P5

CARS IN TECHNOPOLIS

FUTURE CARS AND BUILDING INTEGRATED

HAMON HAWEZY

Content

-Background
-Research
-Starting point and design principles
-Location
-Urban plan
-The building

Fascination

Fascinated by cars and comfortable living, now I want to explore the possibilities in combining them in a new building design.

“I love my car so much that i hide it in a garage from the world (and from myself) because it has to stay safe”

Video 1

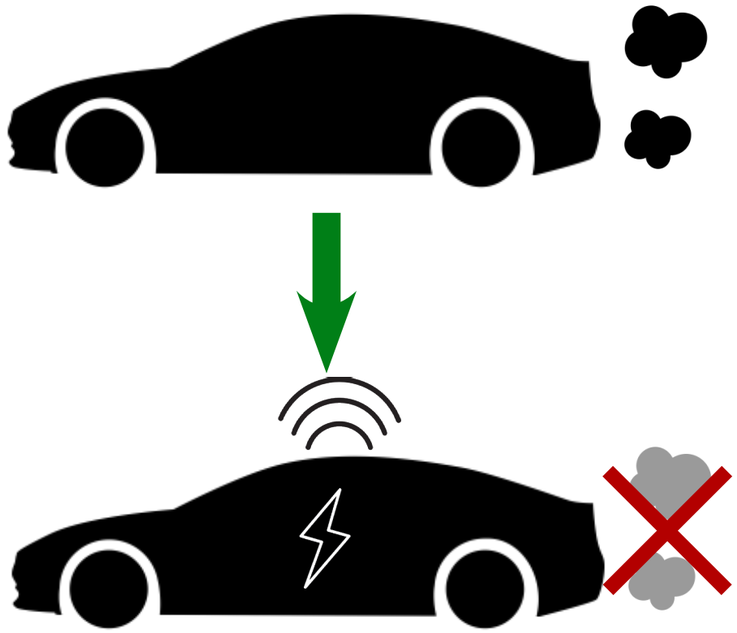
Problem statement

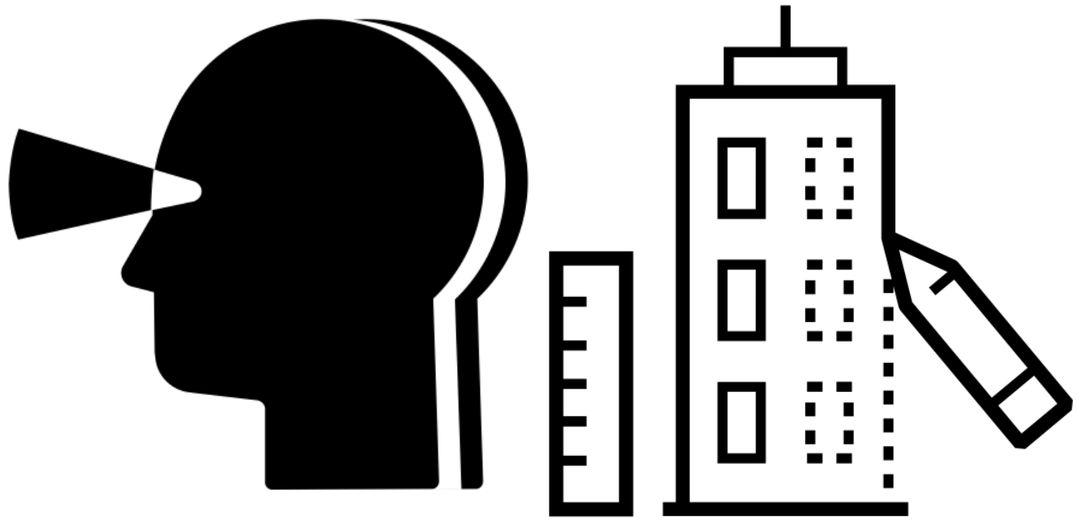
Architects and planners have been forced to confront the challenge of accommodating the car within thebuilt environment from the moment self-powerd vehicles took the streets in the last decade of the nineteenth century.

(Murray Fraser & Joe Kerr, Motopia: Cities, Cars and Architecture, Book: Autopia: Cars and Culture,2002).

Norman Foster, Future is now forum:

- 19th century Manure crisis was solved by innovation of cars
- The car, which is todays enemy was yesterday the friend, the saviour. The health threatening crisis, that needs the same kind of action globally.





