



“ For us, **sustainability** in buildings is not solely about reducing its **environmental impact** but also improving their **social value**, their inhabitant's **health**, minimising **construction** and **maintenance costs**, **speeding construction** and designing buildings that generate **activity**, **comfort** and **flexibility** of use with consistent consideration of **its entire lifecycle**”





• ¿Why? Circular economy architecture can activate the triple sustainability

environmental

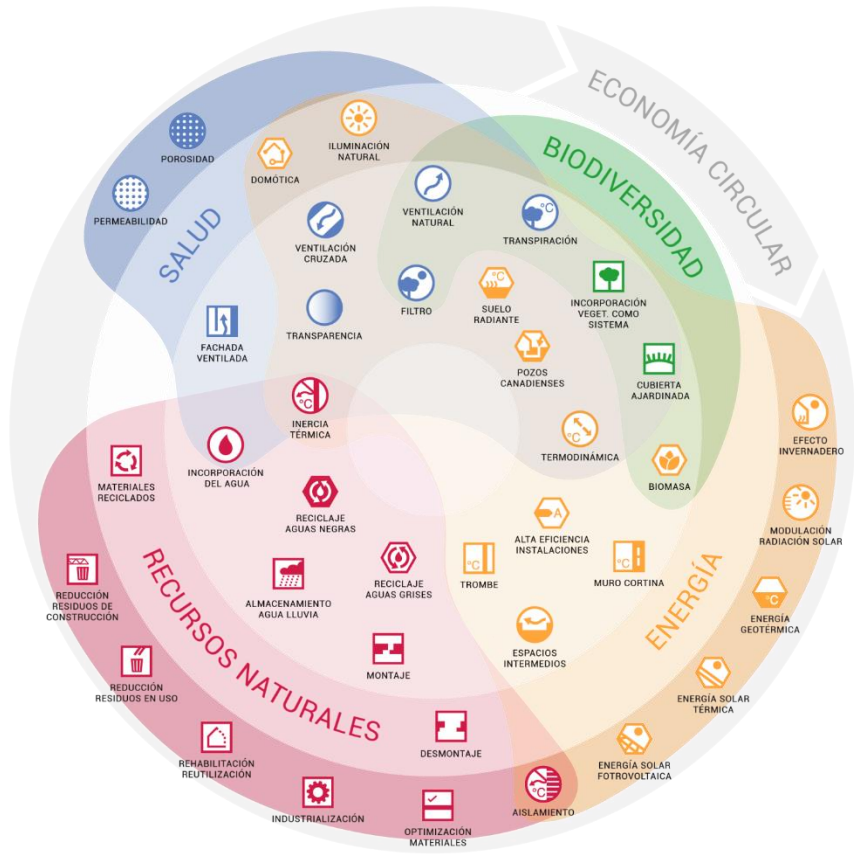
- lower material impact throughout the lifespan of buildings
- proximity of the components, recyclability
- flexibility: avoiding buildings obsolescence
- zero waste building production
- lower energy and CO2 consumption
- dry assembled components, industrialization
- Environmental Product Declaration
- biodiversity, reduction of heat island effect ...

economical

- higher efficiency procedures
- high value local industries development
- cost control

social

- adaptation to quick changing society demands through flexible buildings and assembled systems
- quality components
- healthy buildings
- less impact on cities (noise, smoke) through industrialization procedures
- more health and security during construction



- ¿Why? We cannot afford inefficiency any longer

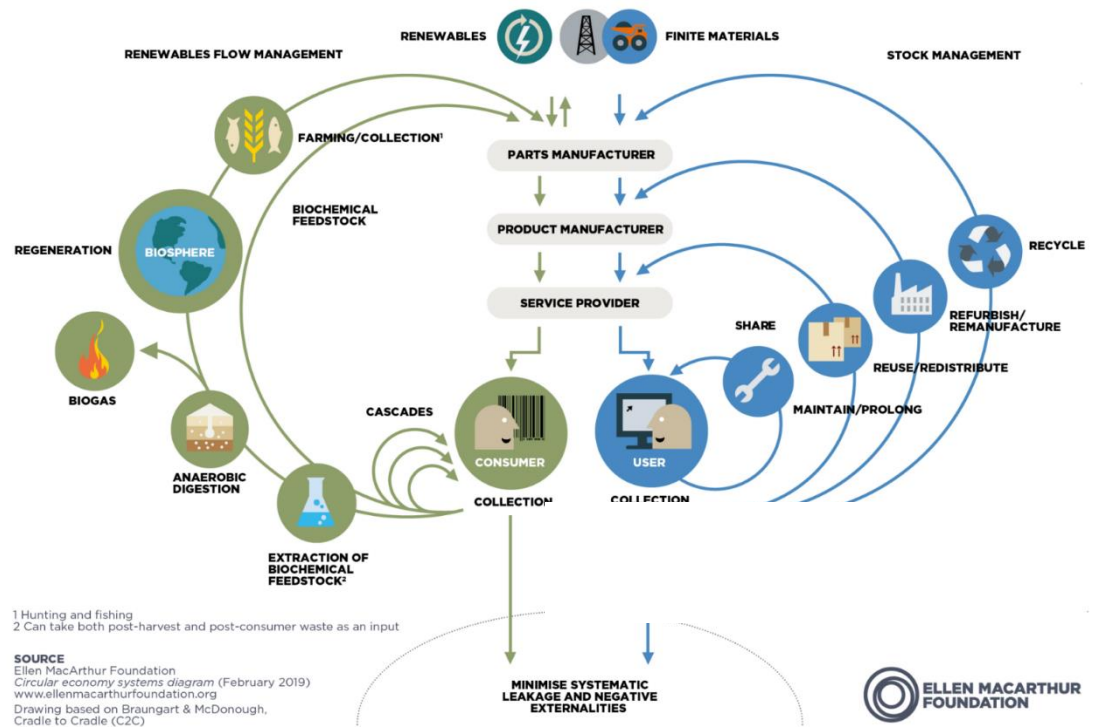


- About 374 million tonnes of construction and demolition waste (C&DW) were generated in 2016 (Eurostat, 2019a) making it is the largest waste stream in the EU by weight.
- Source: Construction and Demolition Waste: challenges and opportunities in a circular economy, January 2020

