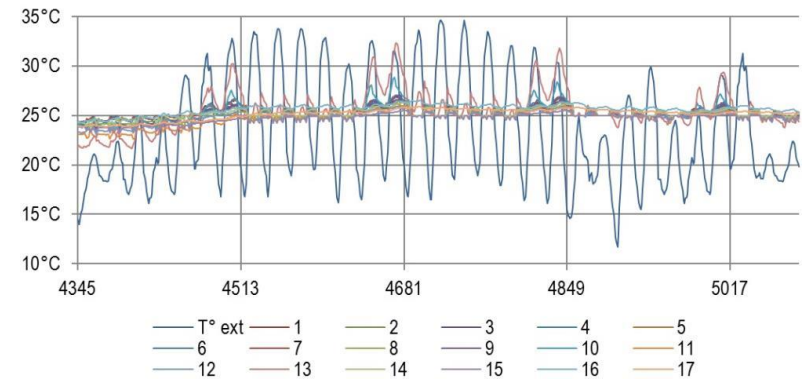
- Daglichtfactor



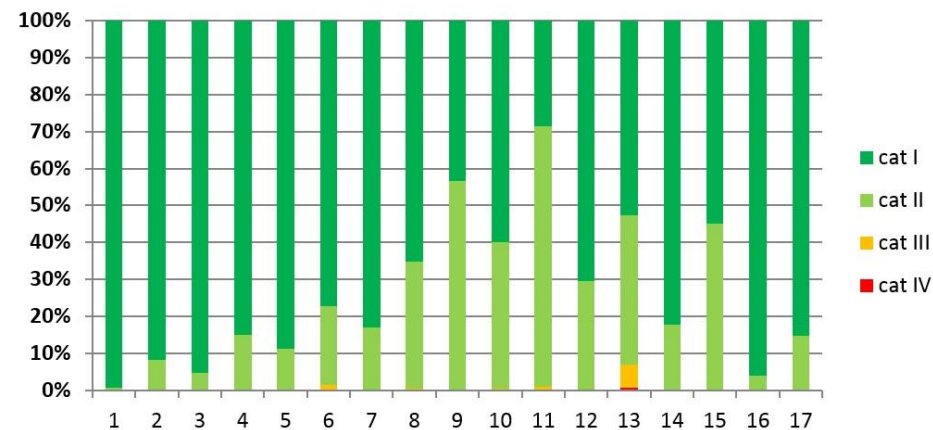
nZEB

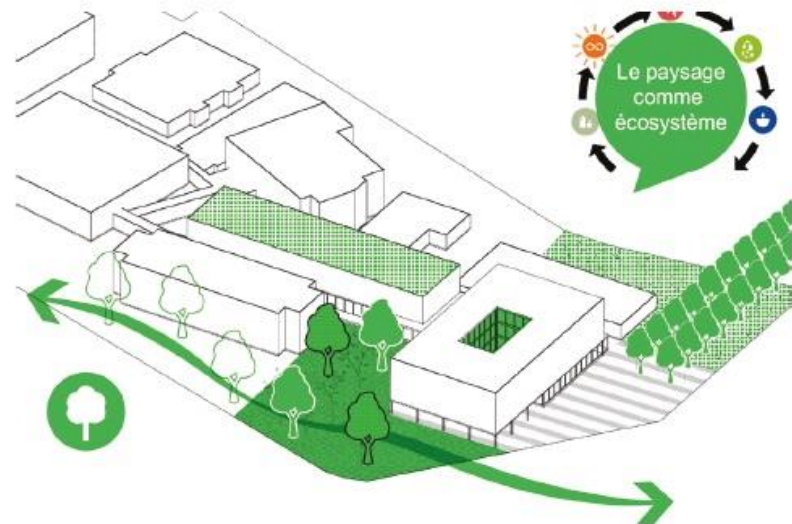
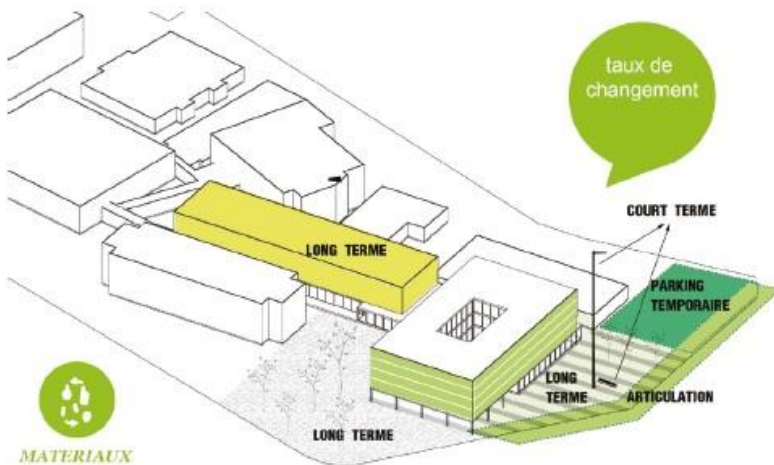
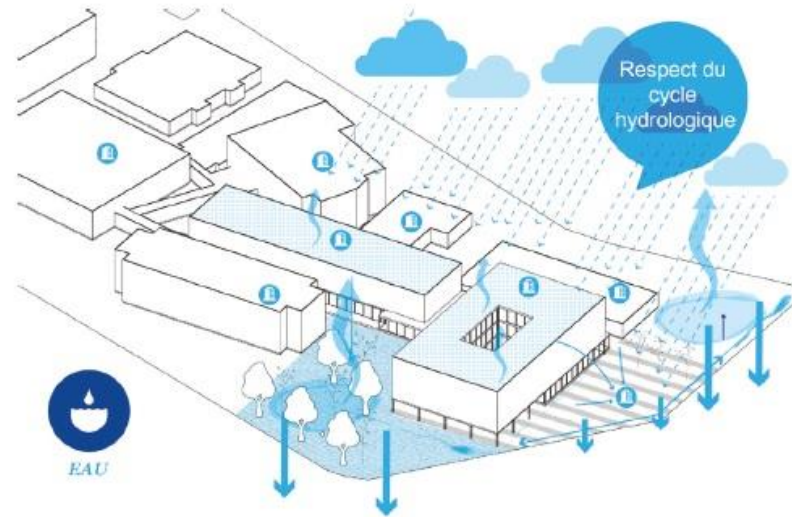
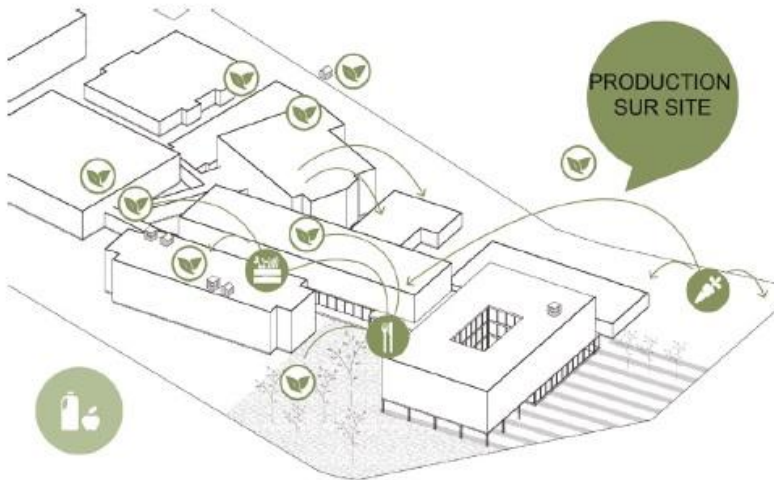


Canicule - Température ambiante



Distribution des catégories de confort durant les heures d'occupation







PROJECT BRACOPS

REVERSIBLE BUILDING DESIGN PROTOCOL

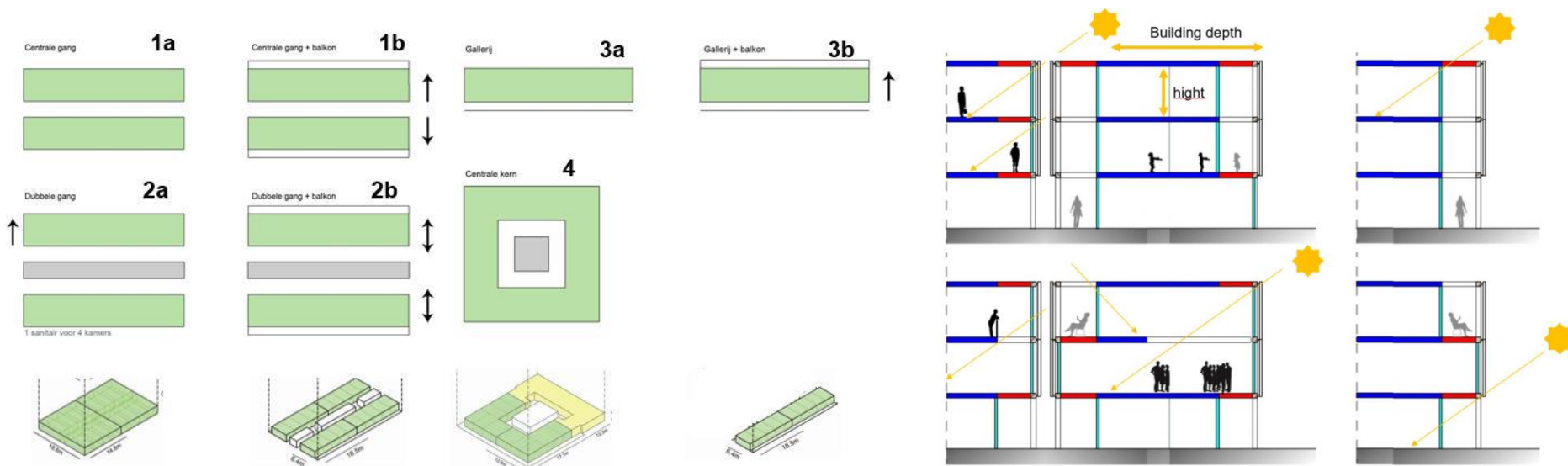
- ▶ **Fase 1 - voorstelling van de resultaten**
- ▶ **Fase 2 - constructiedetails**

ANDERE TOOLS



Fase 1 - voorstelling van de resultaten

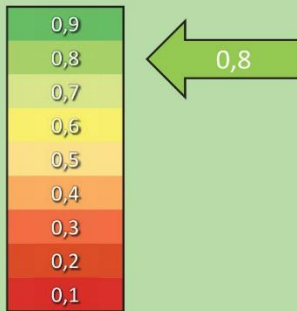
► Afmetingen



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

1.1 subscore:

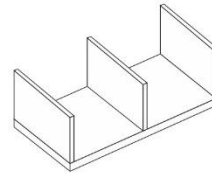


Volume dimensions and spatial configuration of building block regarding good quality daylight allowing multiple use scenarios.

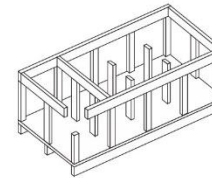
TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

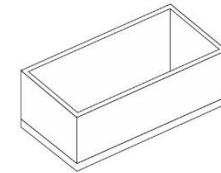
1.1 TYPE OF STRUCTURE



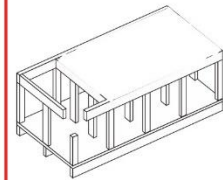
Schijven



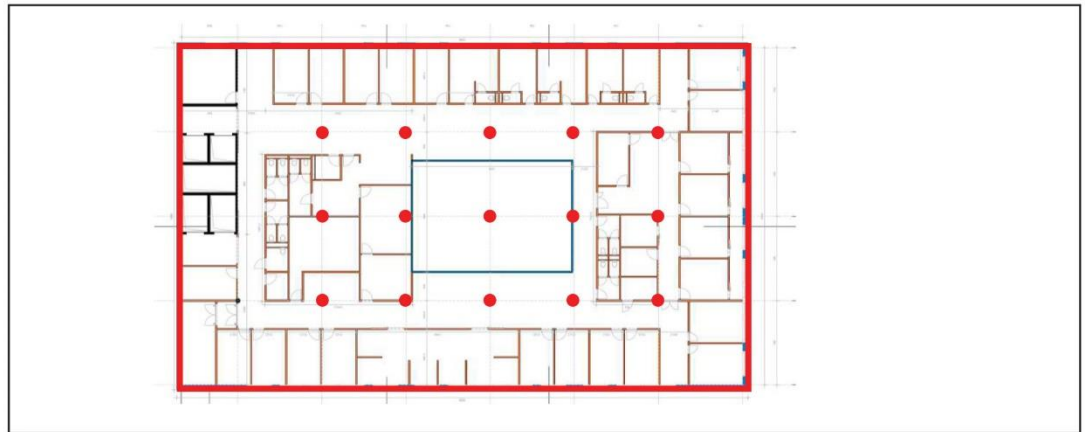
Post & Beam



Box



Post & Slab



Plan 1:100



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

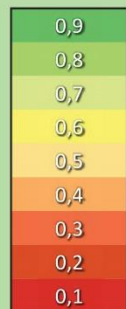
Location: <city, country>

Function: <office>

4D

architects

1.1 subscore:



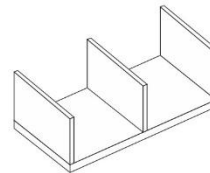
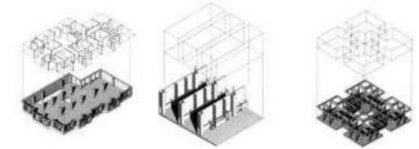
0,7

Volume dimensions and spatial configuration of building block regarding good quality daylight allowing multiple use scenarios.