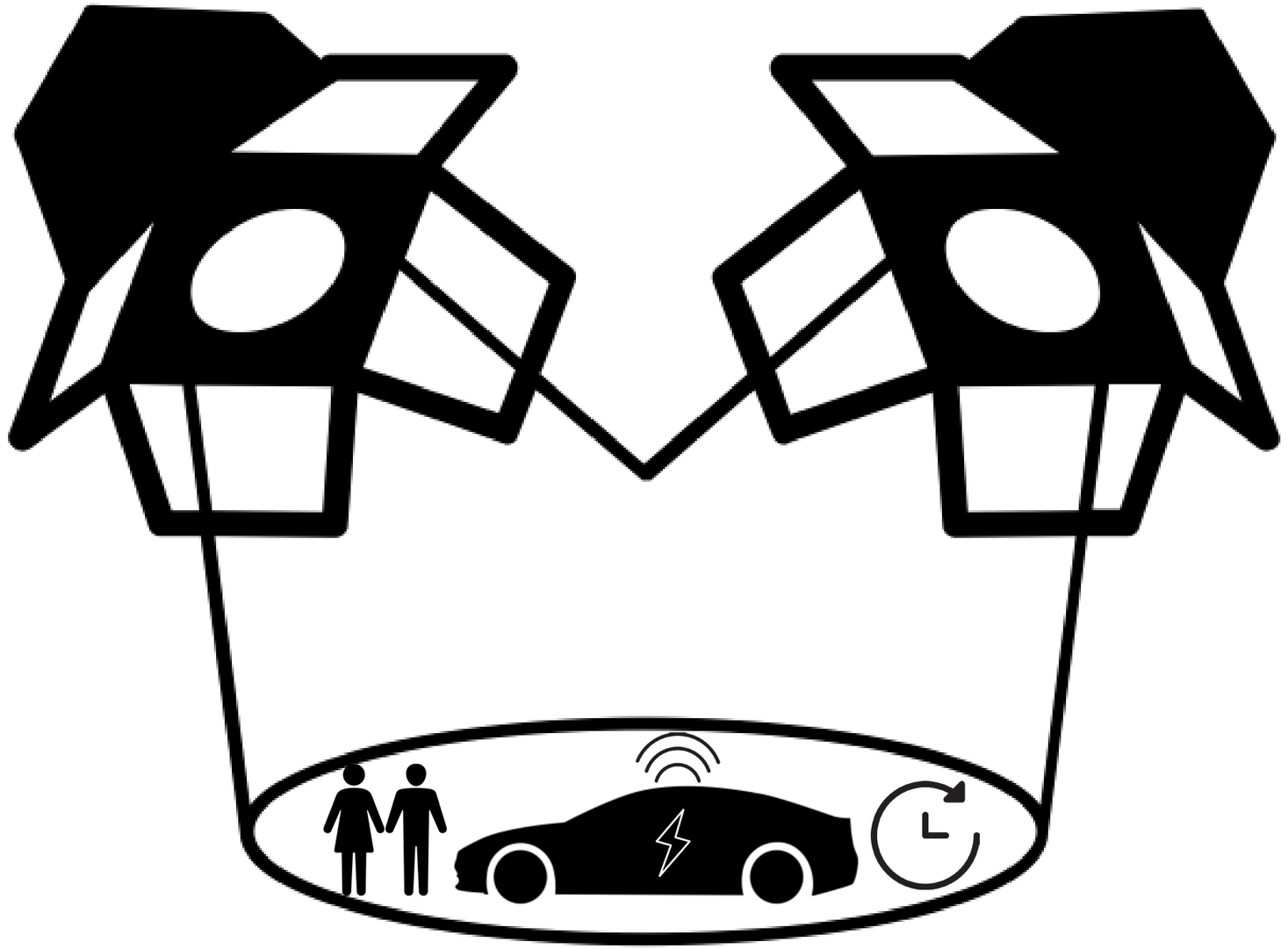
The cars are changing, this has consequences for the future design of buildings.

Objective

Developing a design in which the future electric car is integrated into a new building to use this project as a showcase of the future possibilities.

The electric car of future becomes a part of the building, adds to comfort for the user and the sustainablity.

Overall design question



How can the future electric car be integrated in a new luxury apartment building for car enthusiasts which is placed in a new complex where the future car use is showcased?

Thematic research question

Assuming that cars are changing in the near future, how will architecture integrate and adapt to it?