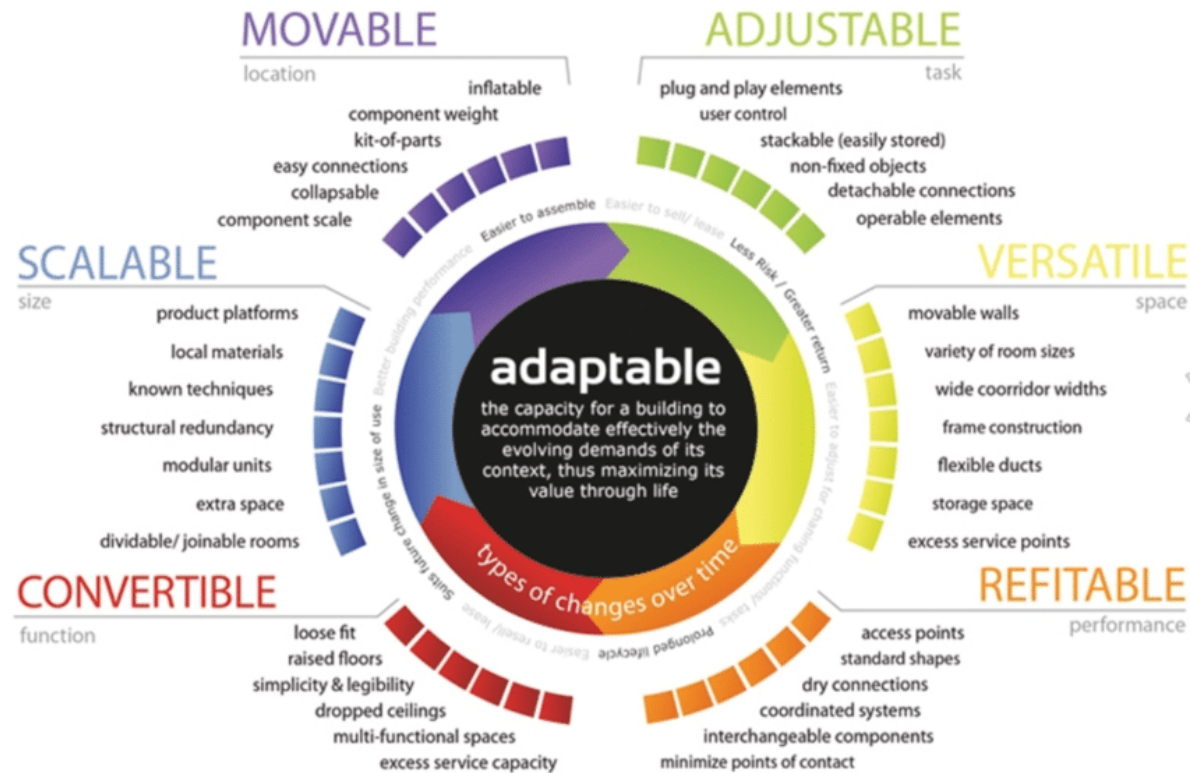


# • ¿How? Through cooperative dynamics and technologies

- LEAN procedures and *Integrated Project Delivery* IPD method (all agents: promoter, construction company, + industry, city council...)
- BIM digital twin
- Life cycle analysis
- Buildings as infrastructure (core&Shell + fitout)
- Product-as-a-service (PaaS)
- Extended Producer responsibility (EPR)



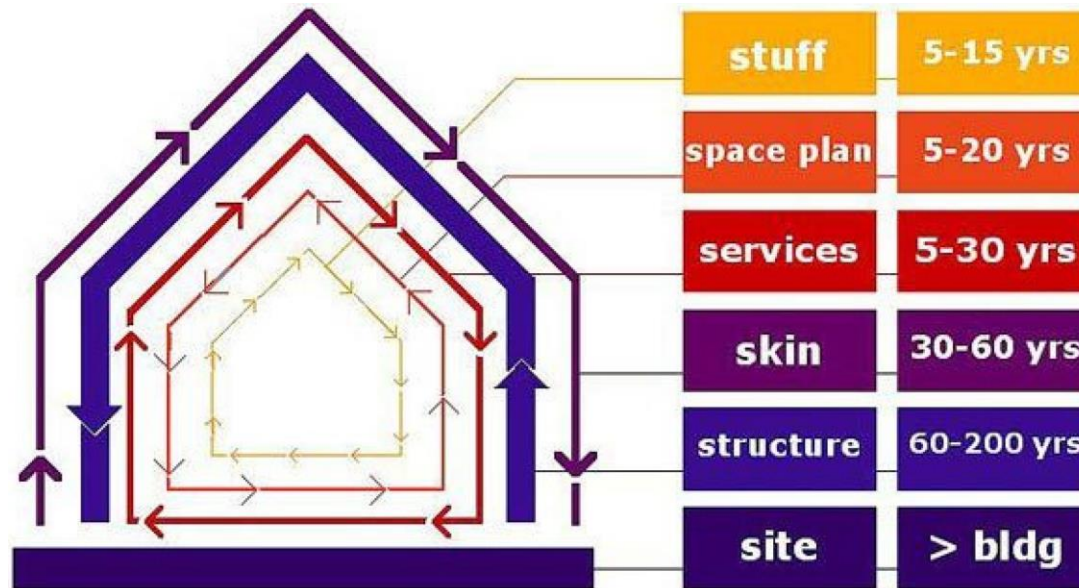
- ¿How? Flexibility design for reuse



- Design strategies for adaptability in buildings
- Source: Adaptable Futures (2012)

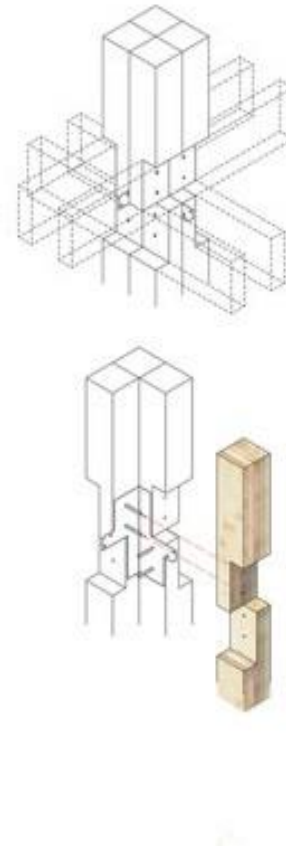
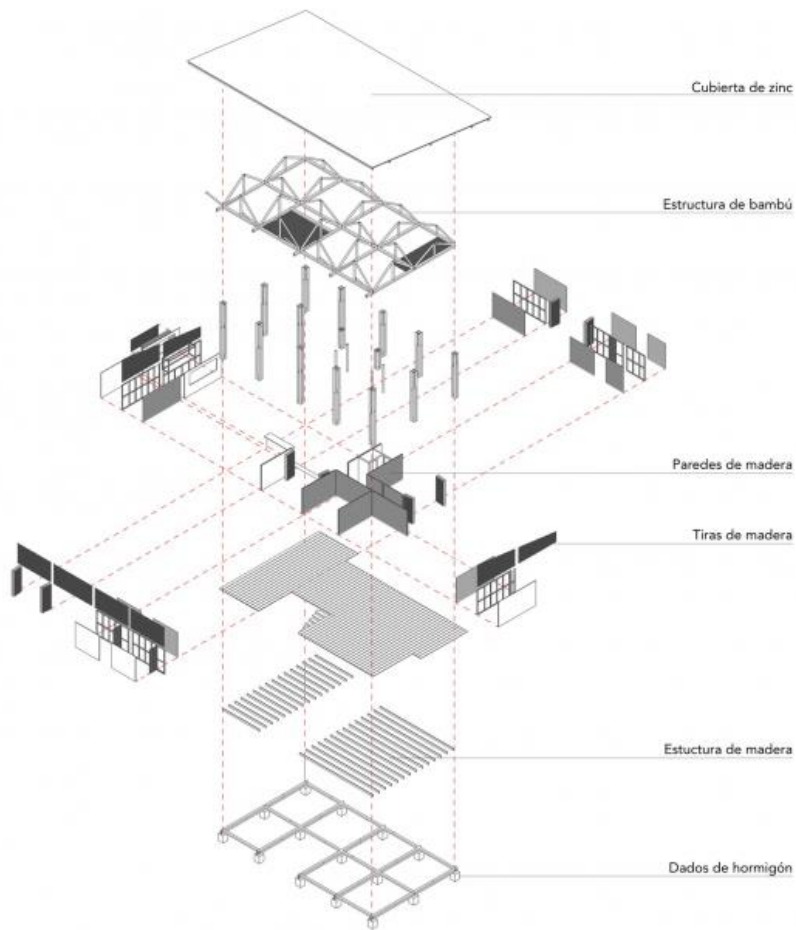


- ¿How? Shearing layers. Core&Shell +Fitout



- Different layers of the building and their expected time scale
- Source: Brand, S. How Buildings Learn: What Happens after They're Built