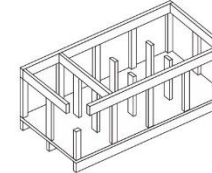
TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

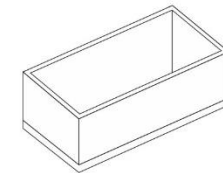
1.1 TYPE OF STRUCTURE



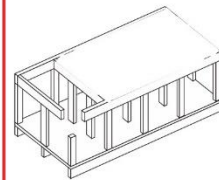
Schijven



Post & Beam

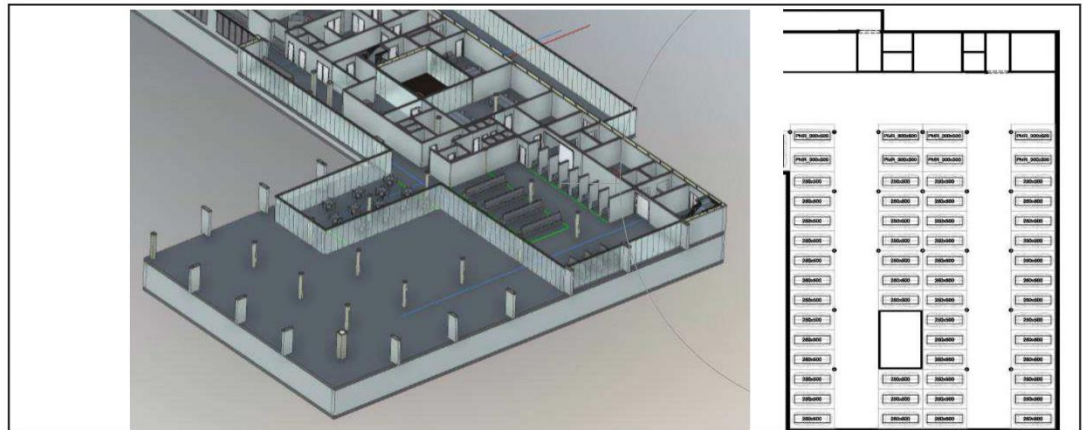


Box



Post & Slab

Post and slab 7500 m in combination with parking = 0,7



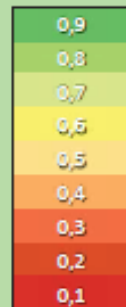
Plan 1:100



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

1.2 sub-score:

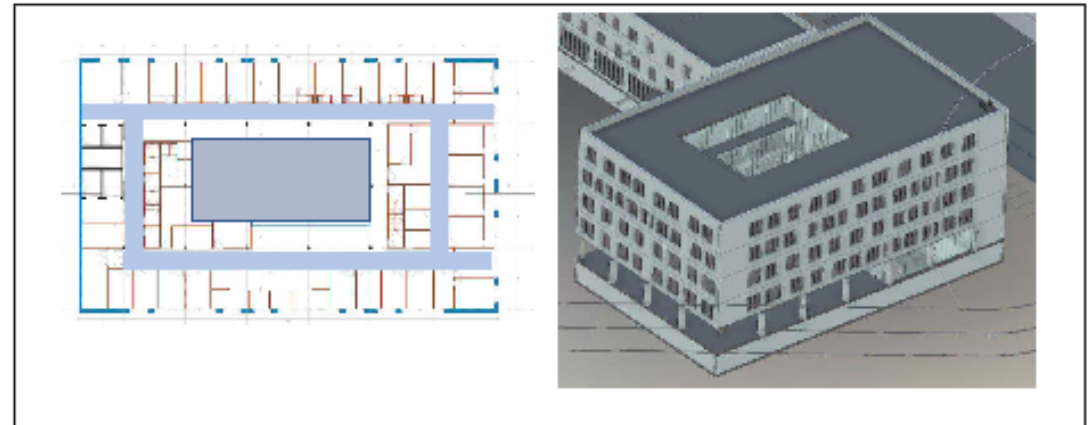
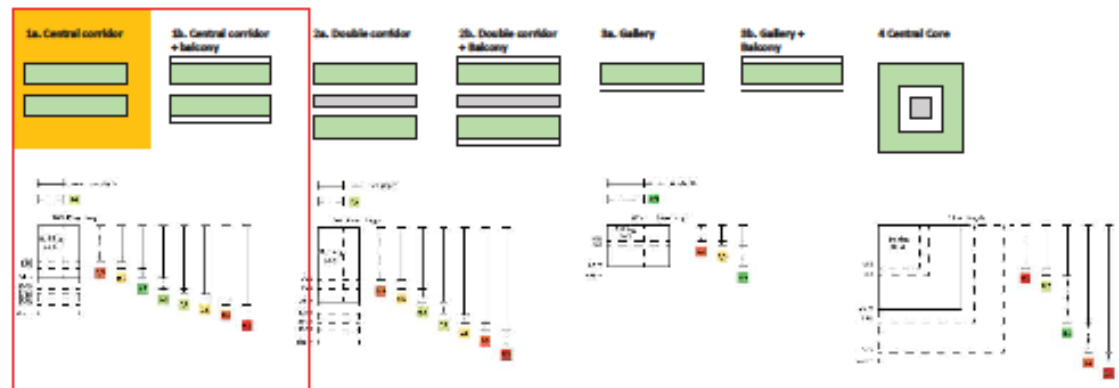


0,43

TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.2 DEPTH & TYPOLOGY

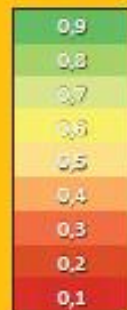




BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

Total score:



0,6

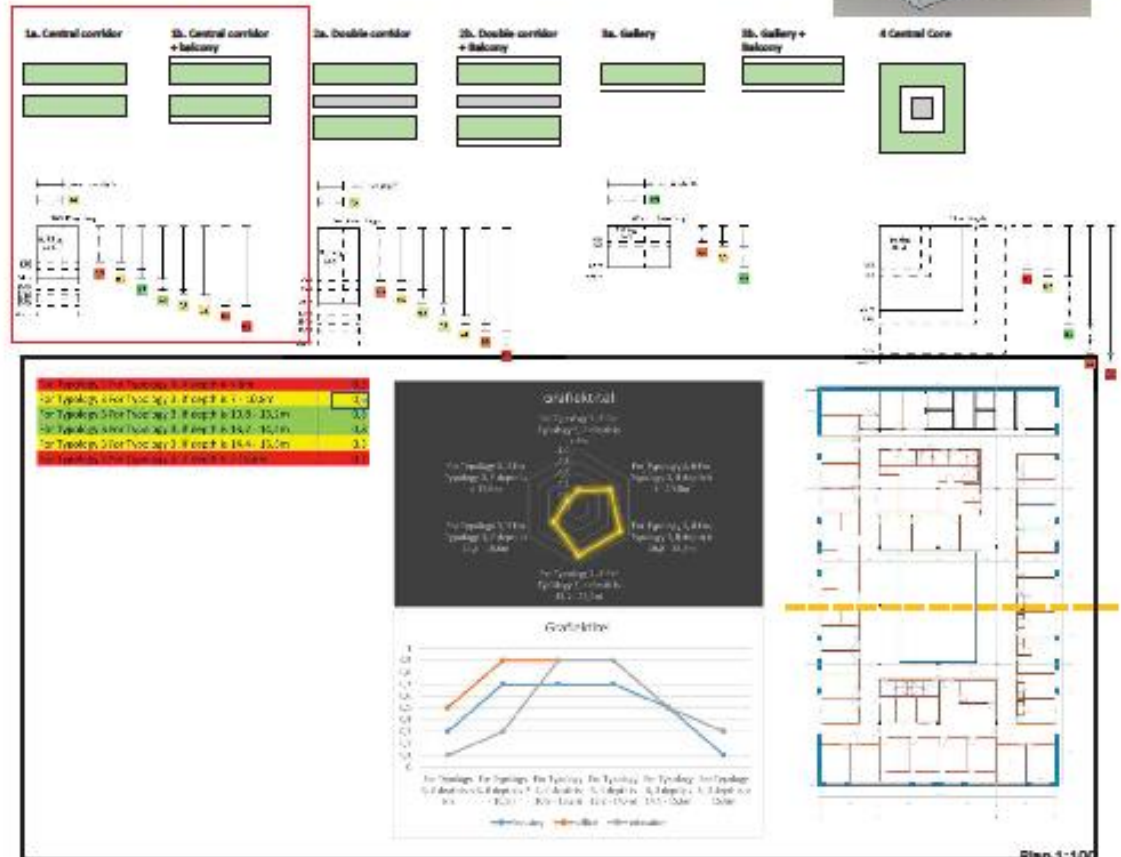
The Transformation Capacity score focuses on the ability of building space and structure to accommodate different functions without causing major reconstruction works, demolition and material loss. The less effort is needed to transform a building, the higher the transformation potential will be. The greater the variety and number of modification options (reuse options of buildings), the higher the transformation potential.



TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

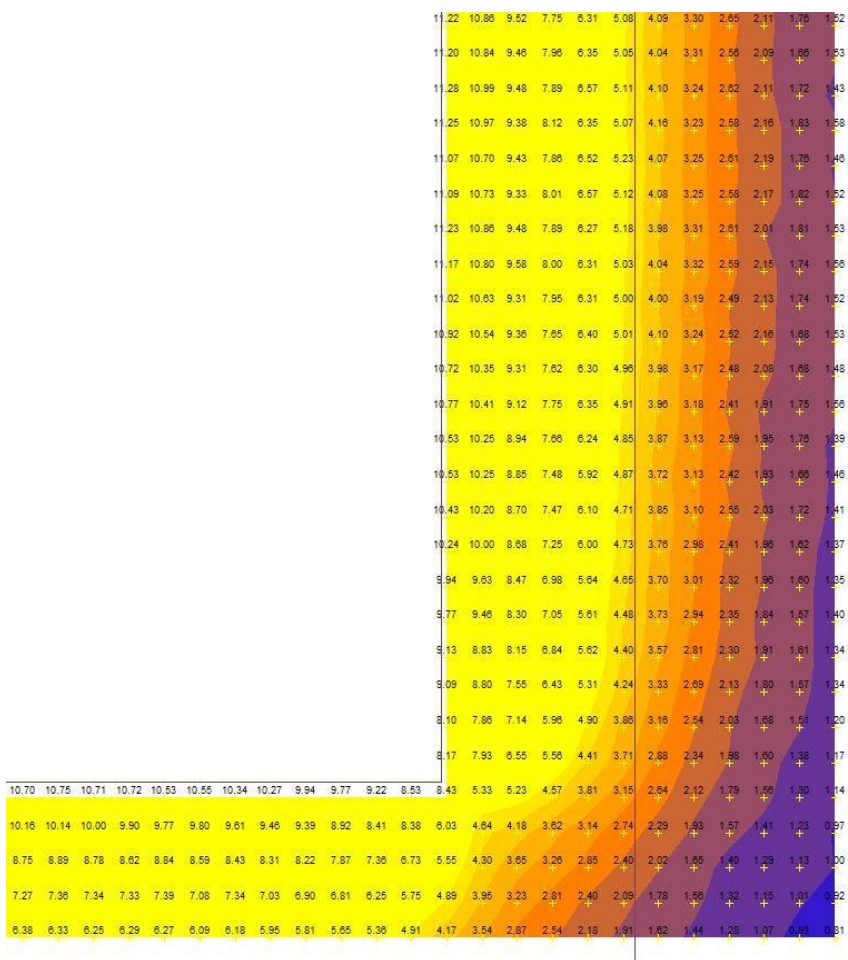
1.2 DEPTH & TYPOLOGY



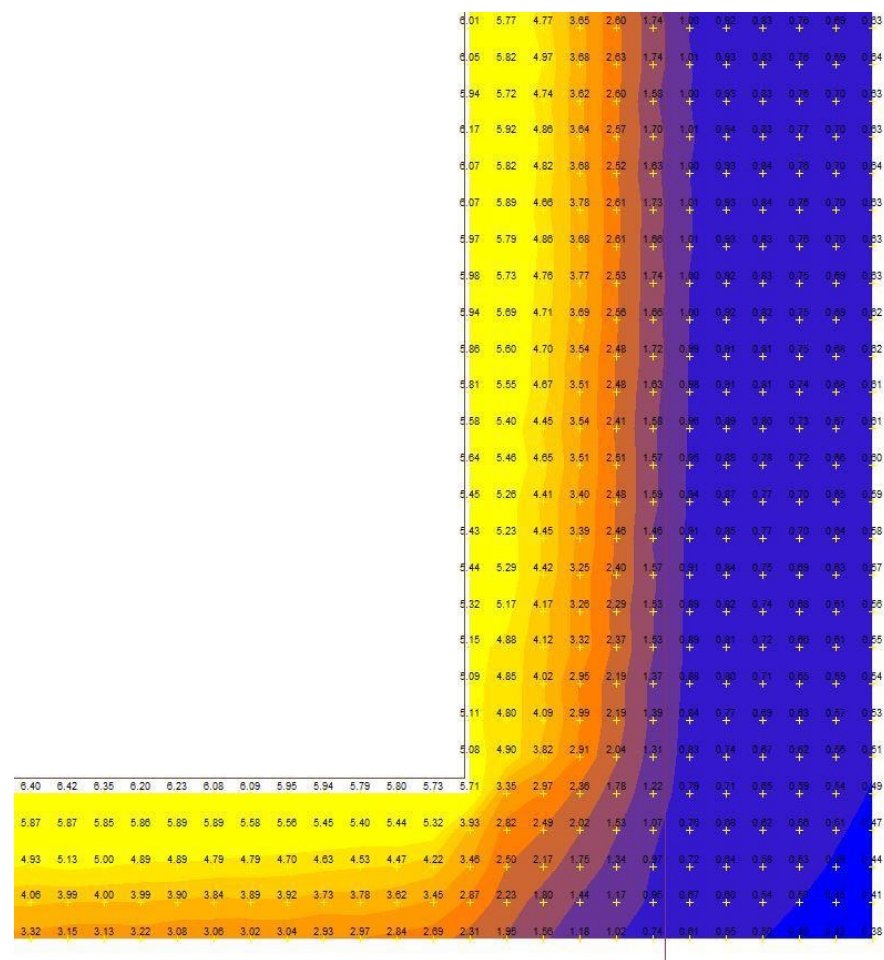
Plan 1-100



Niveau 3



Niveau 1

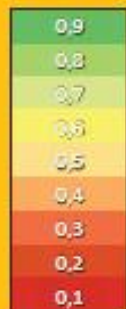




BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

Total score:



<Fully transformable building>

0,2

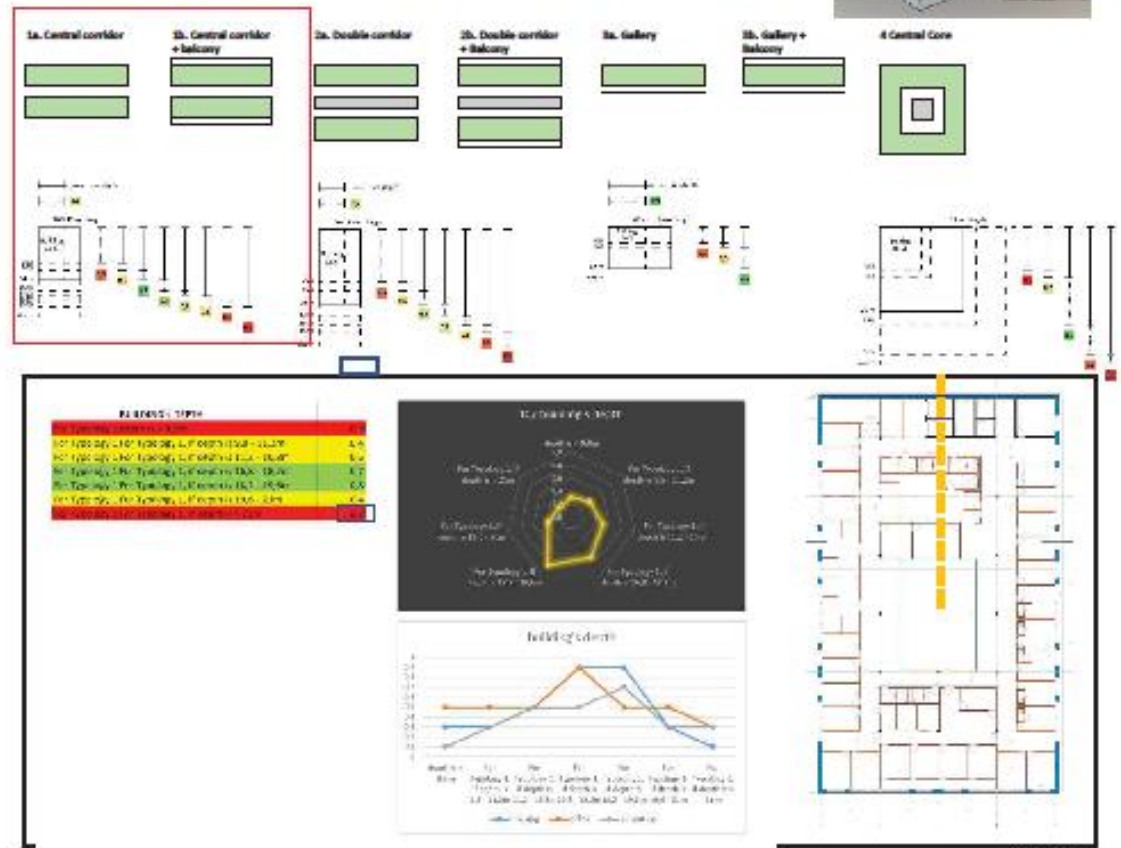
The Transformation Capacity score focuses on the ability of building space and structure to accommodate different functions without causing major reconstruction works, demolition and material loss. The less effort is needed to transform a building, the higher the transformation potential will be. The greater the variety and number of modification options (reuse options of buildings), the higher the transformation potential.



TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.2 DEPTH & TYPOLOGY

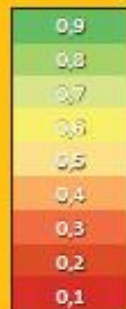




BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

Total score:



<Fully transformable building>

0.5

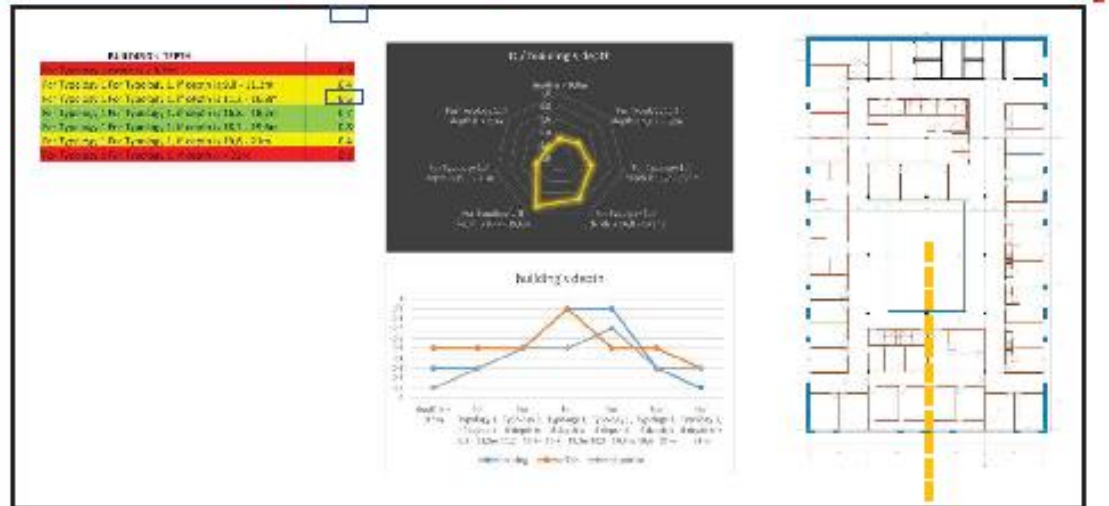
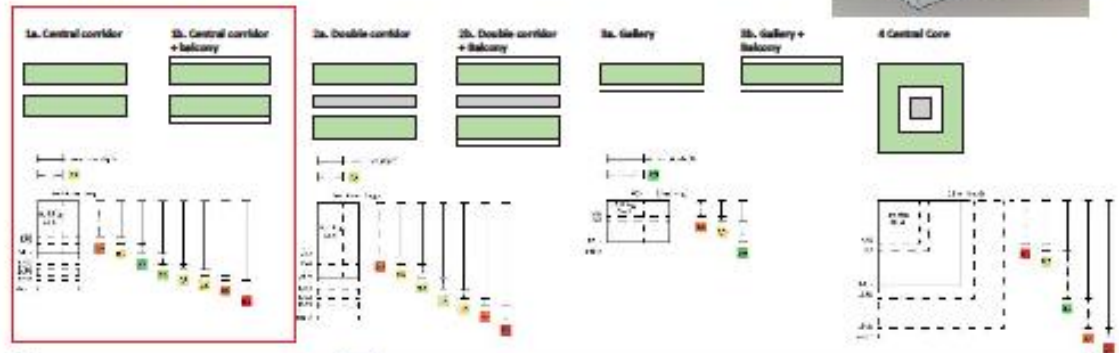
The Transformation Capacity score focuses on the ability of building space and structure to accommodate different functions without causing major reconstruction works, demolition and material loss. The less effort is needed to transform a building, the higher the transformation potential will be. The greater the variety and number of modification options (reuse options of buildings), the higher the transformation potential.



TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.2 DEPTH & TYPOLOGY

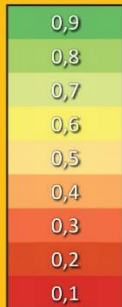


4D architects

BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
 Location: <city, country>
 Function: <office>

Total score:



The Transformation Capacity score focuses on the ability of building space and structure to accommodate different functions without causing major reconstruction works, demolition and material loss. The less effort is needed to transform a building, the higher the transformation potential will be. The greater the variety and number of modification options (reuse options of buildings), the higher the transformation potential.

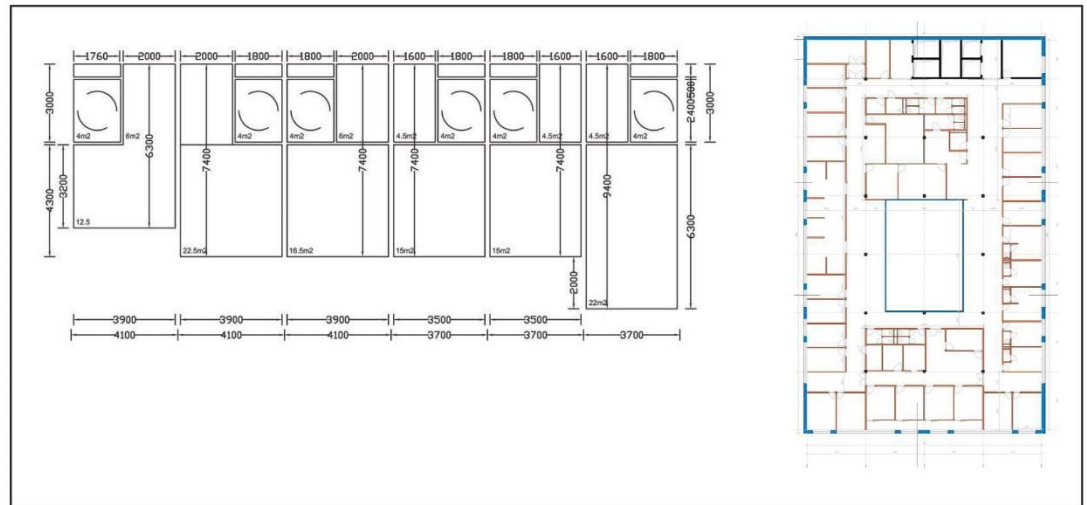
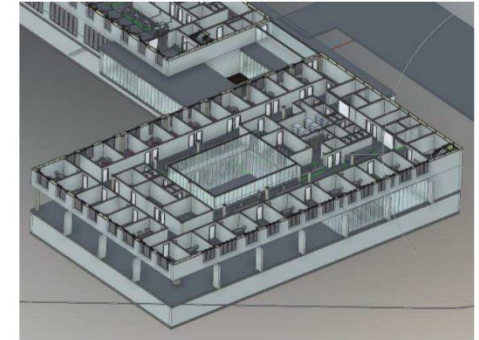


TRANSFORMATION INDICATORS / BUILDING LEVEL

1. Dimension

1. 3 Unit Dimension

0,4



Plan 1:100

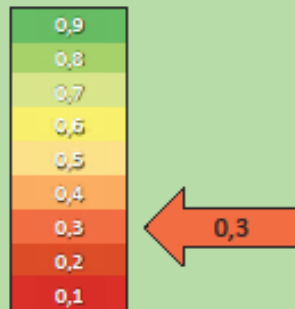




BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

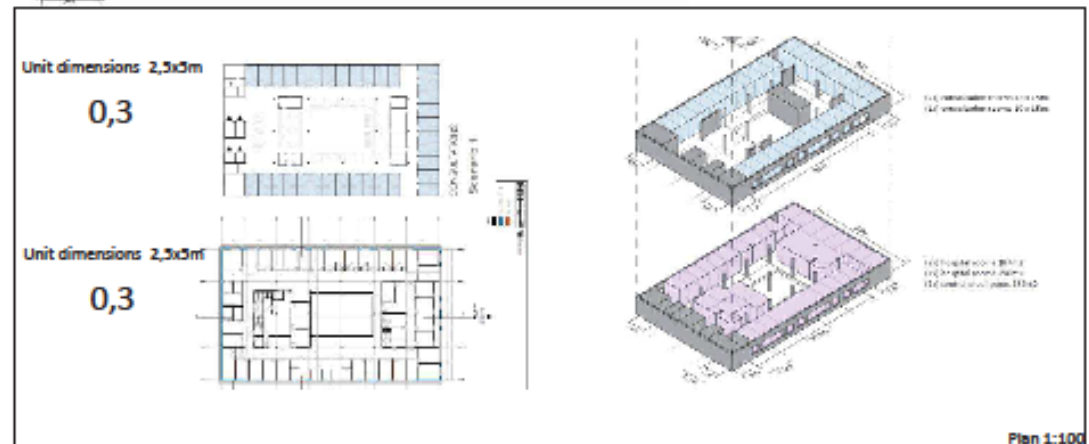
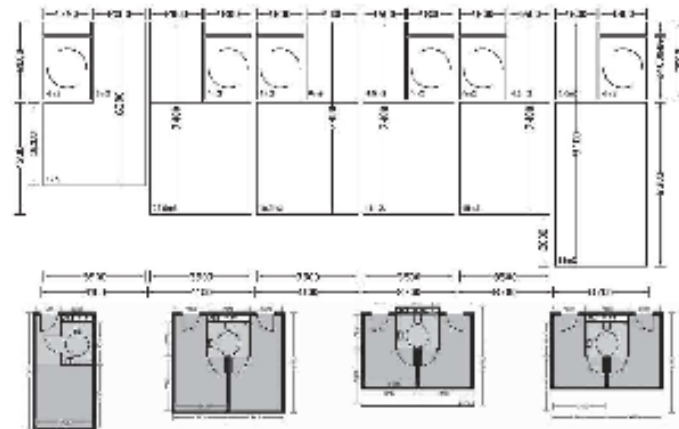
1.3 subscore:



TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.3 Unit dimension



BUILDING

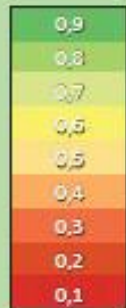
TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

1.3 subscore:

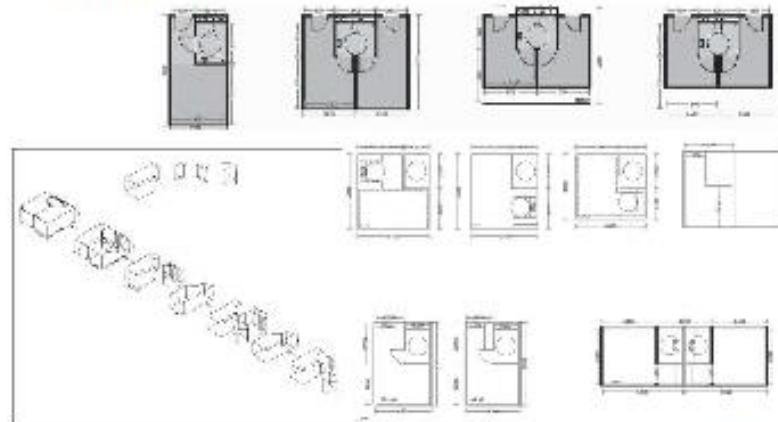


0,5

TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.3 Unit dimension

Unit dimensions 7,5x7,5m
(2x3,75)m

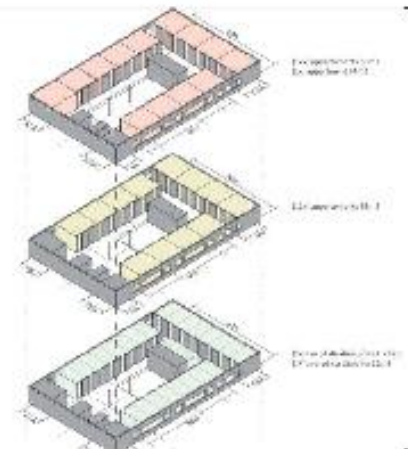
0,7

Unit dimensions 7,5x7,5m
(2x3,75)m

0,7

Unit dimensions 3,75x7,5m
Room for two

0,1





BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

Total score:



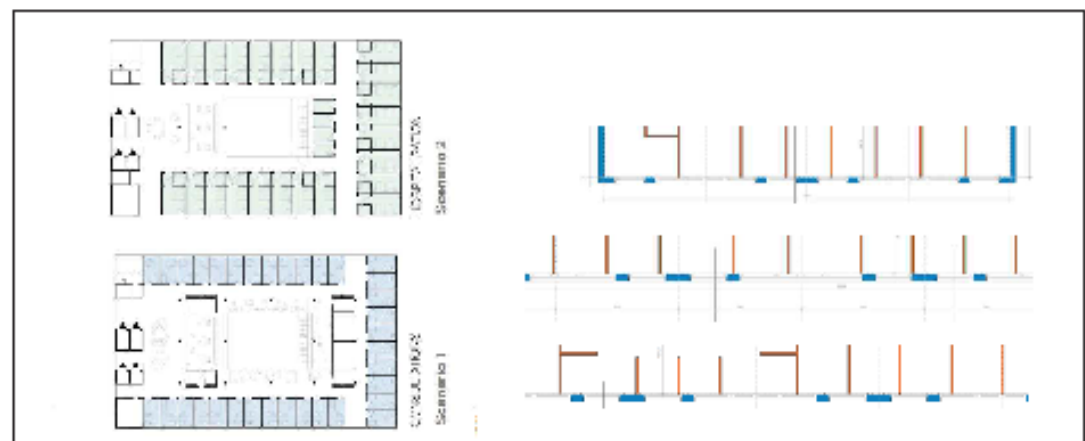
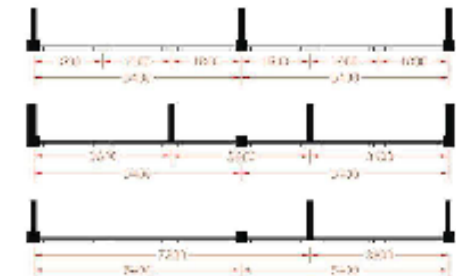
The Transformation Capacity score focuses on the ability of building space and structure to accommodate different functions without causing major reconstruction works, demolition and material loss. The less effort is needed to transform a building, the higher the transformation potential will be. The greater the variety and number of modification options (reuse options of buildings), the higher the transformation potential.