Thematic research in two subjects:

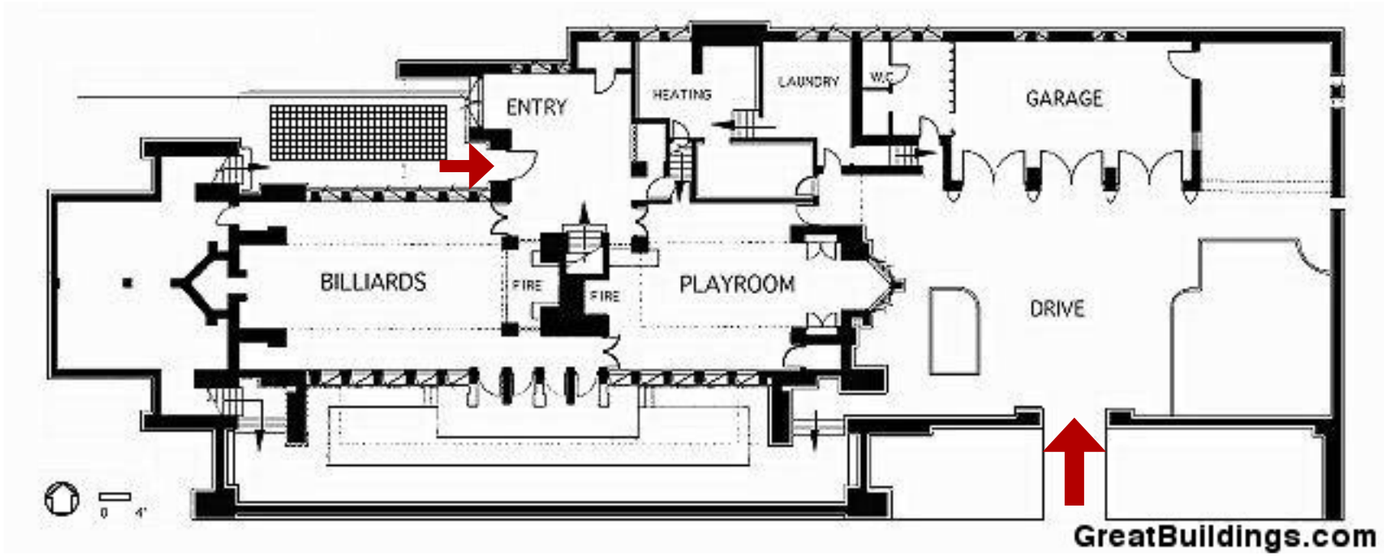
- Architecture (dimensions and integration)
- Technology (Sustainability)

Research

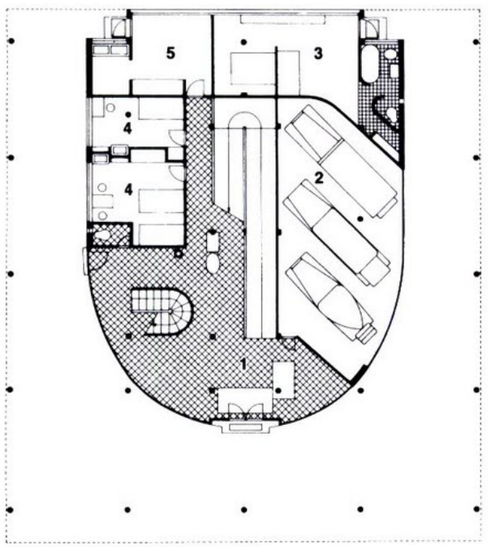
Relevance

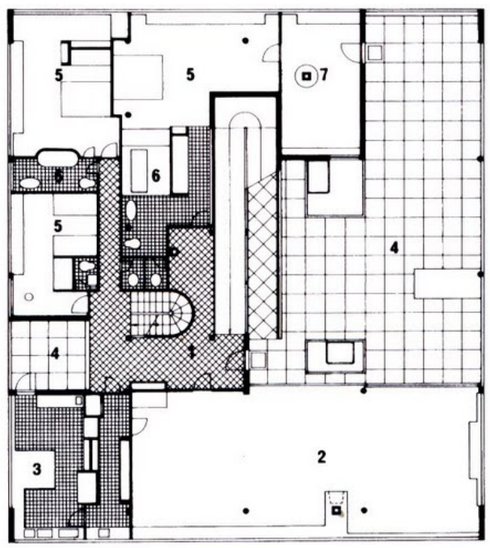
Cars have influenced architecture since the beginning of their existence.