# • ¿How? Designing for Deconstruction



- Convento House / Enrique Mora Alvarado
- Source: Archdaily

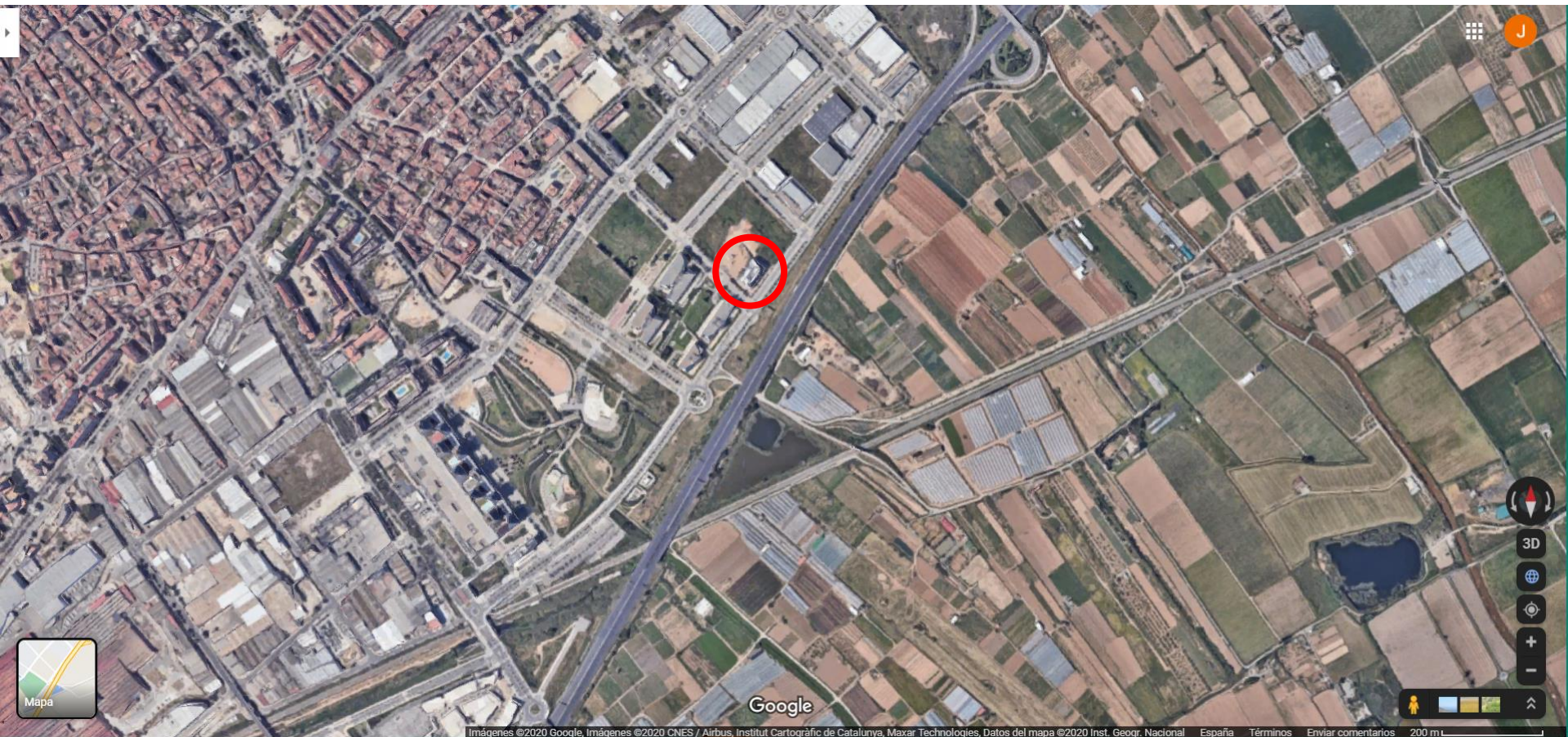
- Details of Nest We Grow / Kengo Kuma & Associates + College of Environmental Design UC Berkeley. Image © Shinkenchiku Sha
- Source: Archdaily



# • SÒCRATES Building

- 1\_More than a structure, an infrastructure
- 2\_Versatile and adaptable spaces
- 3\_Active facade
- 4\_Typological variety
- 5\_Open multipurpose spaces
- 6\_Assembly and disassembly of components
- 7\_Natural comfort and well-being
- 8\_Waste 0 during construction
- 9\_The building as a bank of materials
- 10\_Environmental certification





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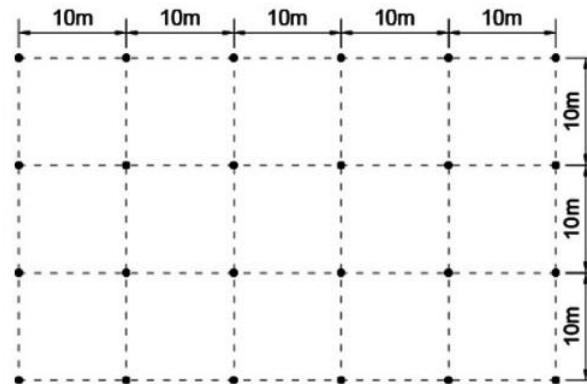