TRANSFORMATION INDICATORS / BUILDING LEVEL

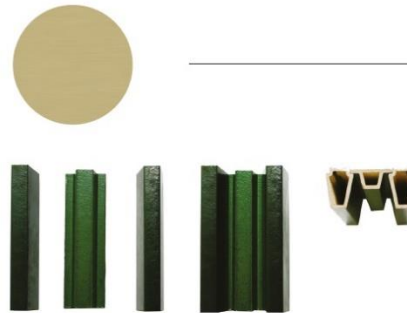
1. DIMENSIONS

1.3 Façade modularity





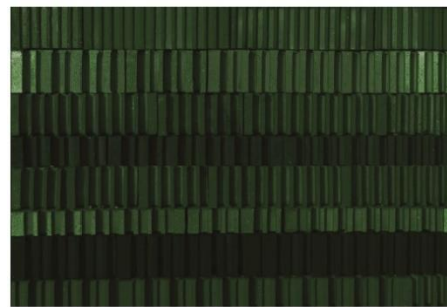
Sergisson Bates



Neutelings Riedijk



Bearth & Deplazes



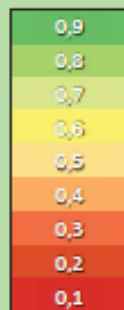
Sergisson Bates



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

1.4 subscore:

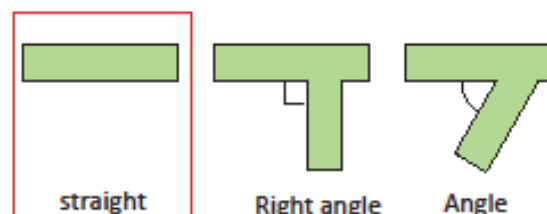


0,9

TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

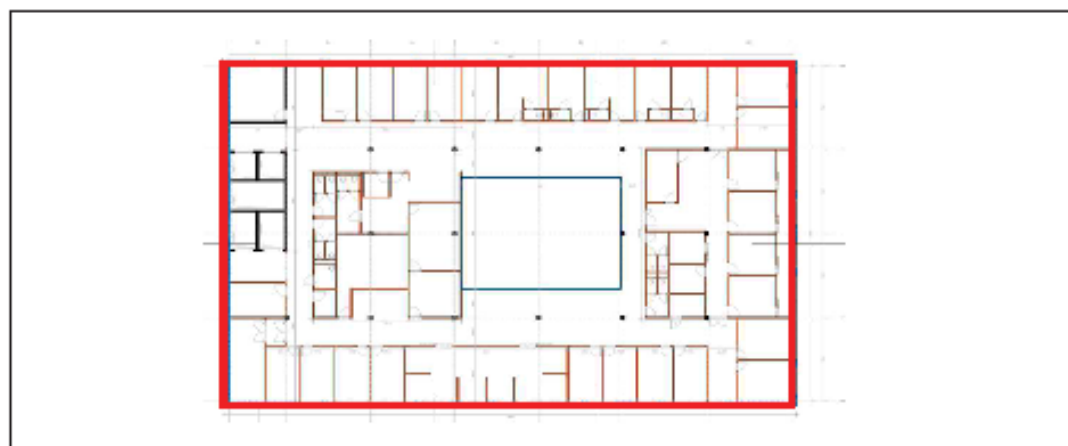
1.4 ANGLE OF THE BUILDING'S 'BREAKPOINT'



BUILDING CORNER'S ANGLE

If building corner's angle is 83° - 105°
If building corner's angle is 70° - 83° or 105° - 120°
If building corner's angle is 50° - 70° or 120° - 135°
If building corner's angle is < 50° or > 135°

housing	office	school	TC	
0,9	0,9	0,9	0,9	0,9
0,8	0,8	0,8	0,8	0,8
0,4	0,4	0,1	0,1	0,3
0,1	0,1	0,1	0,1	0,1

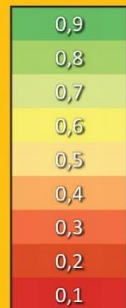


4D architects

BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
 Location: <city, country>
 Function: <office>

Total score:



0,9

<Fully transformable building>

The Transformation Capacity score focuses on the ability of building space and structure to accommodate different functions without causing major reconstruction works, demolition and material loss. The less effort is needed to transform a building, the higher the transformation potential will be. The greater the variety and number of modification options (reuse options of buildings), the higher the transformation potential.

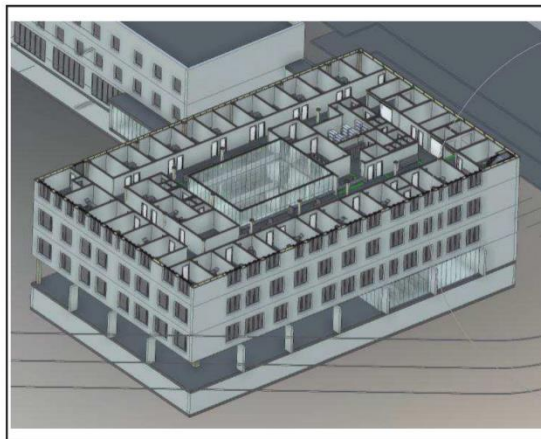
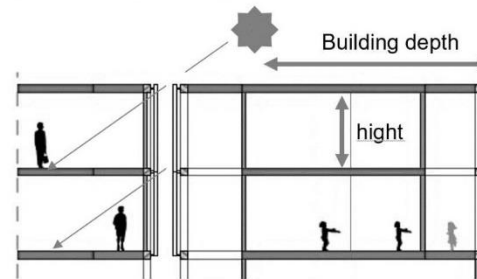


EUROPEAN UNION

TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.5 DEPTH & FLOOR-TO-CEILING HEIGHT



Plan 1:100



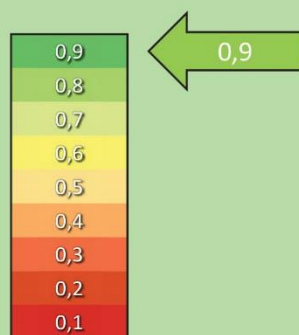
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

1.6 subscore:



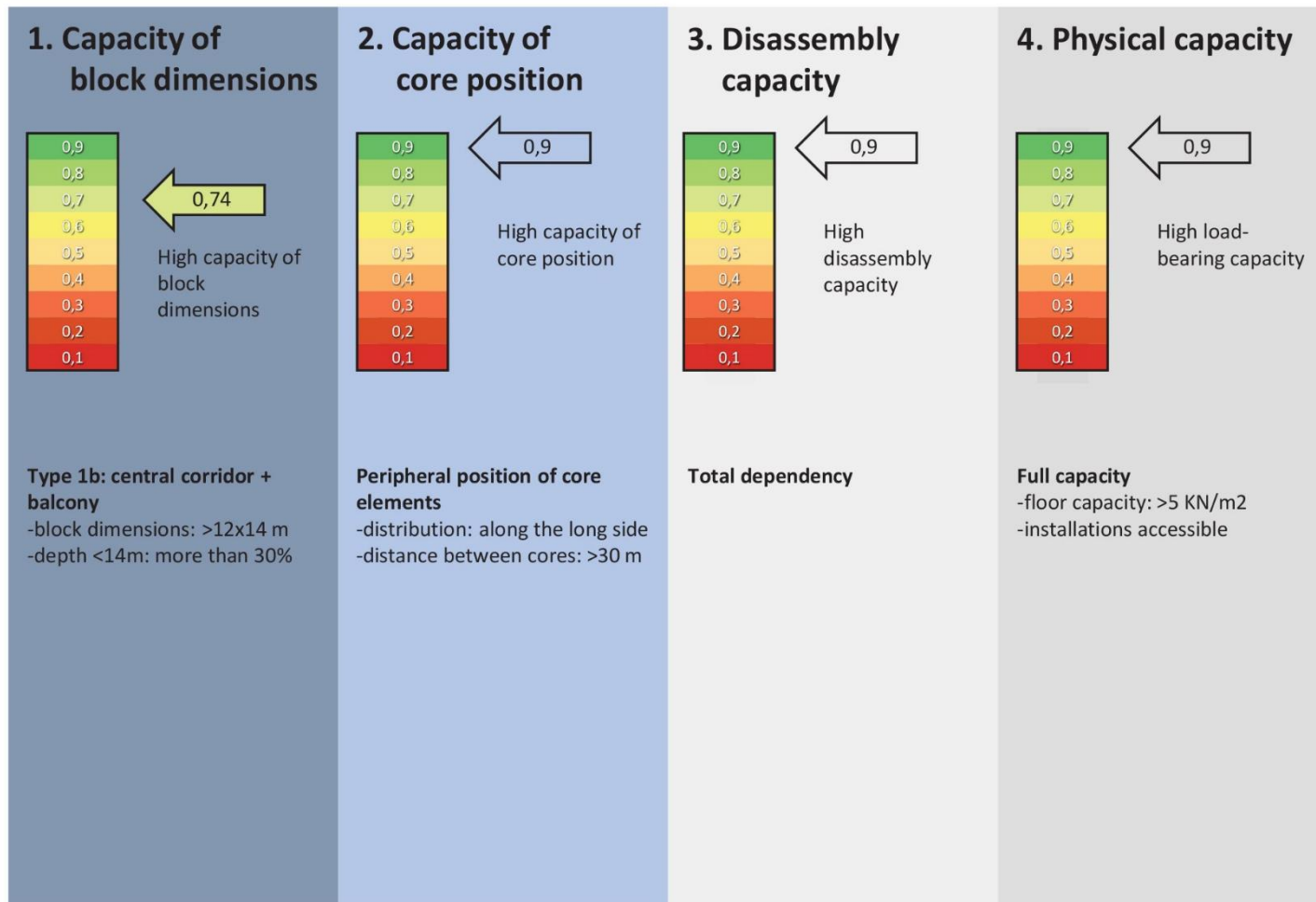
TRANSFORMATION INDICATORS / BUILDING LEVEL

1. DIMENSIONS

1.6 MAXIMUM DISTANCE TO A COMMUNICATION CORE



SUBSCORE PER INDICATOR



Four major indicators determine the Transformation Capacity of a building. The project will receive a total score aggregated by a simple average of the subscores for each indicator.

Fase 1 - voorstelling van de resultaten

- Positie van de kernen



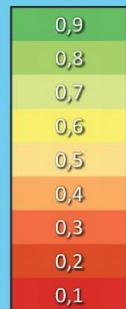
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

2.1 subscore:



0,7

x

TRANSFORMATION INDICATORS / BUILDING LEVEL

2. CAPACITY OF CORE POSITION

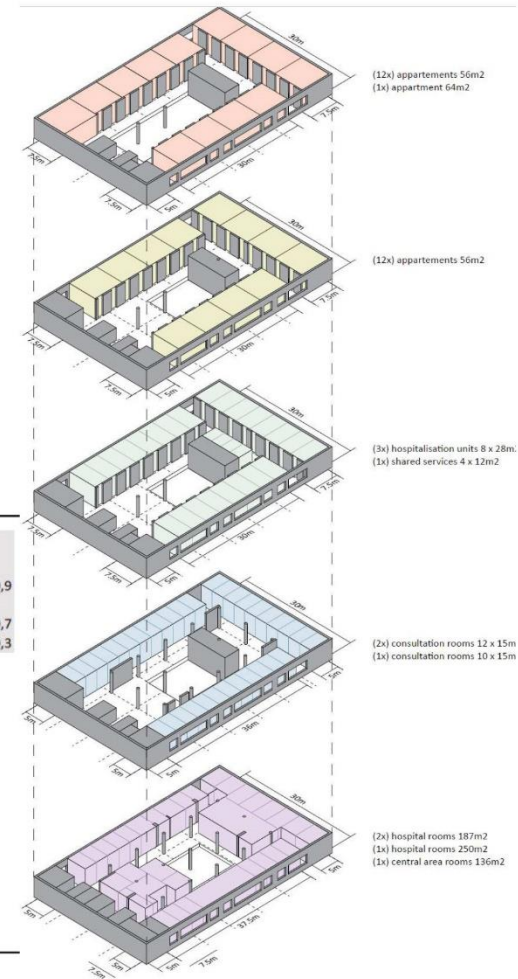
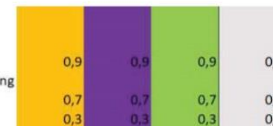
2.1 INTEGRATION OF CORE ELEMENTS

SERVICE, COMMUNICATION CORES AND LOADING CORE INTEGRATION

If all vertical service cores are integrated

If at least one SERVICE core is integrated WITH loadbearing core

If there is no integration



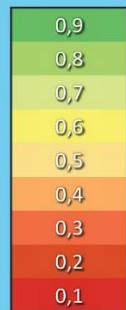
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

2.2 subscore:



0,9

X

TRANSFORMATION INDICATORS / BUILDING LEVEL

2. CAPACITY OF CORE POSITION

2.2 POSITION OF COMMUNICATION CORE



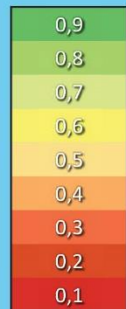
Plan 1:100



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

2.3 subscore:



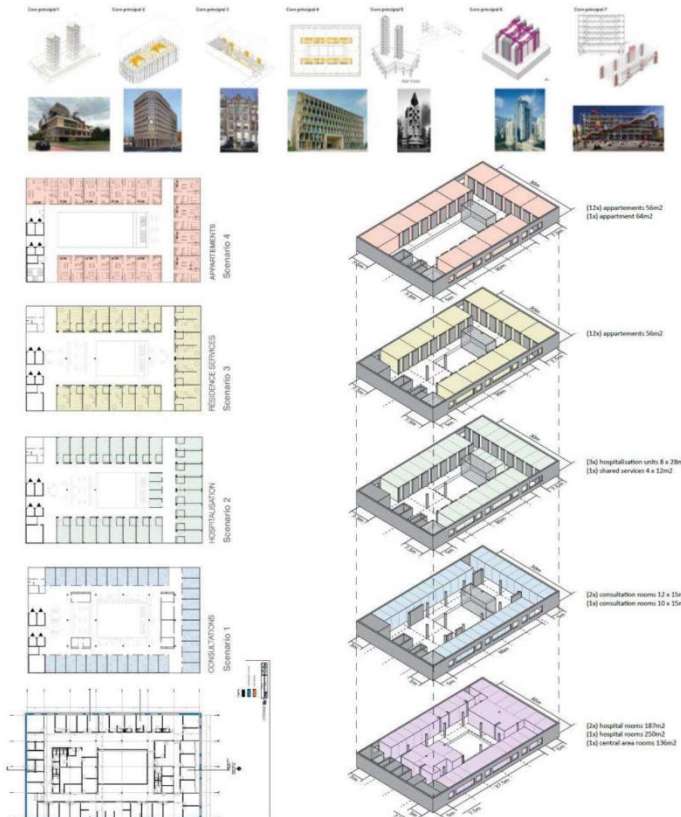
x

TRANSFORMATION INDICATORS / BUILDING LEVEL

2. CAPACITY OF CORE POSITION

2.3 POSITION OF SERVICE CORE

Vertical SERVICE CORE's positioning
If multiple cores central/ and off center
If service core position is central
If service core position is off center
If service core position is peripheral



Plan 1:100



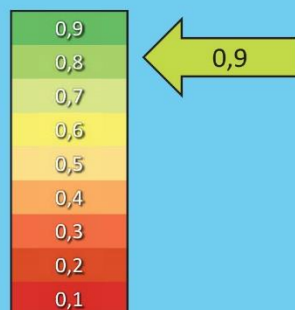
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

2.4 subscore:

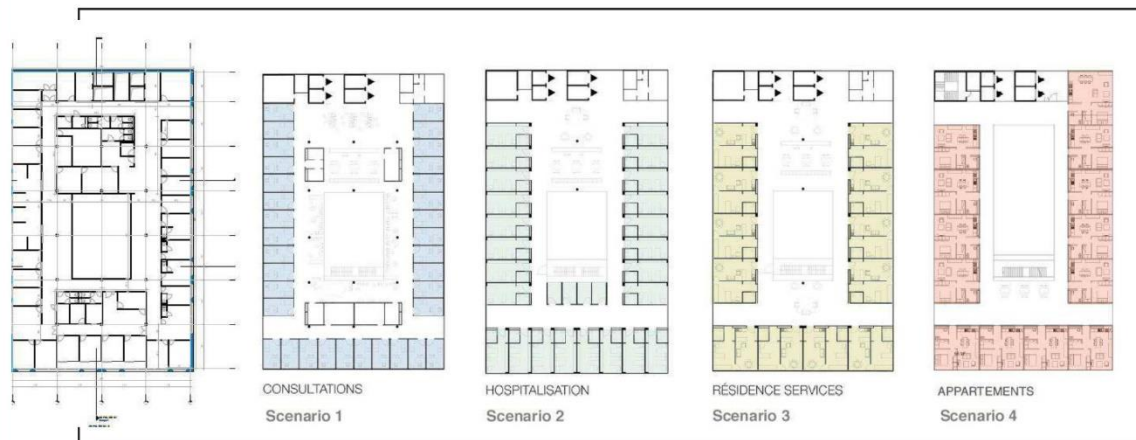
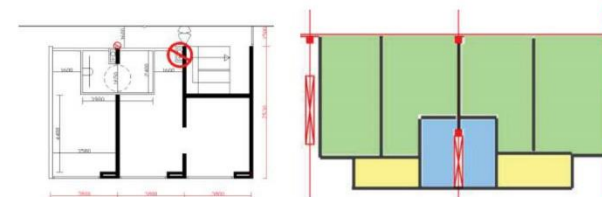


x

TRANSFORMATION INDICATORS / BUILDING LEVEL

2. CAPACITY OF CORE POSITION

2.4 ORIENTATION OF SERVICE CORE



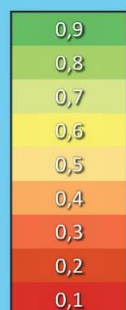
Plan 1:100



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

2.5 subscore:



x

TRANSFORMATION INDICATORS / BUILDING LEVEL

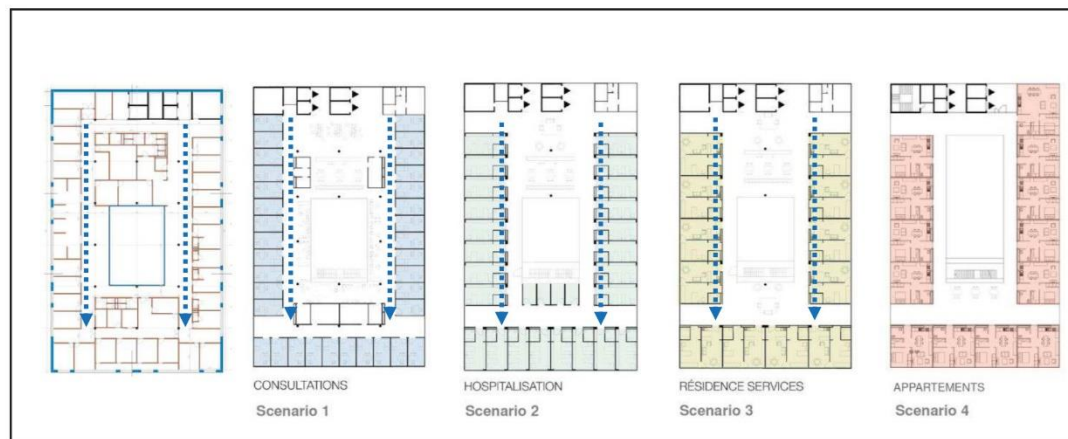
2. CAPACITY OF CORE POSITION

2.5 POSITION OF HORIZONTAL SERVICES NET

main horizontal distribution SERVICE Net and Communication positioning

If horizontal net position is central
If horizontal net position is off center
If horizontal net position is peripheral

0,3	0,3	0,3	0,3
0,7	0,5	0,5	0,6
0,9	0,9	0,9	0,9



Plan 1:100



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

2.5 subscore:



x

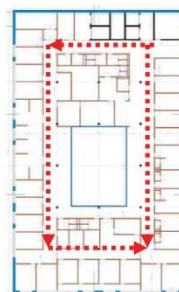
TRANSFORMATION INDICATORS / BUILDING LEVEL

2. CAPACITY OF CORE POSITION

2.6 Distance between central core and distribution let



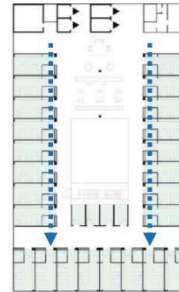
60m



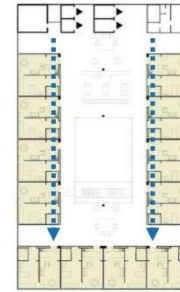
CONSULTATIONS
Scenário 1



HOSPITALISATION
Scenário 2



RÉSIDENCE SERVICES
Scenário 3

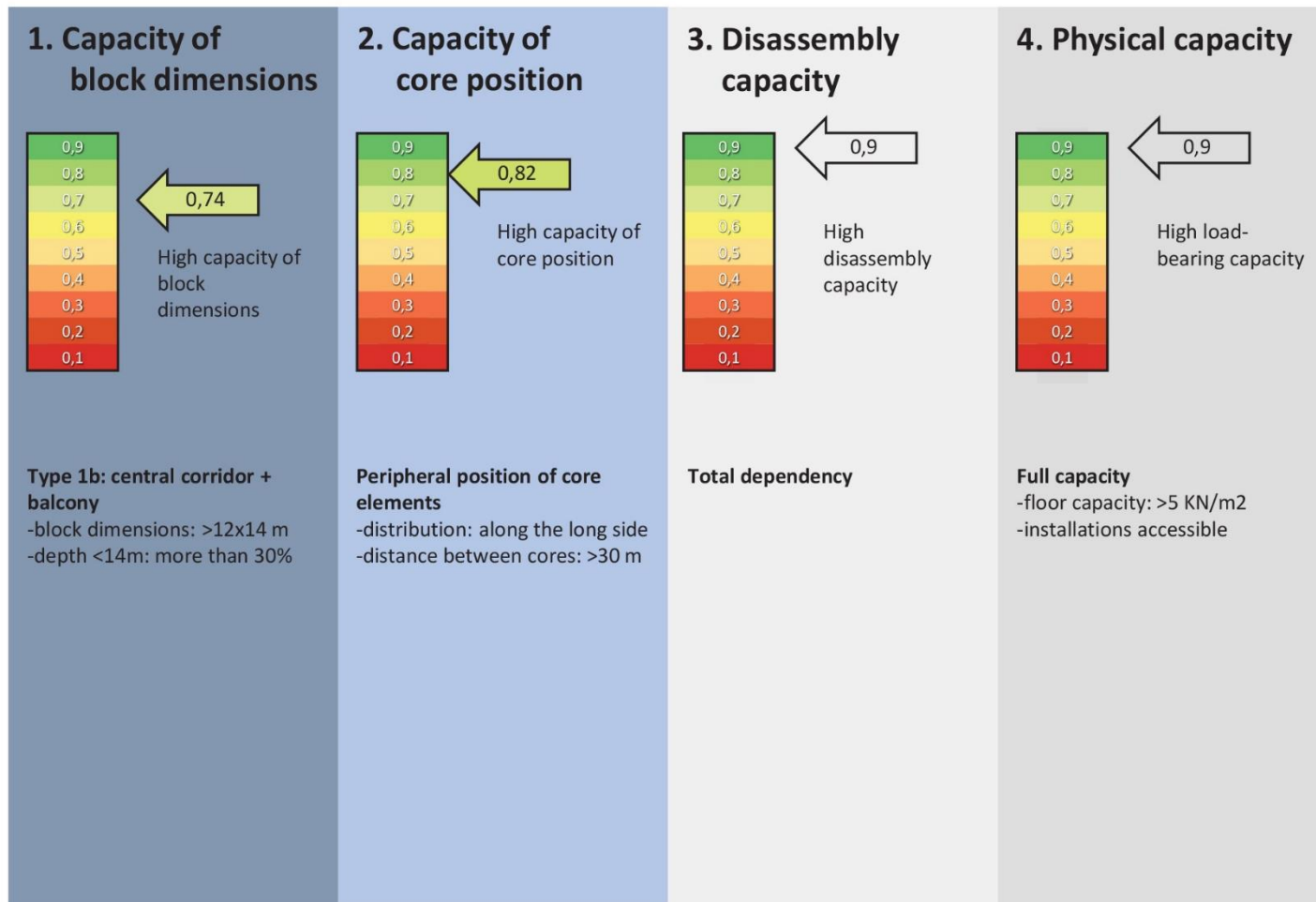


APPARTEMENTS
Scenário 4

Plan 1:100



SUBSCORE PER INDICATOR



Four major indicators determine the Transformation Capacity of a building. The project will receive a total score aggregated by a simple average of the subscores for each indicator.

Fase 1 - voorstelling van de resultaten

- ▶ Demontagevermogen



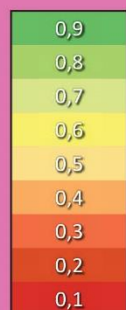
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

3. Disassembly score:



0,9

High disassembly capacity

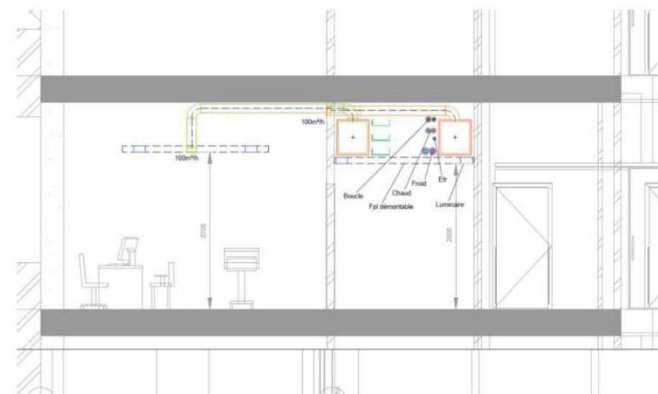
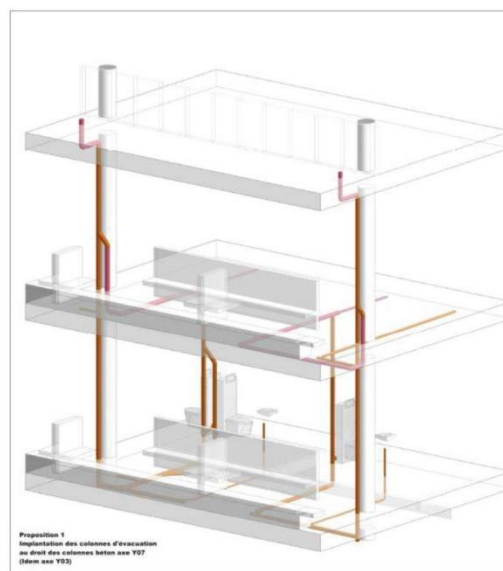
Technical separation of functional parts enabling disassembly, reuse and access to installations without affecting other parts.