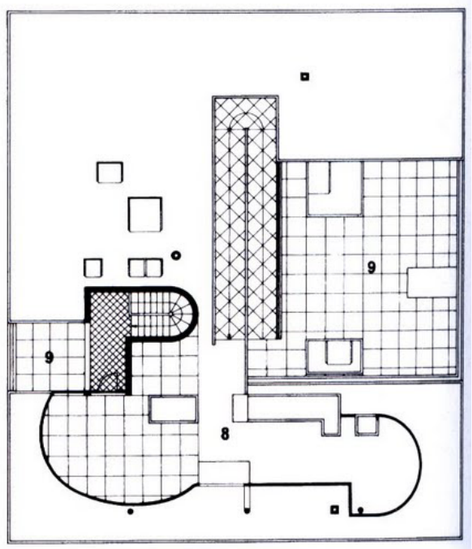
Robie House, 1909, Frank Lloyd Wright



Villa Savoye, 1930, Le corbusier

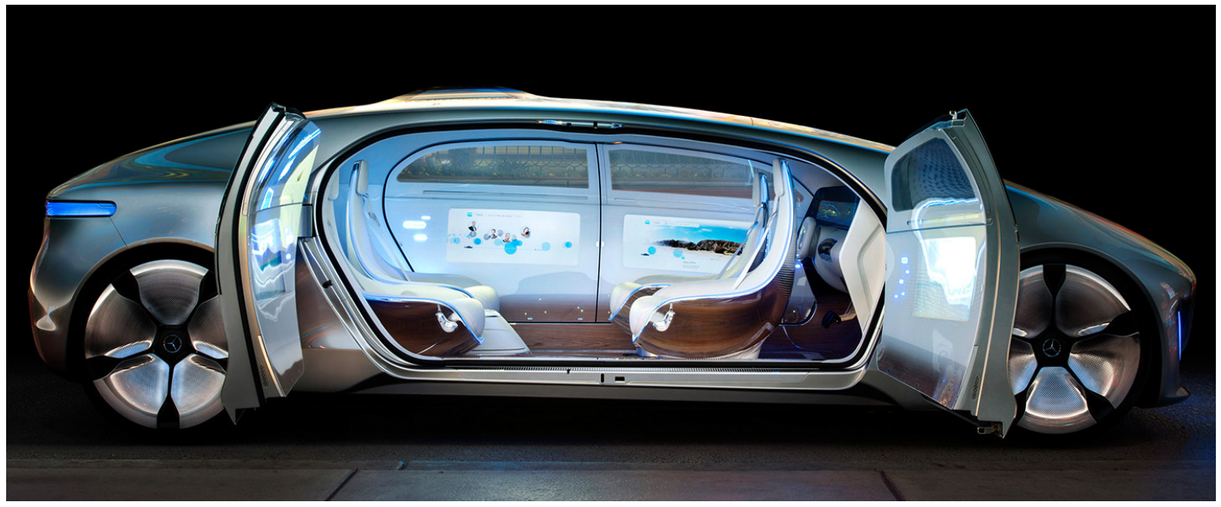






Future Cars

What are the future cars?