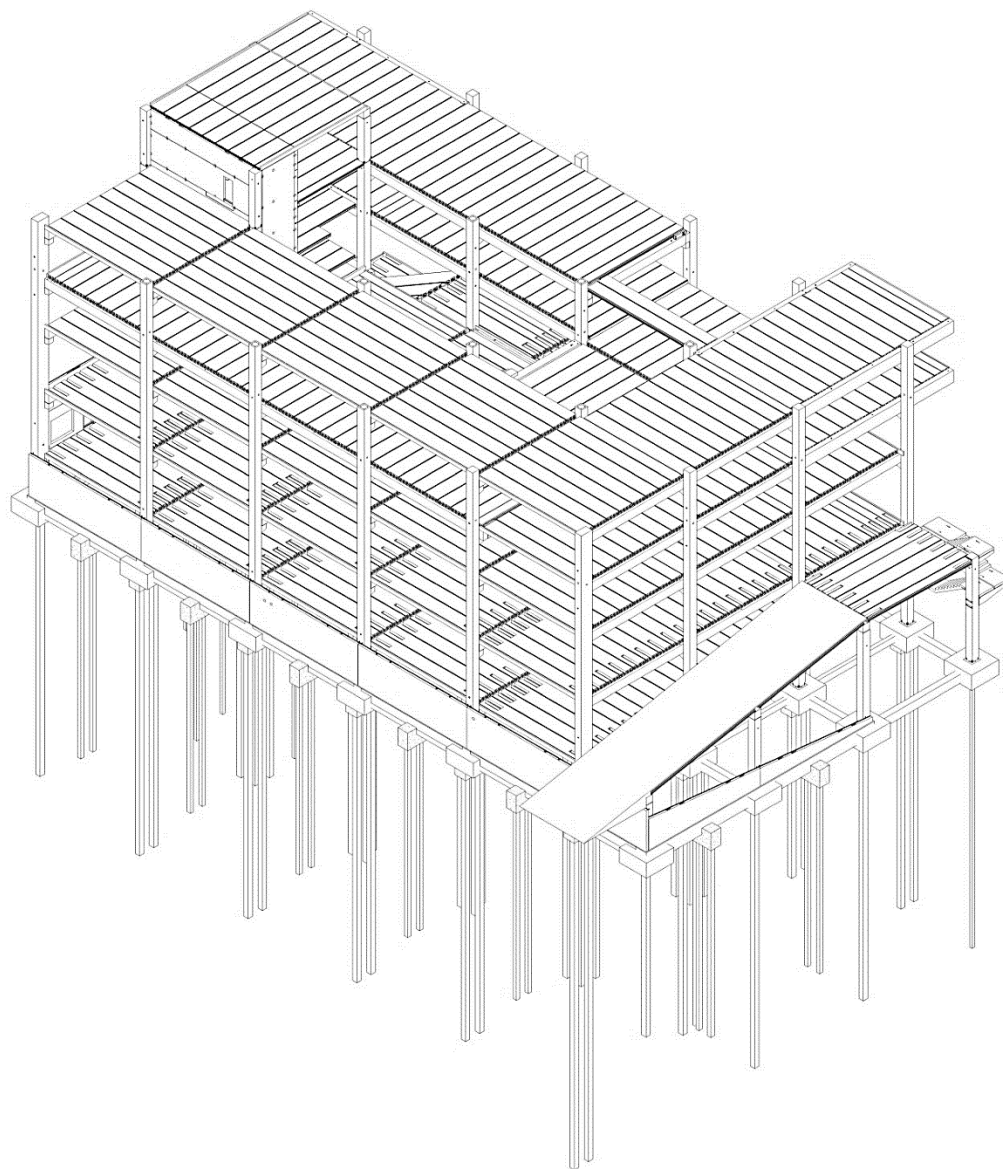






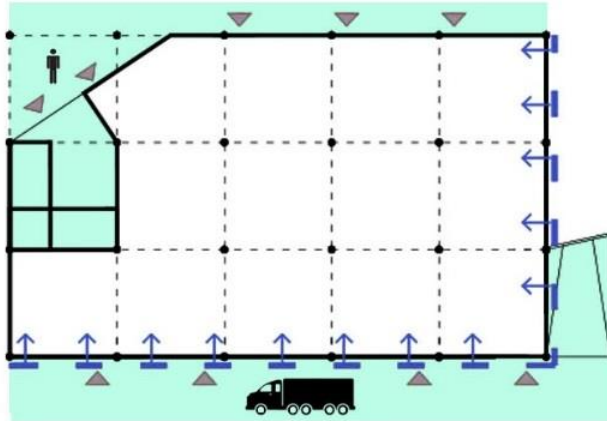
- 1\_More than a structure, an infrastructure