TRANSFORMATION INDICATORS / BUILDING LEVEL

3. DISASSEMBLY CAPACITY

3.1 Integration of horizontal services net

Horizontal service net and main load-bearing structure are separated



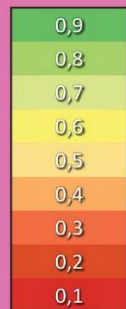
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

3. Disassembly score:



0,9

High disassembly capacity

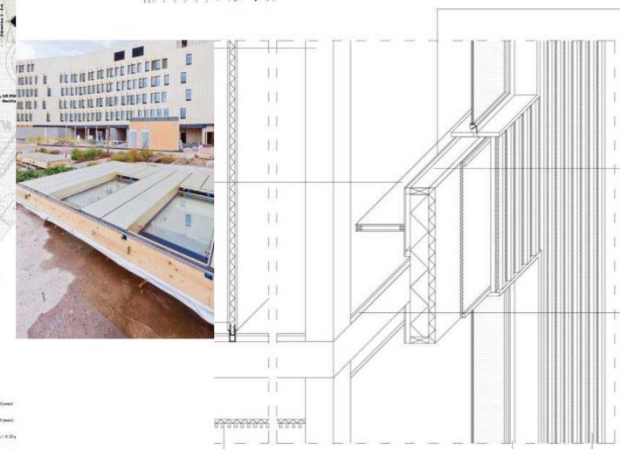
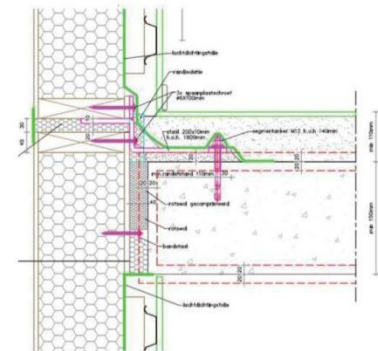
Technical separation of functional parts enabling disassembly, reuse and access to installations without affecting other parts.

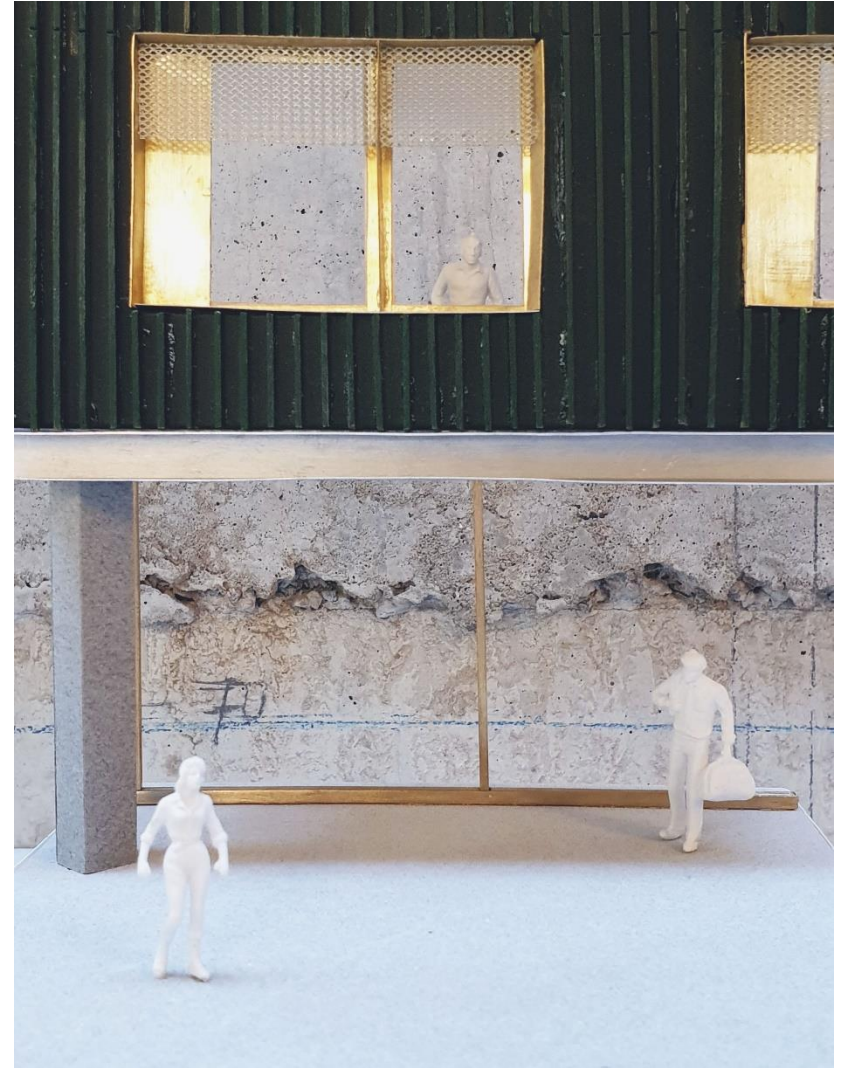
TRANSFORMATION INDICATORS / BUILDING LEVEL

3. DISASSEMBLY CAPACITY

3.2.1 Integration of load-bearing elements and façade

façade and main load-bearing structure are separated







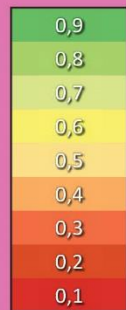
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

3. Disassembly score:



0,9

High disassembly capacity

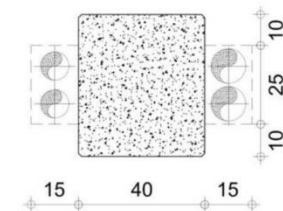
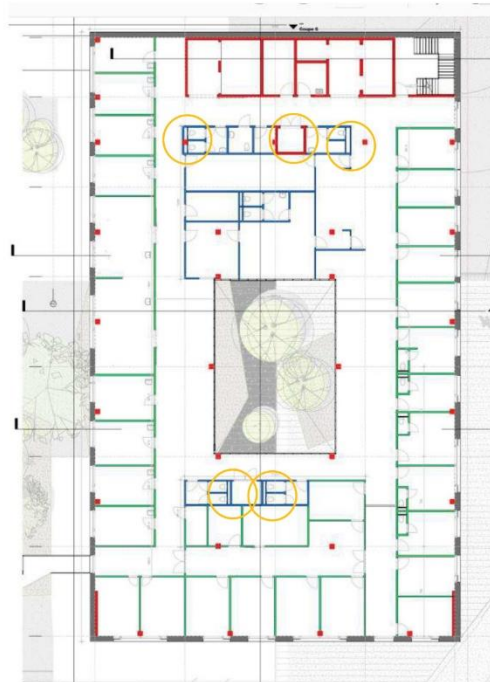
Technical separation of functional parts enabling disassembly, reuse and access to installations without affecting other parts.

TRANSFORMATION INDICATORS / BUILDING LEVEL

3. DISASSEMBLY CAPACITY

3.2.2 Integration of load-bearing elements and Installation

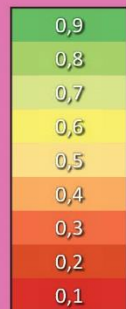
partitioning and main load-bearing structure are separated



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

3. Disassembly score:



0,9

High disassembly capacity

Technical separation of functional parts enabling disassembly, reuse and access to installations without affecting other parts.

TRANSFORMATION INDICATORS / BUILDING LEVEL

3. DISASSEMBLY CAPACITY

3.2.3 Integration of load-bearing elements and Installation

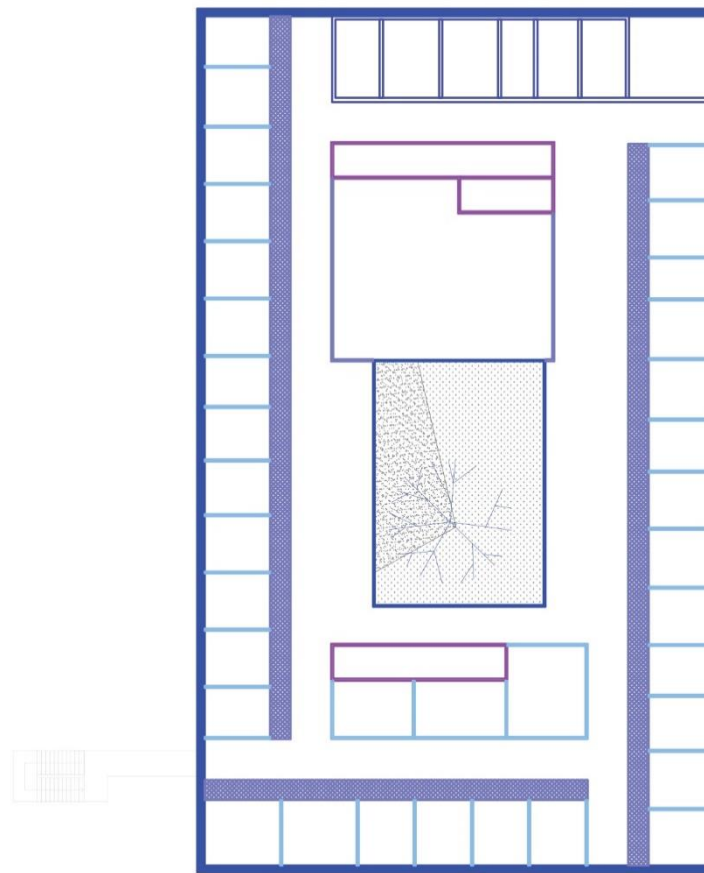
Partitioning walls and main load-bearing structure are separated



archipelago



LEVENSDUUR VAN DE ELEMENTEN



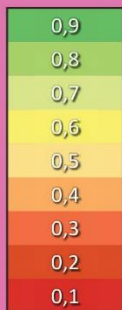
- Façade
- 20-25 ans
- 15-20 ans
- 5-10 ans



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

3. Disassembly score:



0,5

Technical separation of functional parts enabling disassembly, reuse and access to installations without affecting other parts.

TRANSFORMATION INDICATORS / BUILDING LEVEL

3. DISASSEMBLY CAPACITY

3.2.4 Integration of load-bearing elements and floor

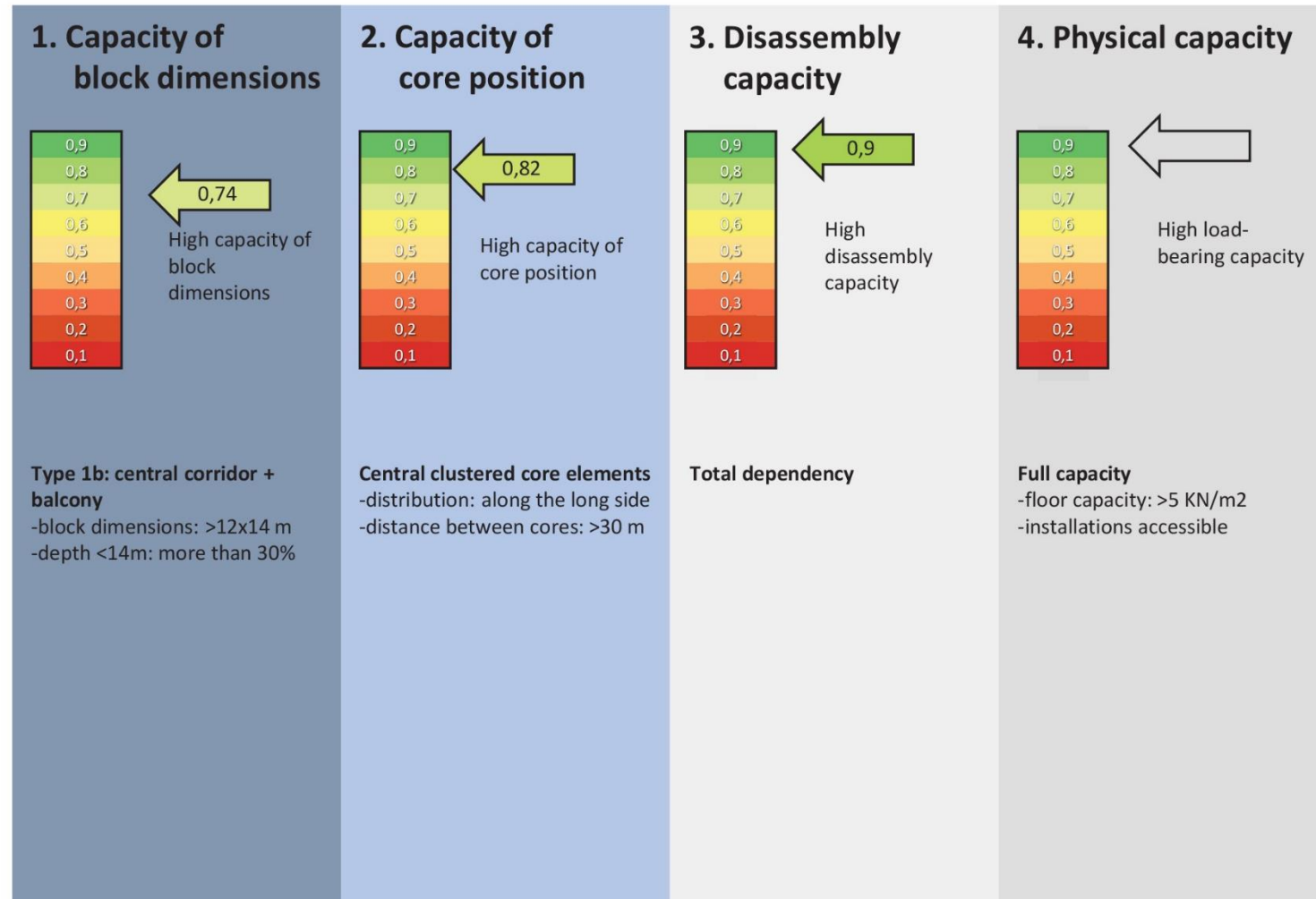
load-bearing structure integrated with the floor



Pré-dalle pré-équipées des coques



SUBSCORE PER INDICATOR



Four major indicators determine the Transformation Capacity of a building. The project will receive a total score aggregated by a simple average of the subscores for each indicator.

Fase 1 - voorstelling van de resultaten

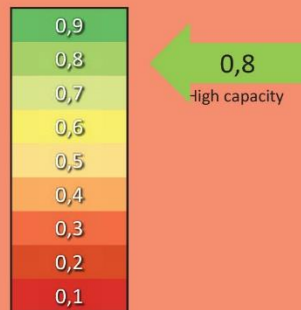
- Draagvermogen



BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>
Location: <city, country>
Function: <office>

4. Capacity score:



Load-bearing capacity and spatial support for new installations allowing upgrade and other uses.

TRANSFORMATION INDICATORS / BUILDING LEVEL

4. CAPACITY

SCORE PER SUBINDICATOR

4.1 Load-bearing capacity of floor

Fixed load: 3.0 kN/m²
Variabel load: 5.0 kN/m²

1. STRUCTURE

Main LOADS : 3,0 kN/m²
OVERLOAD : 3,0 kN/m²

Structure type :

SLABS and COLUMN, **no beams**.