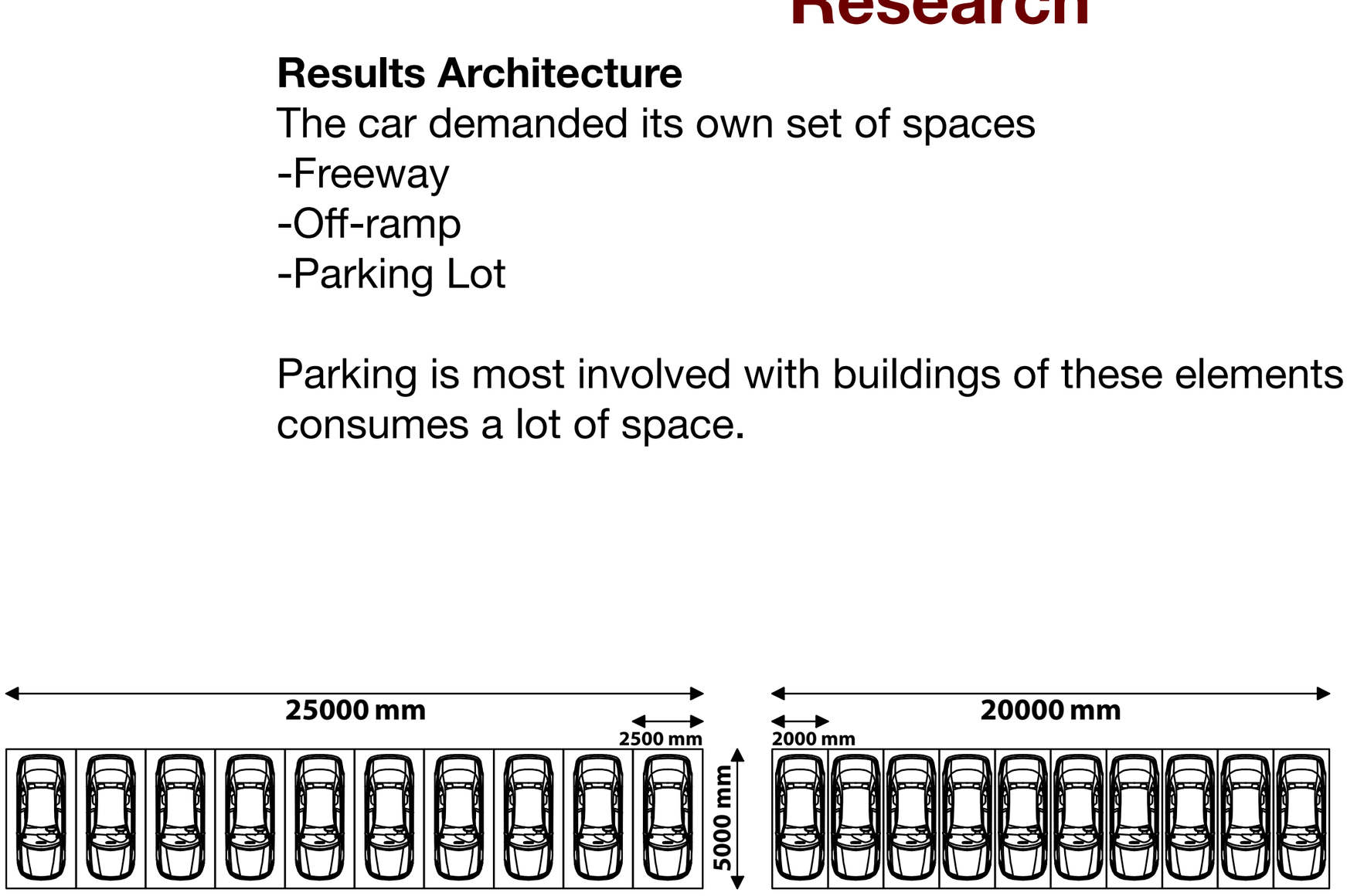
Self-Driving and Electric

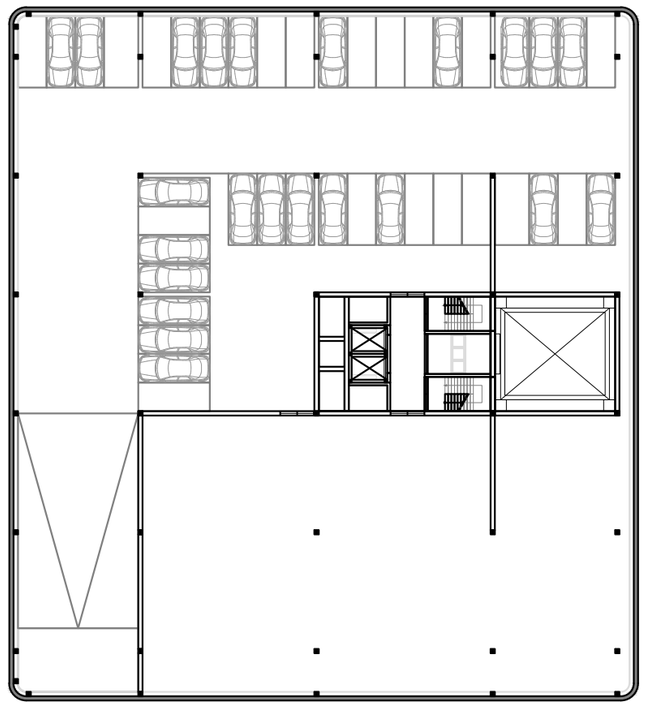
SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/ Deceleration	*Monitoring* of Driving Environment	Fallback Performance of *Dynamic Driving Task*	System Capability *(Driving Modes)*
***Human driver* monitors the driving environment**						
0	**No Automation**	the full-time performance by the *human driver* of all aspects of the *dynamic driving task*, even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	**Driver Assistance**	the *driving mode*-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	Human driver and system	Human driver	Human driver	Some driving modes
2	**Partial Automation**	the *driving mode*-specific execution by one or more driver assistance systems of both steering and acceleration/ deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	**System**	Human driver	Human driver	Some driving modes
***Automated driving system* ("system") monitors the driving environment**						
3	**Conditional Automation**	the *driving mode*-specific performance by an *automated driving system* of all aspects of the dynamic driving task with the expectation that the *human driver* will respond	System	**System**	Human driver	Some driving modes
4	**High Automation**	the *driving mode*-specific performance by an automated driving system of all aspects of the *dynamic driving task*, even if a *human driver* does not respond appropriately to a *request to intervene*	System	System	**System**	Some driving modes
5	**Full Automation**	the full-time performance by an *automated driving system* of all aspects of the *dynamic driving task* under all roadway and environmental conditions that can be managed by a *human driver*	System	System	System	**All driving modes**

Research

Results Architecture
The car demanded its own set of spaces
-Freeway
-Off-ramp
-Parking Lot

Parking is most involved with buildings of these elements, but it consumes a lot of space.