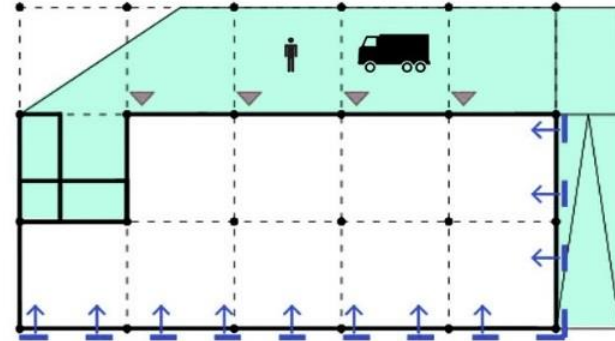




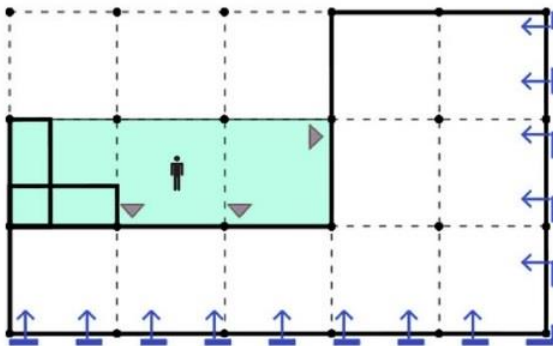
- 2\_Versatile and adaptable spaces



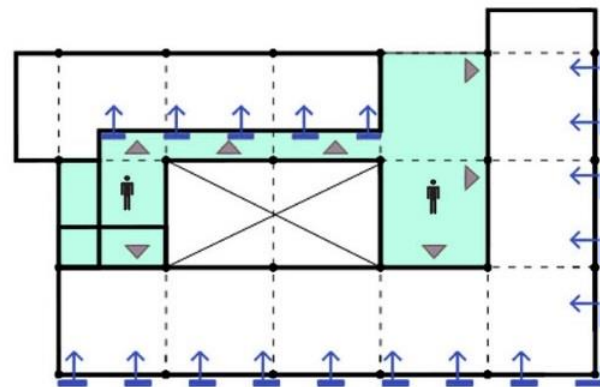
Planta 0



Planta 1



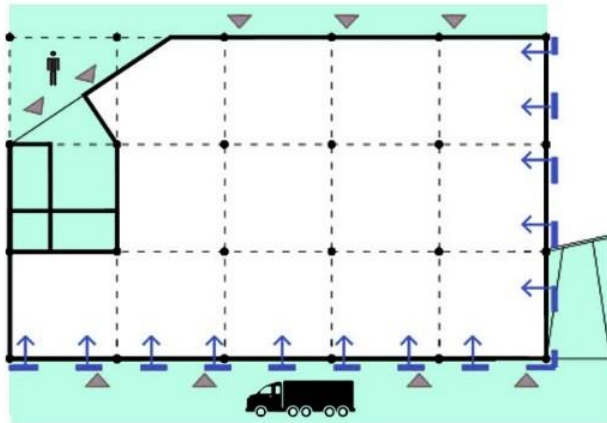
Planta 2



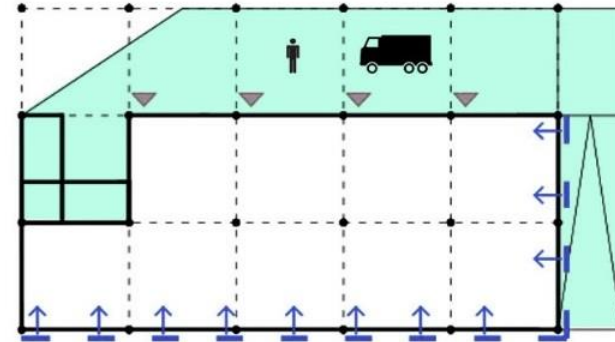
Planta 3



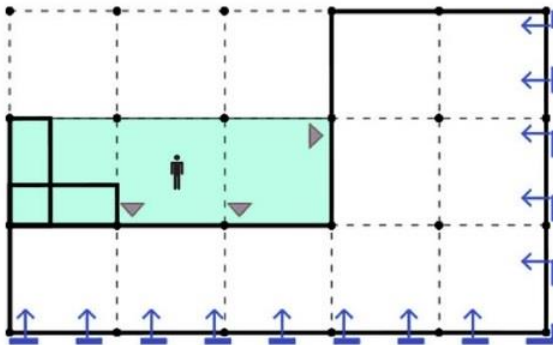
- 3\_Active facade



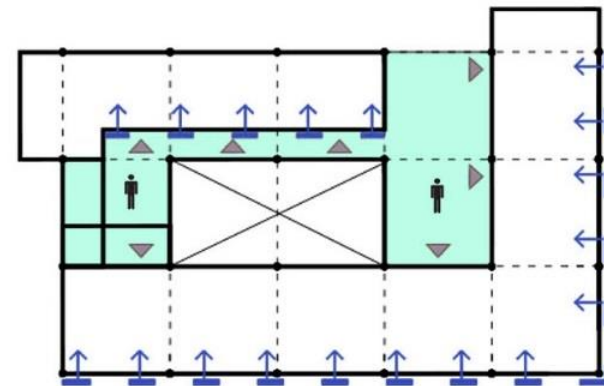
Planta 0



Planta 1



Planta 2



Planta 3



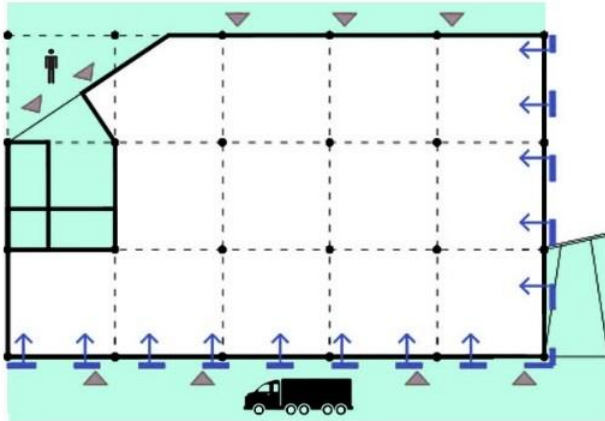




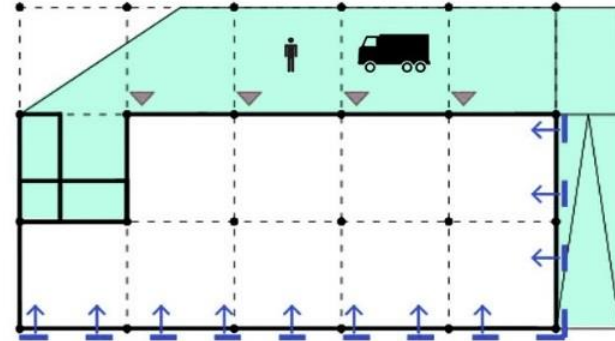