SLABS system : <http://www.airdeck.be/>

Thickness : (based on max span of 11m) 440mm to 450mm

B290		380	A380/6Q/B240	0,0105	1872	711,22	25,13%	0,224	8,5	9,8
		390	A390/6Q/B290		1749	682,01	30,05%	0,213	9,3	10,5
		400	A400/6Q/B290		1768	707,01	29,30%	0,223	9,5	10,7
		410	A410/6Q/B290		1785	732,01	28,58%	0,233	9,7	10,9
		420	A420/6Q/B290		1802	757,01	27,90%	0,243	9,9	11,1
		430	A430/6Q/B290		1819	782,01	27,25%	0,253	10,1	11,3
		440	A440/6Q/B290		1834	807,01	26,64%	0,263	10,3	11,5
		450	A450/6Q/B350		1704	766,77	31,84%	0,247	10,8	12,0

Added thickness: 100mm for finishing

Total complex: 550mm

Free space under slabs = 400cm – 55cm = 345cm

Structure position has been reviewed due to the parking (see plans joined).



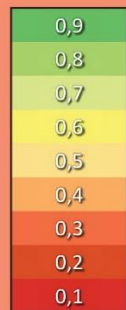
BUILDING TRANSFORMATION CAPACITY

Project name: <Example project>

Location: <city, country>

Function: <office>

4. Capacity score:



0,9

High capacity

Load-bearing capacity and spatial support for new installations allowing upgrade and other uses.

TRANSFORMATION INDICATORS / BUILDING LEVEL

4. CAPACITY

SCORE PER SUBINDICATOR

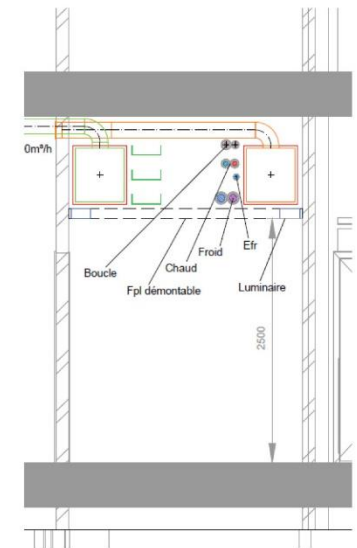
4.2 Space for distribution of services

ref. h.	rule	TC
≥3300	If floor-to-floor height ≥ 4500mm, and if function = healthcare/school (-600mm), and if type of structure = solid floor (-600mm).	0,9
≥3300	If floor-to-floor height ≥ 4200mm, and if function = healthcare/school (-600mm), and if type of structure = beams (-300mm).	0,9
≥3300	If floor-to-floor height ≥ 4200mm, and if function = office (-300mm), and if type of structure = solid floor (-600mm).	0,9
≥3300	If floor-to-floor height ≥ 3900mm, and if function = office (-300mm), and if type of structure = beams (-300mm).	0,9
≥3300	If floor-to-floor height ≥ 3900mm, and if function = housing (-0mm), and if type of structure = solid floor (-600mm).	0,9
≥3300	If floor-to-floor height ≥ 3600mm, and if function = housing (-0mm), and if type of structure = beams (-300mm).	0,9
≥2700 and <3300	If floor-to-floor height ≥ 3900mm, and if floor-to-floor height < 4500mm, and if function = healthcare (-600mm), and if type of structure = solid floor (-600mm).	0,5
≥2700 and <3300	If floor-to-floor height ≥ 3600mm, and if floor-to-floor height < 4200mm, and if function = healthcare (-600mm), and if type of structure = beams (-300mm).	0,5
≥2700 and <3300	If floor-to-floor height ≥ 3600mm, and if floor-to-floor height < 4200mm, and if function = office (-300mm), and if type of structure = solid floor (-600mm).	0,5
≥2700 and <3300	If floor-to-floor height ≥ 3300mm, and if floor-to-floor height < 3900mm, and if function = office (-300mm), and if type of structure = beams (-300mm).	0,5

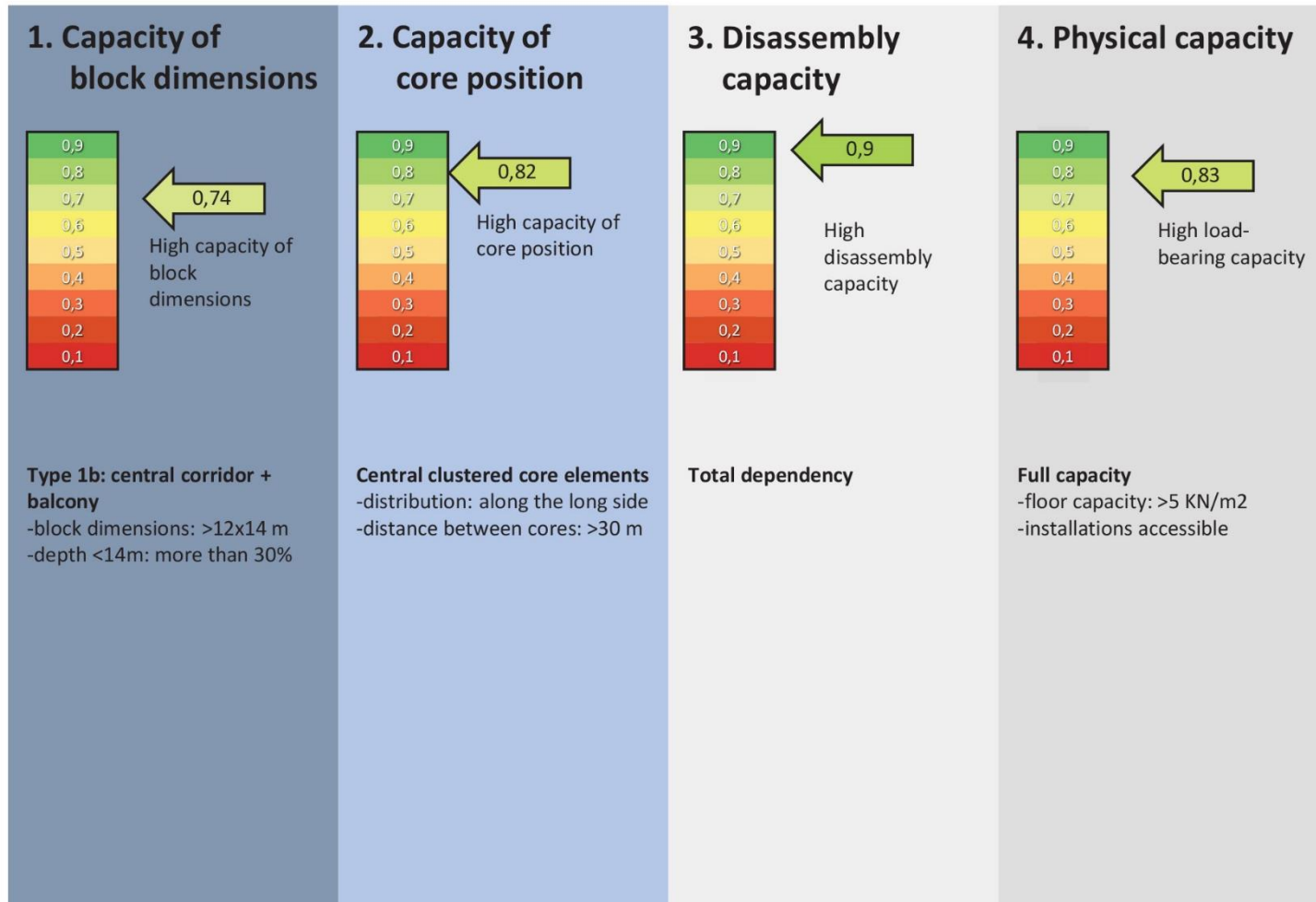
Added thickness: 100mm for finishing

Total complex: 550mm

Free space under slabs = 400cm – 55cm = 345cm



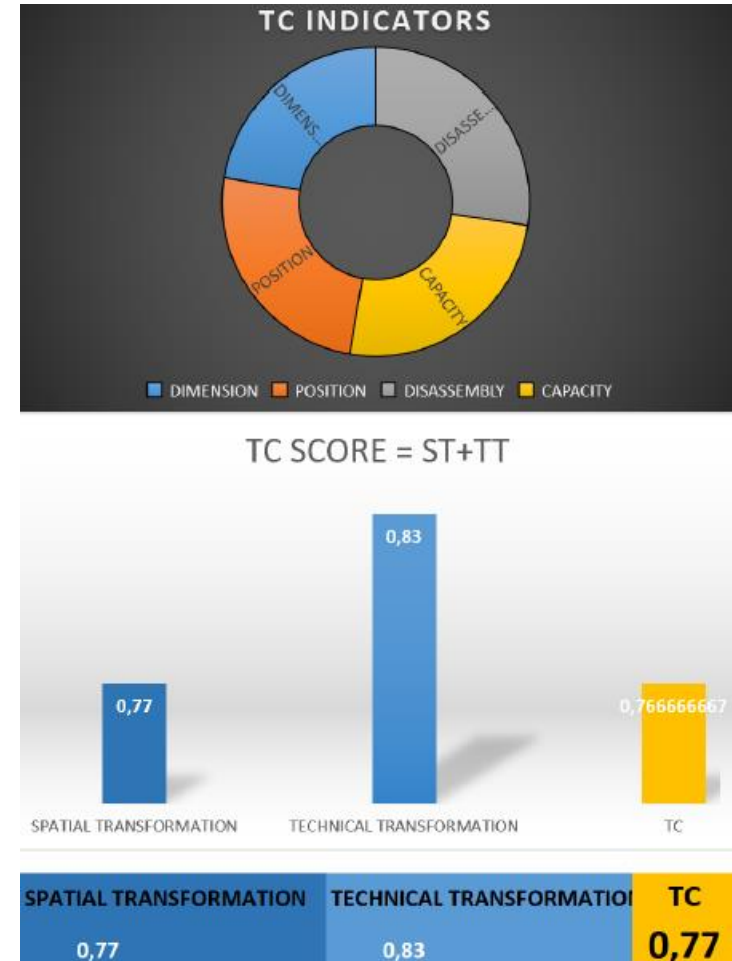
SUBSCORE PER INDICATOR



Four major indicators determine the Transformation Capacity of a building. The project will receive a total score aggregated by a simple average of the subscores for each indicator.

Fase 1 - voorstelling van de resultaten

► Totaalscore



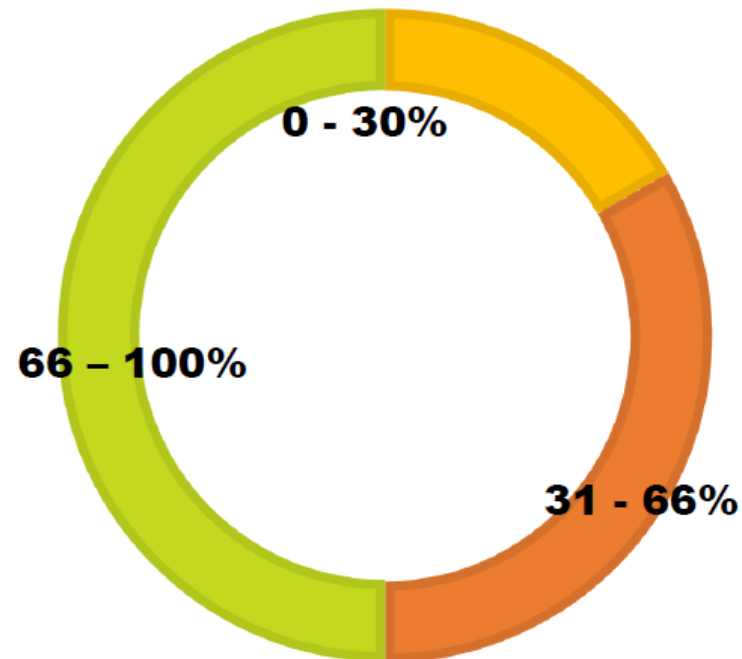
Fase 1 - voorstelling van de resultaten

- Interpretatie van de score

To TC 0,30 = no transformation capacity
or transformation with major demolition

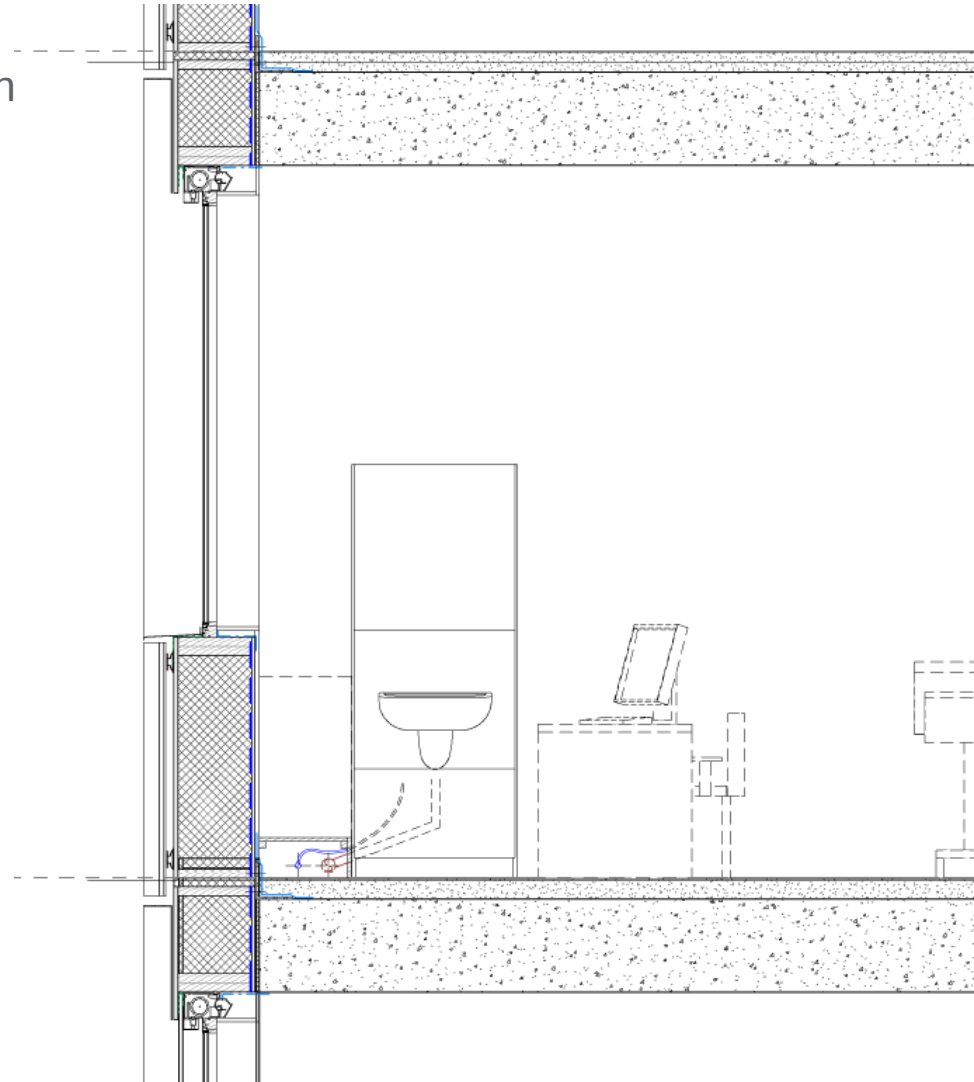
TC 0,31-0,65 = partial transformation/
partly reversible partial transformation.
Potential change of functions involving
partial demolition (not more than 20% of
the core structure)