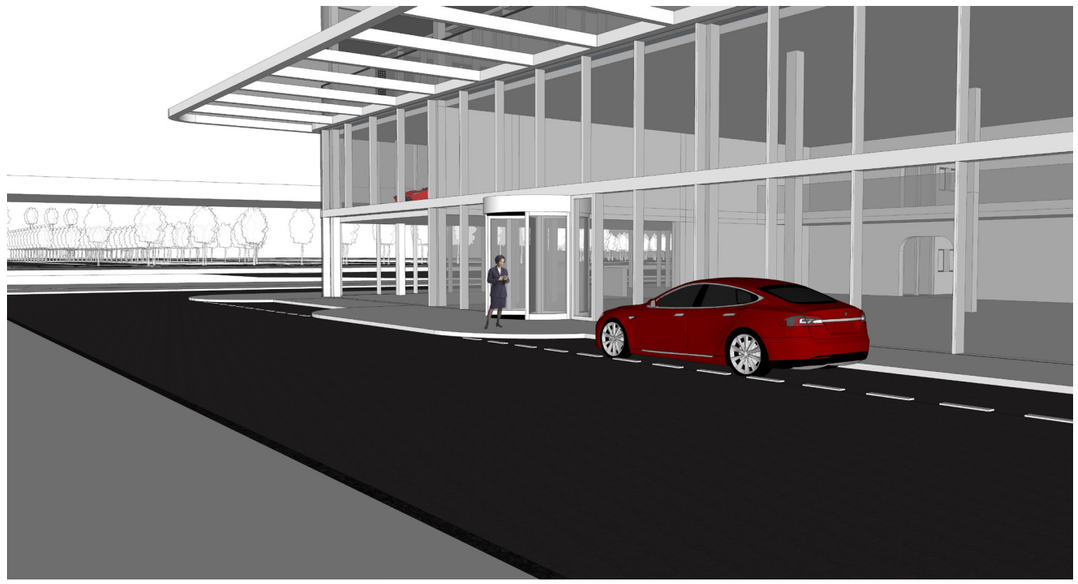


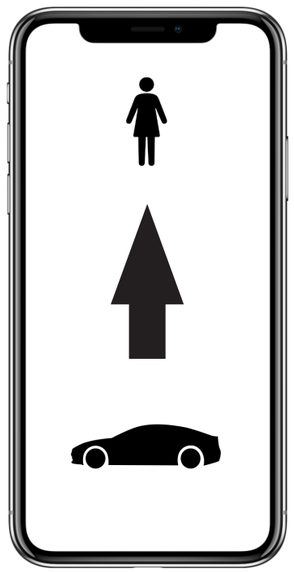
Parking spaces in the basement of the design

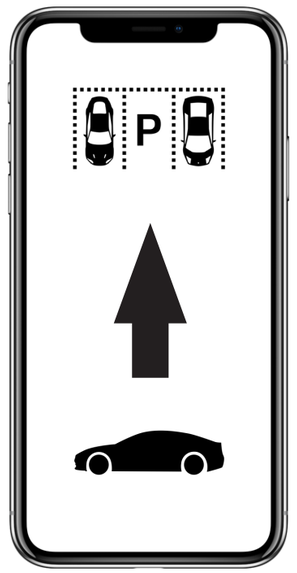
Self driving cars can save space, not only in parking space but also routing and accessibility of parking garages.