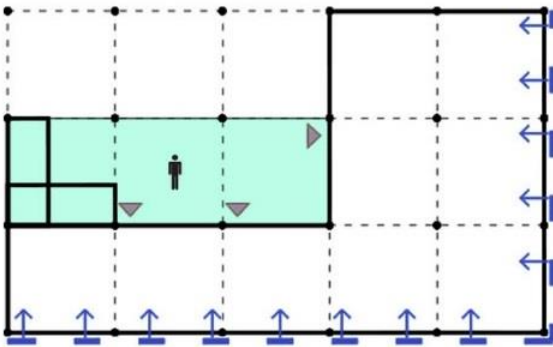
- 4\_Typological variety



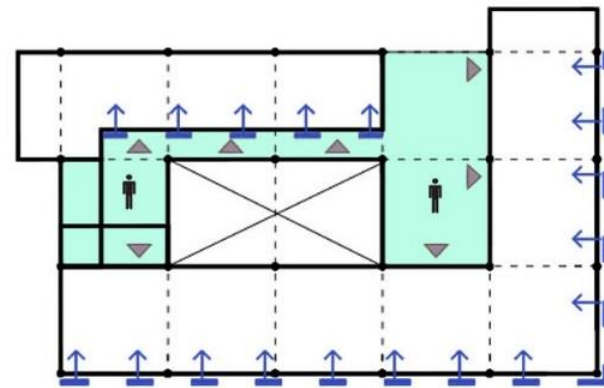
Planta 0



Planta 1



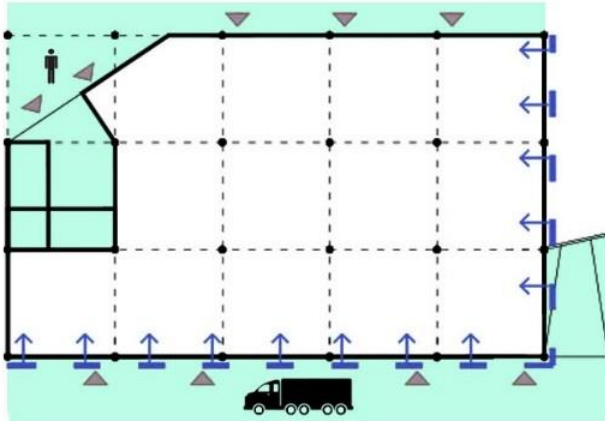
Planta 2



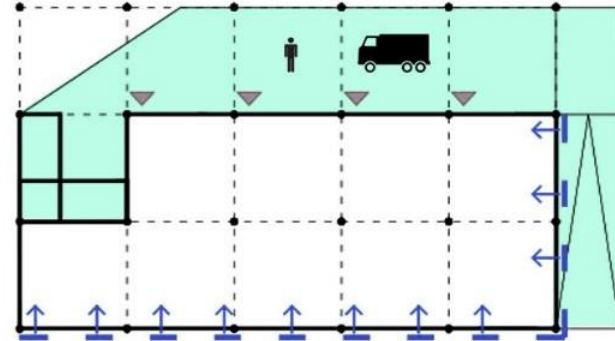
Planta 3



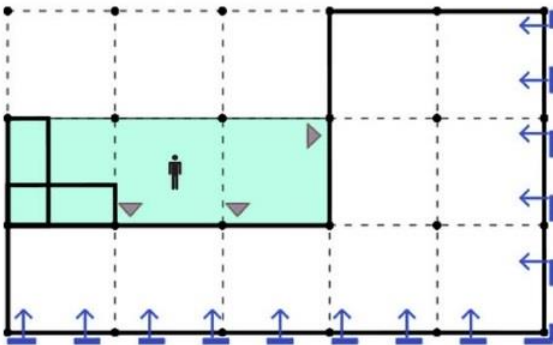
- 05\_open multipurpose spaces



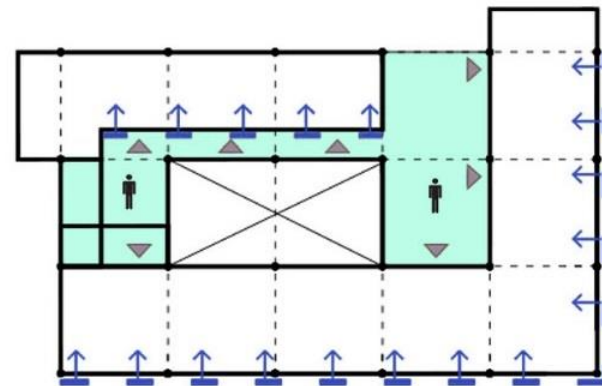
Planta 0



Planta 1



Planta 2



Planta 3









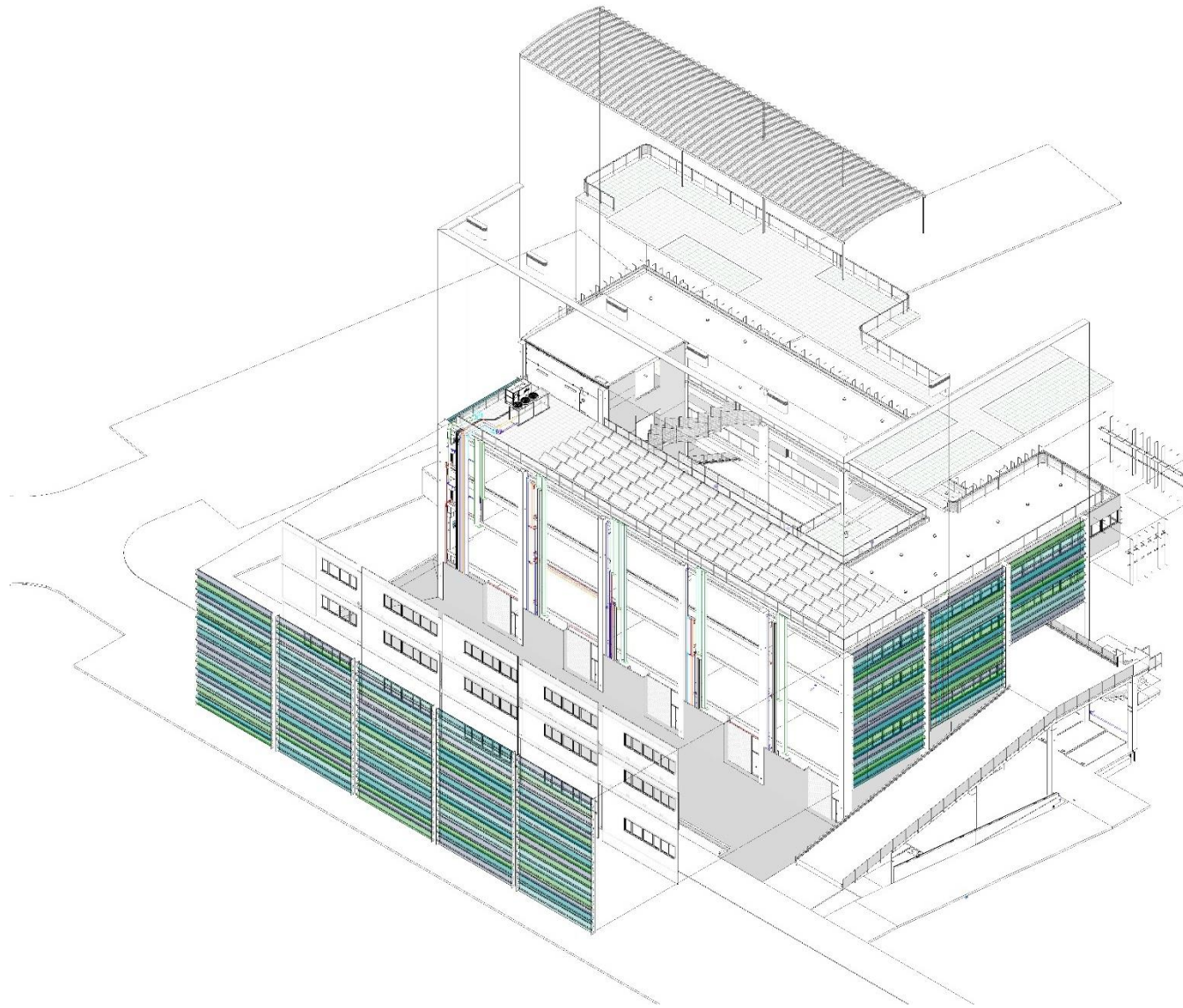






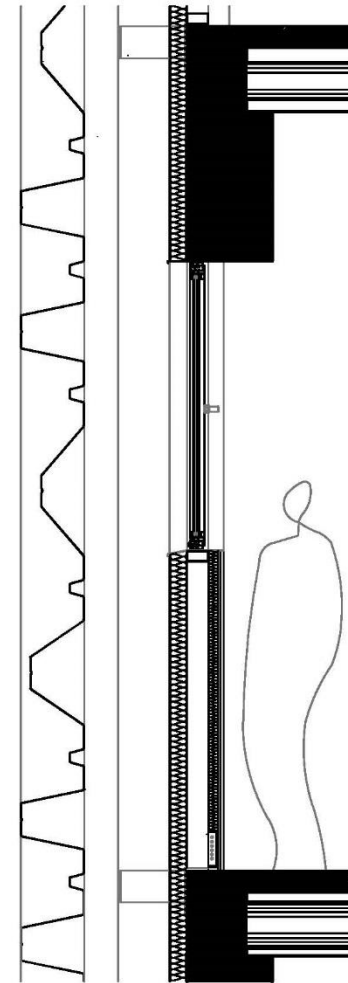
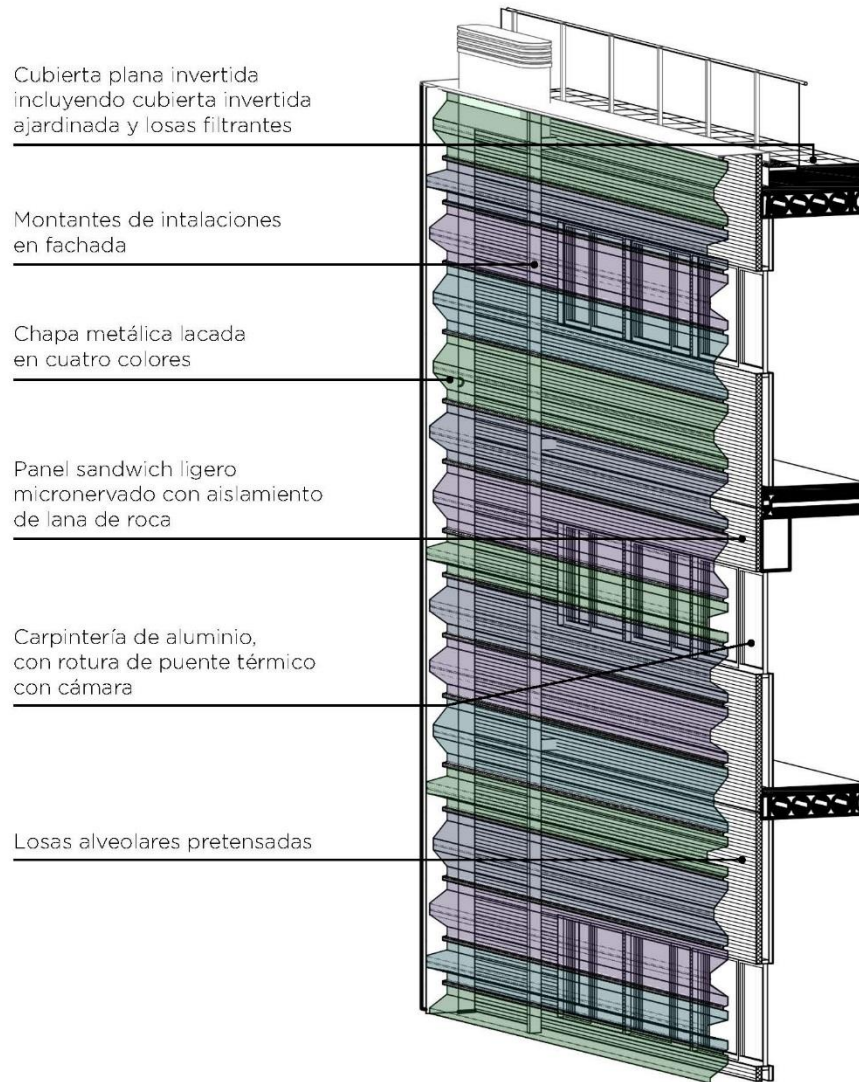