0,66-0,90 = transformable/reversible
building change of functionality and
configuration without demolition



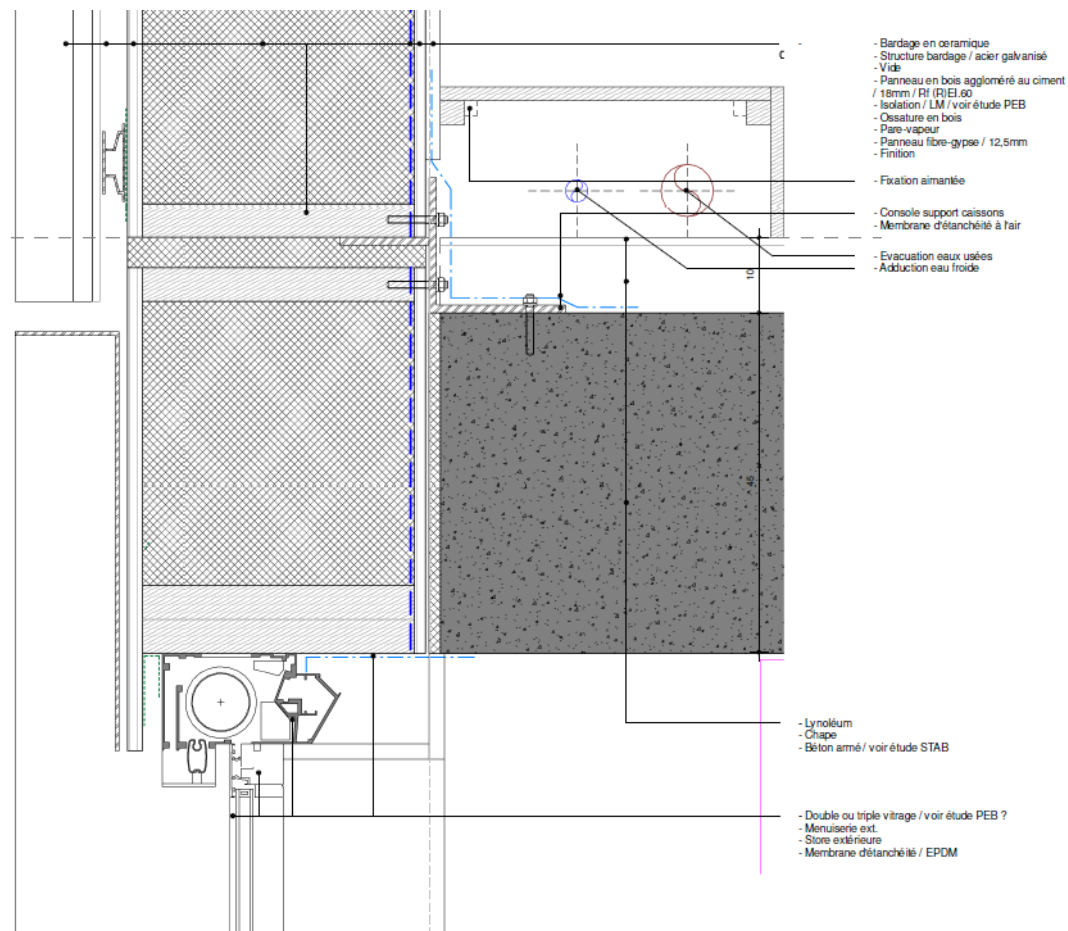
Fase 2 - constructiedetails

- ▶ Verbindingen tussen macro-elemen
- ▶ Bijv.: gevel - plaat



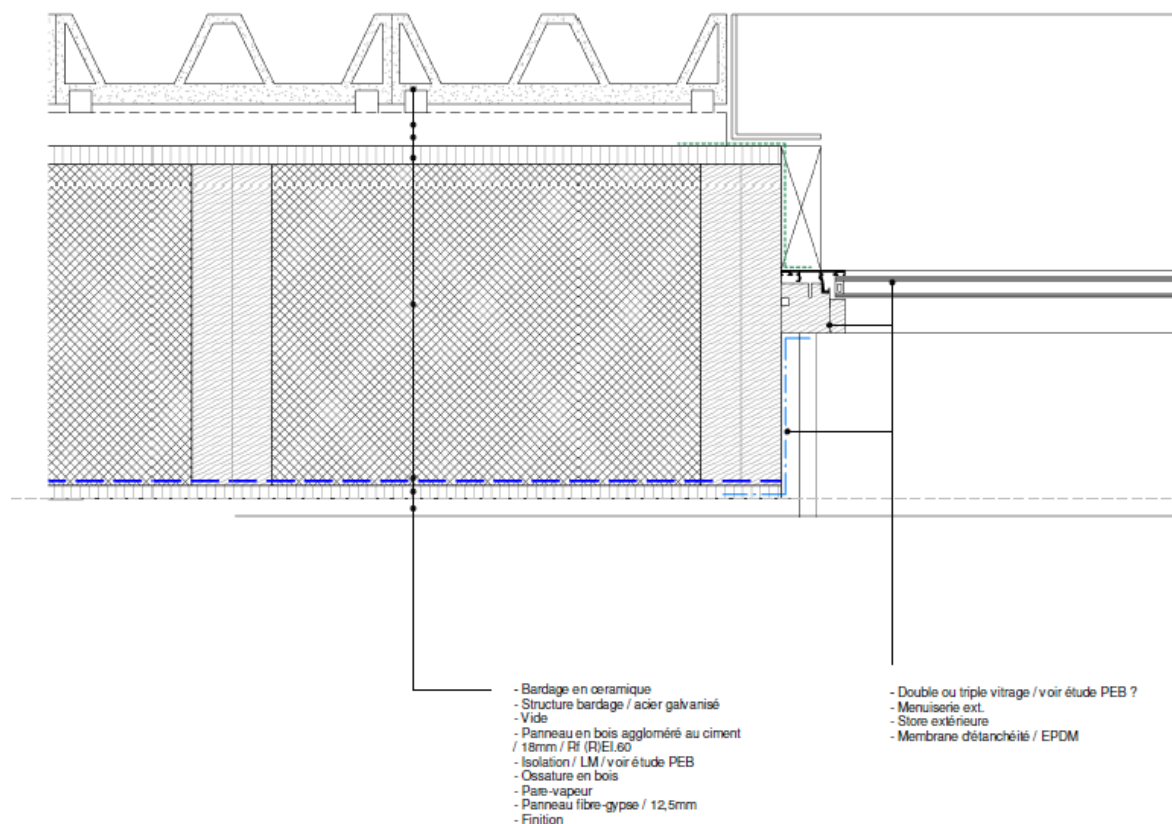
Fase 2 - constructiedetails

- Verbindingen tussen macro-elementen
- Toegankelijkheid



Fase 2 - constructiedetails

- Verbindingen tussen de elementen
- Bijv.: bekleding - raamwerk



PROJECT BRACOPS

REVERSIBLE BUILDING DESIGN PROTOCOL

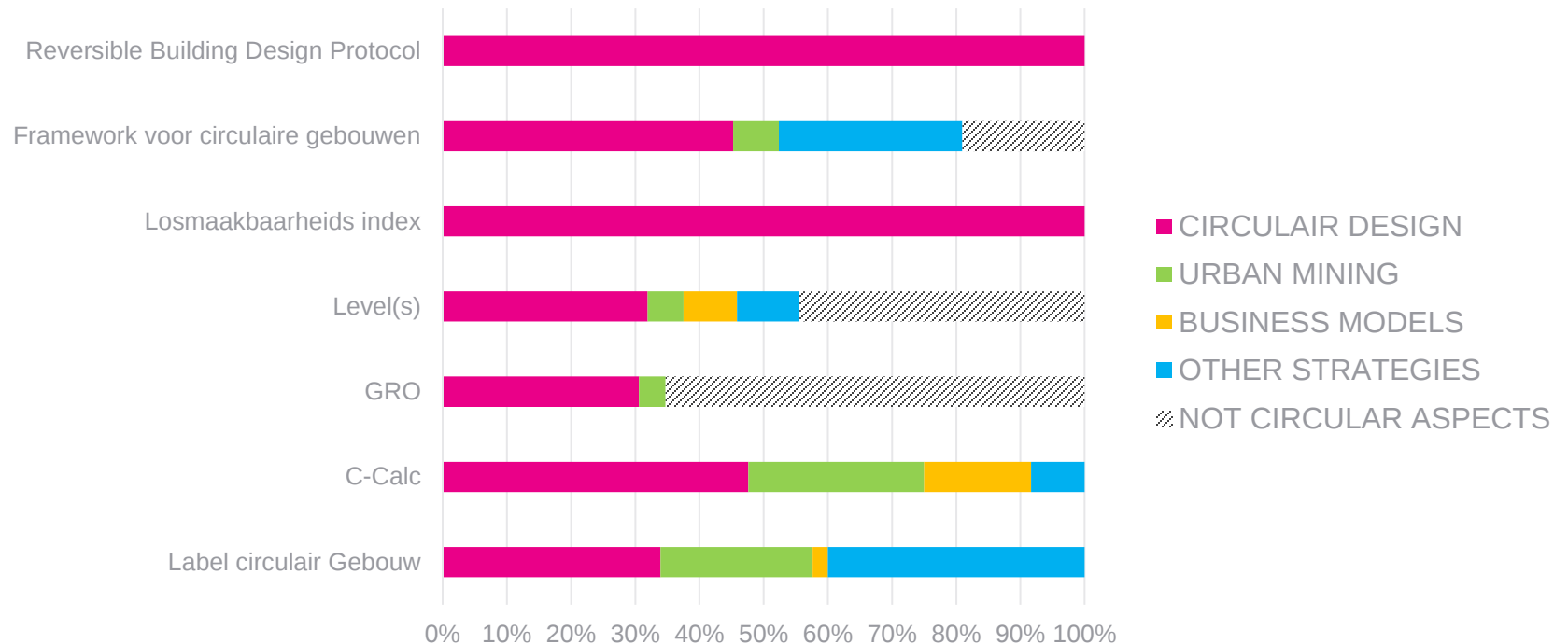
ANDERE KWALITATIEVE EN KWANTITATIEVE TOOLS

- **Vergelijking**



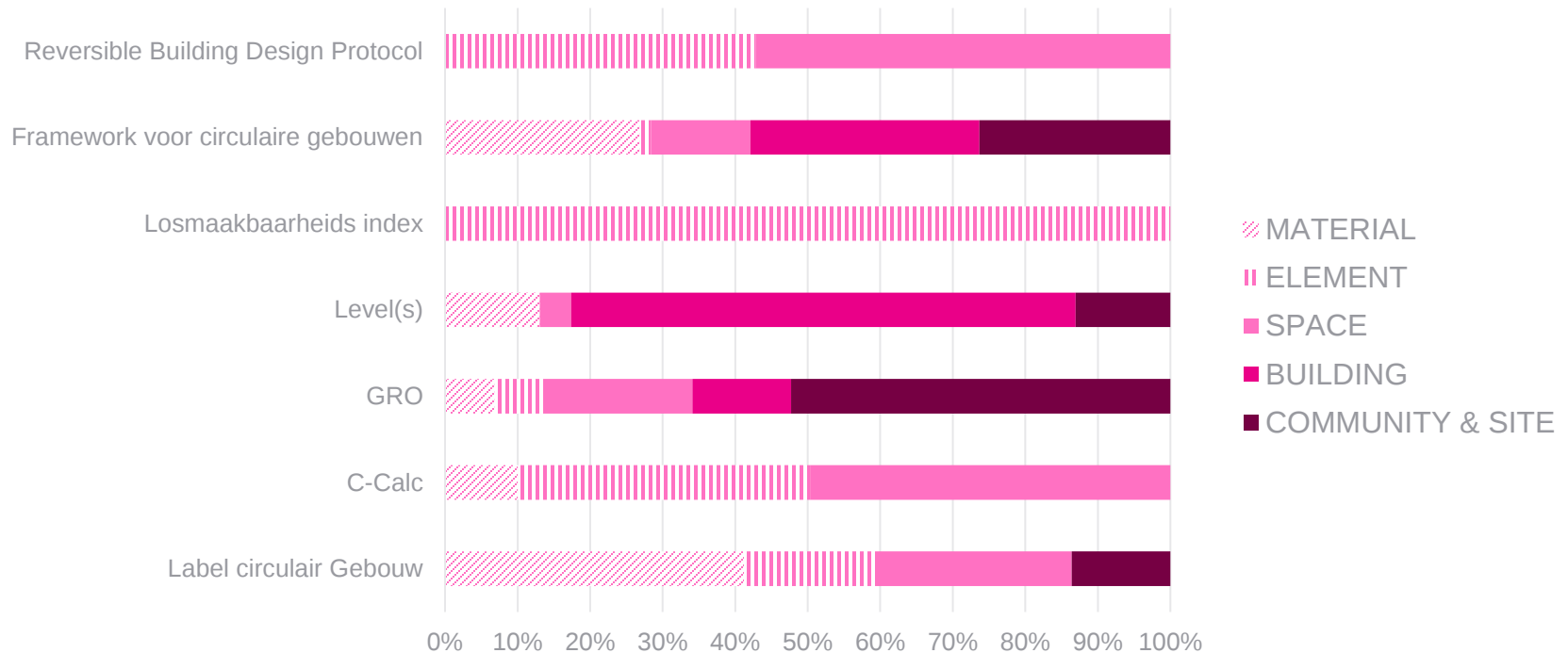
Circulaire bouwstrategieën

► Vergelijking



Circulair ontwerp per laag van het gebouw

► Vergelijking





- ▶ Om de doelstellingen voor de circulaire economie in de bouw te realiseren, dient het circulaire ontwerp de basis van het architecturale ontwerp te vormen.
 - Nieuwe projecten dienen te worden ontworpen als evolutieve structuren en als bron van grondstoffen.
- ▶ Het gebruik van de tools maakt een kwantitatieve en kwalitatieve evaluatie van het project mogelijk.
 - Ondersteuning voor architecturale beslissingen.
- ▶ De evaluatie dient te starten vanaf de eerste ontwerp schets en verder evolueren naarmate het project vordert.
 - Op tijd om wijzigingen mogelijk te maken zonder de planning, het budget, ... in het gedrang te brengen.





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BEDANKT VOOR UW AANDACHT