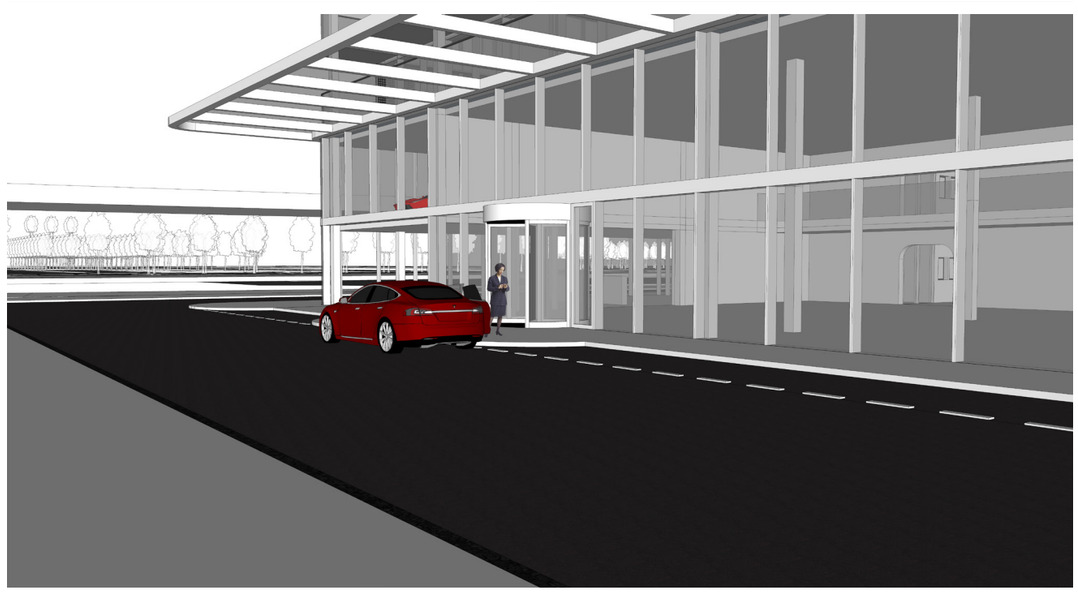
Research

The way we arrive and depart at our location by car will change.









The place where the user can get in or out of the car, concerning **safety** and **functionality** and it should be **integrated** in urban design and architecture.

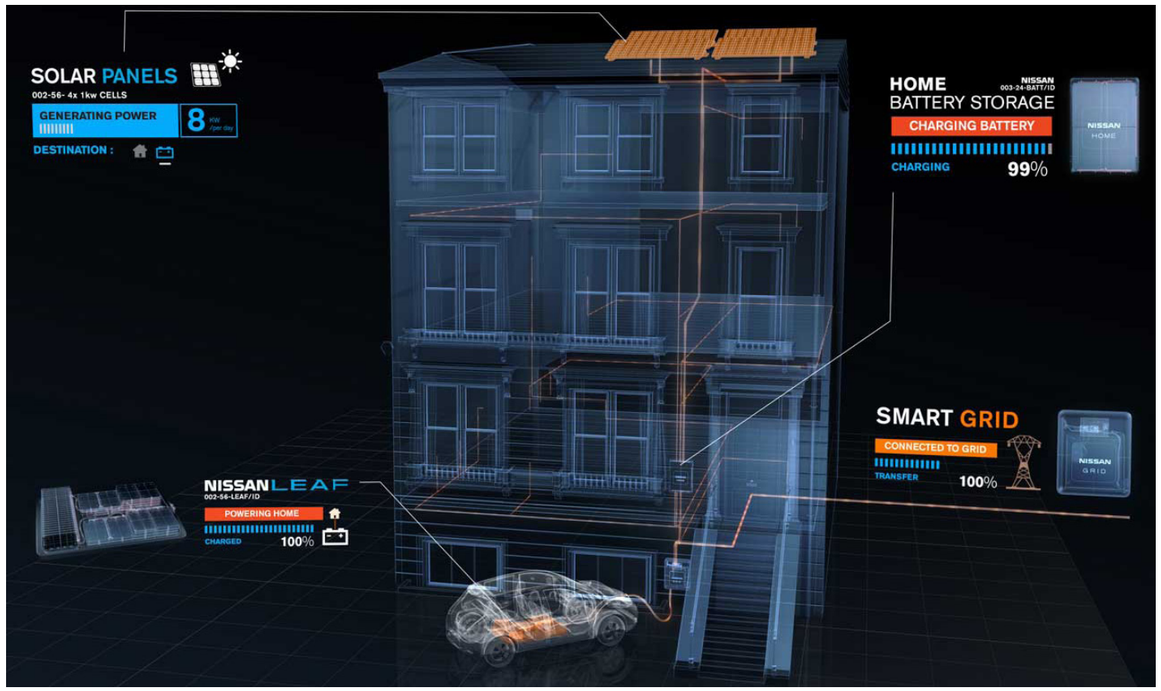
Research

Results Sustainability

Car battery capacities are increasing

Example:
Tesla Model S has batteries up to 100 kWh
Full battery can drive +/- 600 km
We do not need to drive 600 km every day
Possibility to use the battery for energy storage