- 6\_Assembly and disassembly of components





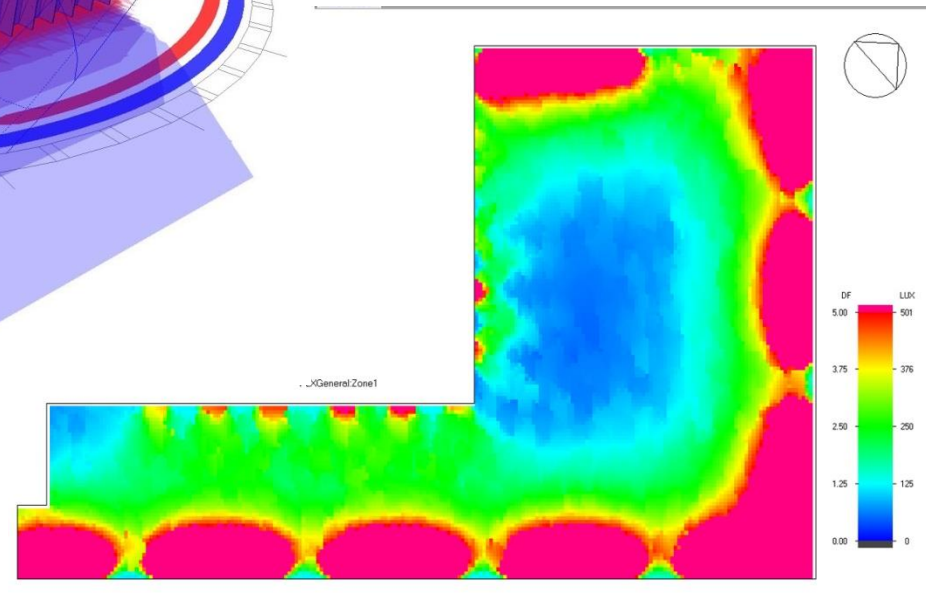
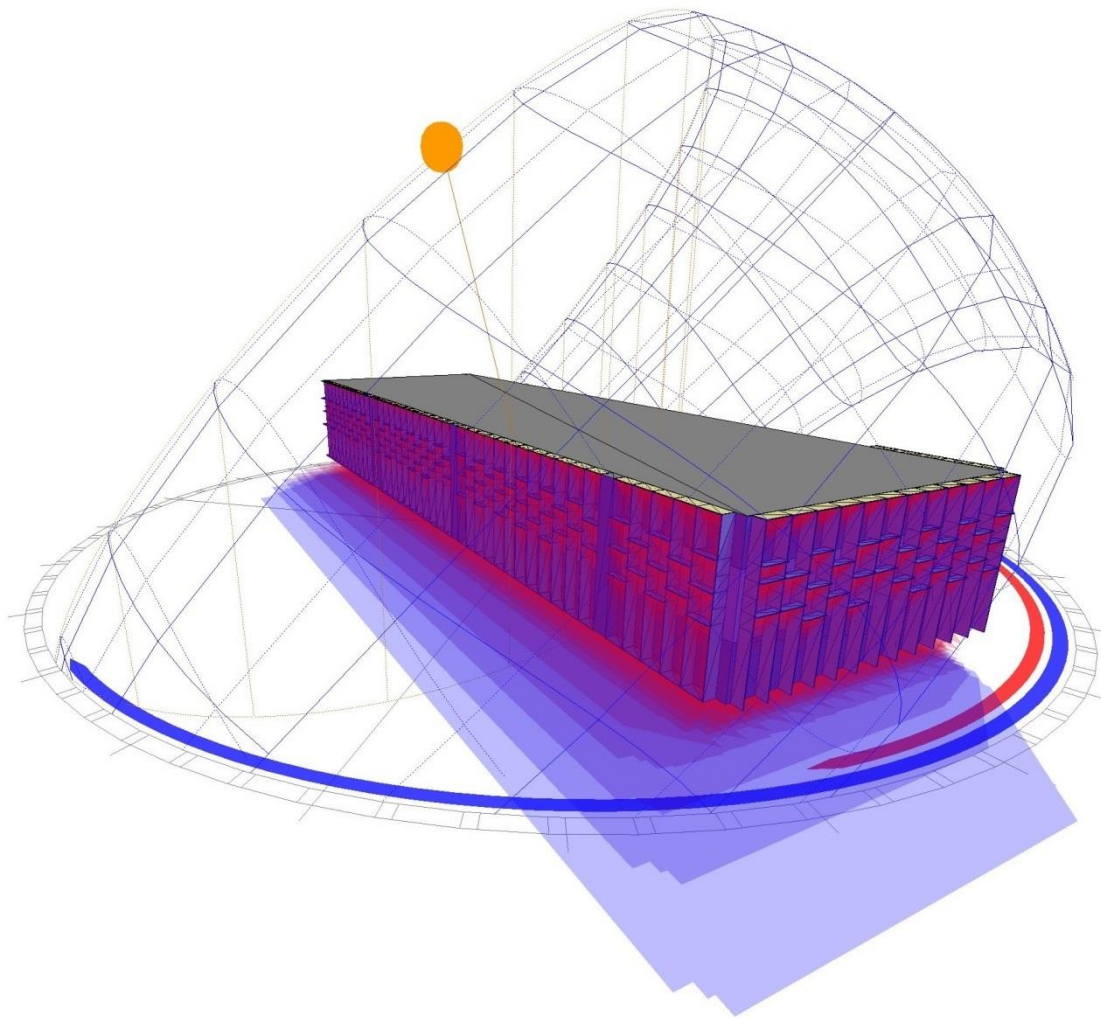




# • 7\_Natural comfort and well-being








• 8\_Zero waste during construction


On site generated waste  
25t = 4kg/m2

revalued waste  
99,3%




Runa neta

6,4t → ♻️ 99%



Paper i cartró

0,8t → ♻️ 100%



Fusta neta

1 t → ♻️ 100%

PLACO

- Programa de take back amb el fabricant per retornar les minves d'obra pel seu reciclatge a la planta d'Igualada



ROCKWOOL

- Experiència pilot
- Prova de Take back amb el fabricant per retornar les minves d'obra pel seu reciclatge (reintroducció al procés productiu) a la planta de Caparros (Navarra)



Geotèrmia

- Pous construïts in situ amb bassa de sedimentació per retornar l'aigua emprada a l'excavació del pou neta



Pilots cimentació

- Clavats, no residus
- Escapçament i restes reutilitzades in situ a fonaments



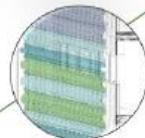
Prefabricats

- Mínima generació de residus
- Embalatges i envasos es retornen al fabricant per a una correcta gestió



Pell

- Prefabricada per a minimitzar residus in situ
- Retorn al fabricant dels residus que es generin per a la seva gestió com residus industrials



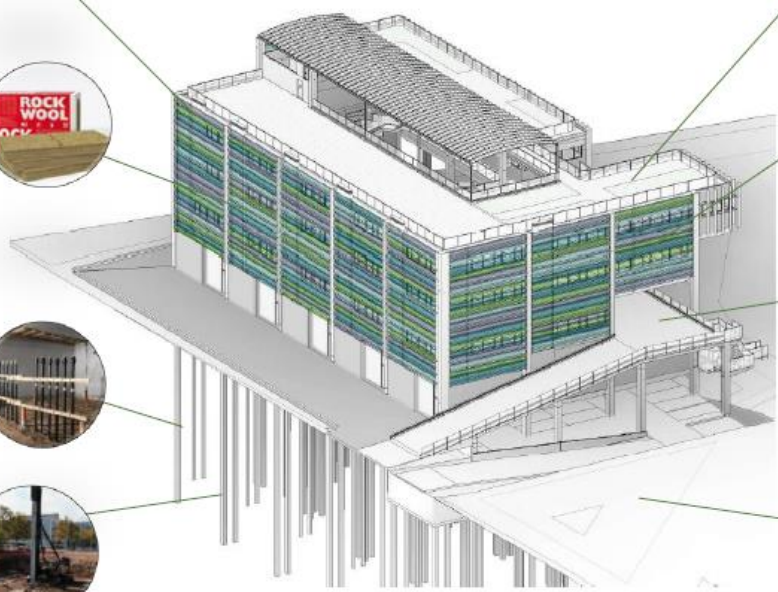
Fonaments

- Acord amb Ciments Molins / PROPAMSA per retornar l'aigua de neteja de les formigoneres a planta
- Ús formigó residual de formigoneres com a formigó de neteja



Terres d'excavació

- Reutilització in situ de més de 7.500 m³ de terres d'excavació  
→ 85% farciment terreny confrontant  
→ 15% mur perimetral





• 9\_Building as bank of materials for the future

**Material Passport**  
88% of materials

**C2C**  
84% materials weight

	Minerals y Petris	8.500 t
	Metalls	145 t
	Multi-material	45 t
	Fusta i Derivats	24 t
	Vidre	10 t

**Coberta APIMET**

- En procés C2C
- Acer lacat
- >95% reciclable i 14% reciclat



**Plaques Fotovoltaïques SUN POWER**

- Certificada C2C Silver
- Fabricades a França
- Identificades 100 ppm, lliures de CMR
- Programa de take-back disponible



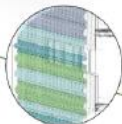
**Coberta V. TER**

- Anteriorment certificades C2C
- Fàcil desmuntatge i reciclables
- Vegetació autòctona
- PP reciclat
- Captació de pluvials



**Pell ENMOMETALL**

- En procés C2C
- Alta ciclabilitat
- Elevades prestacions tèrmiques
- Alt contingut en reciclat



**Prefabricats PRECON**

- Certificats C2C BRONZE
- Contingut en reciclat 3%
- >98% reciclable (downcycling)
- Lliure PVC
- Juntres neoprè (x)
- Fabricat amb electricitat 100% renovable



**Tancaments ENMOMETALL**

- En procés C2C
- Nutrient tècnic
- Elevades prestacions tèrmiques
- Lliure de PVC
- Alta ciclabilitat



**Placa Alveolar PRECON**

- Certificat C2C BRONZE
- Contingut en reciclat 3%
- >98% reciclable (downcycling)
- Lliure PVC
- Fabricat amb electricitat 100% renovable



**Pilots TERRATEST**

- En procés C2C
- Nutrient tècnic
- Control presència metalls pesats problemàtics, atès la permanència en el terreny



**HONEXT Material**

- En procés C2C
- Nutrient biològic
- 100% ciclable i 100% ciclat



**Canonades ABN PIPE SYSTEM**

- En procés C2C
- Nutrient tècnic
- Lliure d'halògens
- PP reticular 100% reciclable
- Connexions electrosoldades, LEAN



**II-luminació GARVILED**

- Certificades C2C Bronze i en d'ampliar catàleg certificat C2C
- Nutrient tècnic
- Lliure d'halògens
- Desenvolupant programa de take-back



• 10\_environmental certification

Y	?	N				
1			Credit	Integrative Process	1	
8	0	12	Location and Transportation			20
			Credit	LEED for Neighborhood Development Location	20	
		2	Credit	Sensitive Land Protection	2	
		3	Credit	High Priority Site	3	
4		2	Credit	Surrounding Density and Diverse Uses	6	
2		4	Credit	Access to Quality Transit	6	
1			Credit	Bicycle Facilities	1	
		1	Credit	Reduced Parking Footprint	1	
1			Credit	Green Vehicles	1	
3	0	8	Sustainable Sites			11
Y			Prereq	Construction Activity Pollution Prevention	Required	
		1	Credit	Site Assessment	1	
		2	Credit	Site Development - Protect or Restore Habitat	2	
1			Credit	Open Space	1	
		3	Credit	Rainwater Management	3	
		2	Credit	Heat Island Reduction	2	
1			Credit	Light Pollution Reduction	1	
1			Credit	Tenant Design and Construction Guidelines	1	
9	0	2	Water Efficiency			11
Y			Prereq	Outdoor Water Use Reduction	Required	
Y			Prereq	Indoor Water Use Reduction	Required	
Y			Prereq	Building-Level Water Metering	Required	
2			Credit	Outdoor Water Use Reduction	2	
6			Credit	Indoor Water Use Reduction	6	
		2	Credit	Cooling Tower Water Use	2	
1			Credit	Water Metering	1	
23	2	8	Energy and Atmosphere			33
Y			Prereq	Fundamental Commissioning and Verification	Required	
Y			Prereq	Minimum Energy Performance	Required	
Y			Prereq	Building-Level Energy Metering	Required	
Y			Prereq	Fundamental Refrigerant Management	Required	
		6	Credit	Enhanced Commissioning	6	
18			Credit	Optimize Energy Performance	18	
1			Credit	Advanced Energy Metering	1	
		2	Credit	Demand Response	2	
3			Credit	Renewable Energy Production	3	
1			Credit	Enhanced Refrigerant Management	1	
		2	Credit	Green Power and Carbon Offsets	2	

7	0	7	Materials and Resources			14
Y			Prereq	Storage and Collection of Recyclables	Required	
Y			Prereq	Construction and Demolition Waste Management Planning	Required	
		6	Credit	Building Life-Cycle Impact Reduction	6	
2			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2	
2			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2	
1		1	Credit	Building Product Disclosure and Optimization - Material Ingredients	2	
2			Credit	Construction and Demolition Waste Management	2	
4	0	6	Indoor Environmental Quality			10
Y			Prereq	Minimum Indoor Air Quality Performance	Required	
Y			Prereq	Environmental Tobacco Smoke Control	Required	
		2	Credit	Enhanced Indoor Air Quality Strategies	2	
2		1	Credit	Low-Emitting Materials	3	
1			Credit	Construction Indoor Air Quality Management Plan	1	
		3	Credit	Daylight	3	
1			Credit	Quality Views	1	
3	0	3	Innovation			6
2		3	Credit	Innovation	5	
1			Credit	LEED Accredited Professional	1	
4	0	0	Regional Priority			4
1			Credit	Regional Priority: Specific Credit	1	
1			Credit	Regional Priority: Specific Credit	1	
1			Credit	Regional Priority: Specific Credit	1	
1			Credit	Regional Priority: Specific Credit	1	
62	2	46	TOTALS			Possible Points: 110
Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110						





# TWO FURTHER CIRCULAR PROJECTS :





## VILADECANS DELTA BUSINESS CENTER

circular economy SÒCRATES BUILDING as a case study

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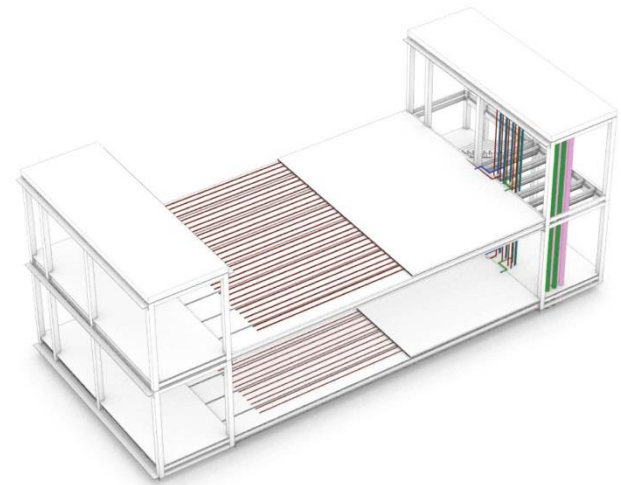
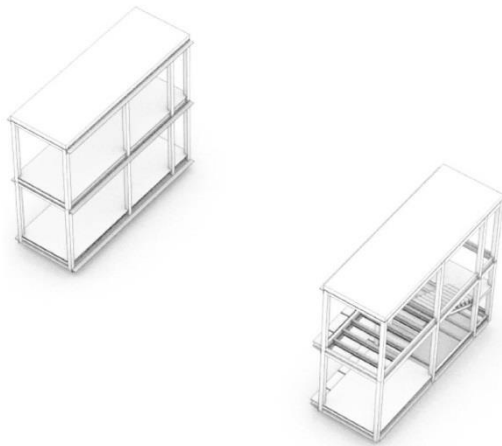
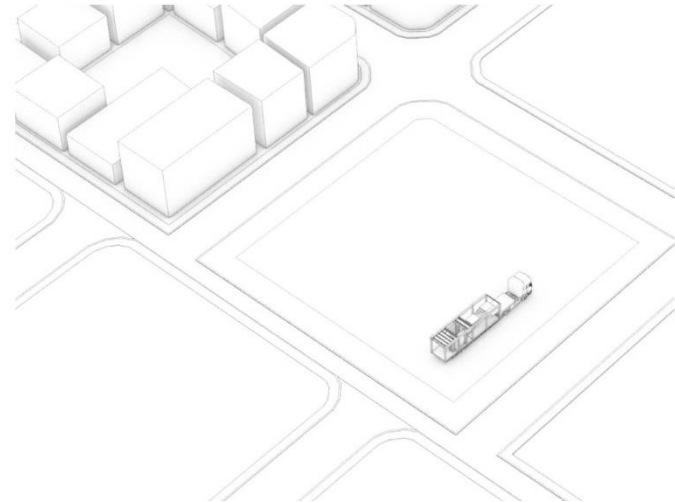
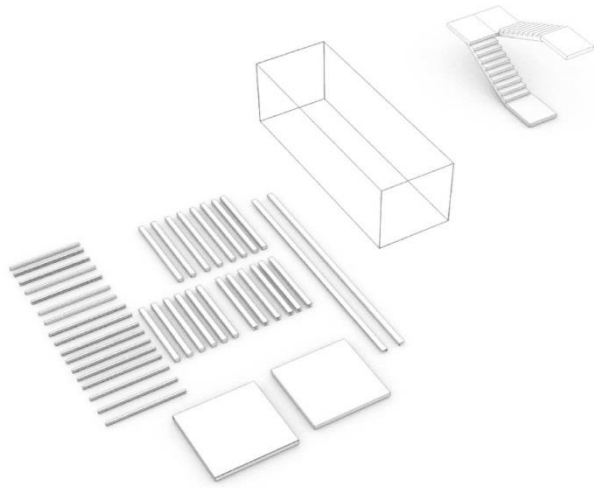
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THANK YOU