Foster + Partners concept with Nissan, March 2016



Lomboxnet, Utrecht, August 2016

Research

		KWH/M2/YEAR
VERTICAL	East	651,5
	South	862,4
	West	648,8
HORIZONTAL		1013,5

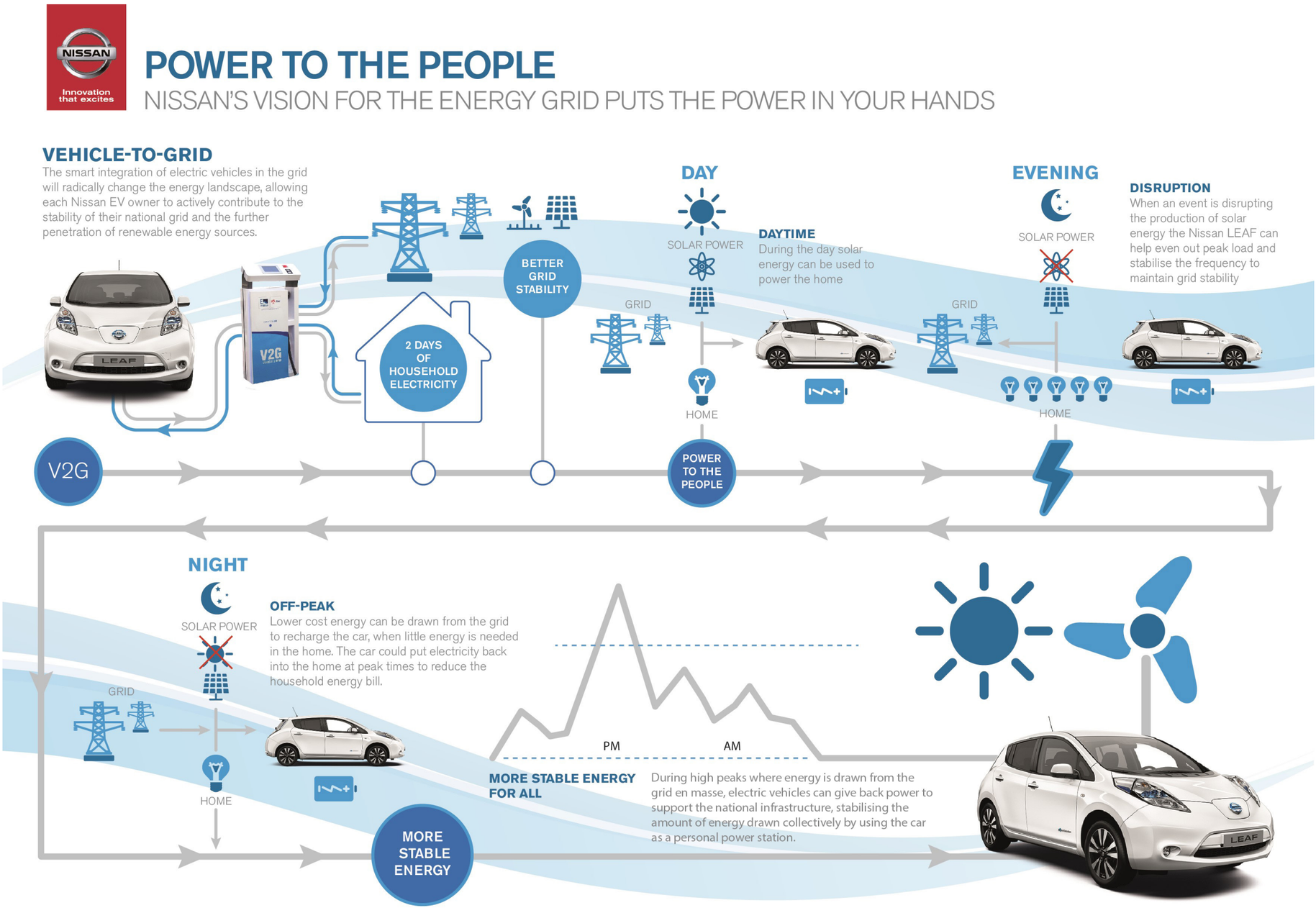
	M2 PV	FLOORS	FACTOR	KWH	
WEST					
MIDDLE	28,8	16		298967,0	
SOLAR CHIMNEY	14,4	16	0,8	119586,8	
SOUTH					
FENCE	18	18		279417,6	
EAST					
WINDOW	14,4	18	0,8	135095,04	
SOLAR CHIMNEY	14,4	18	0,8	135095,04	
ROOF					
SOUTH	113,4			114930,9	
TOP	376,2			381278,7	
NORTH	75,6		0,5	38310,3	
				1502681	**Total kwh solar energy per year**
430700	Total energy use building per year			**1071981**	Over production

Based on the battery of the example given, the over production of enery in my design can power 18 cars for 10.000 km per year.

Research

-V2G
-Peak shaving

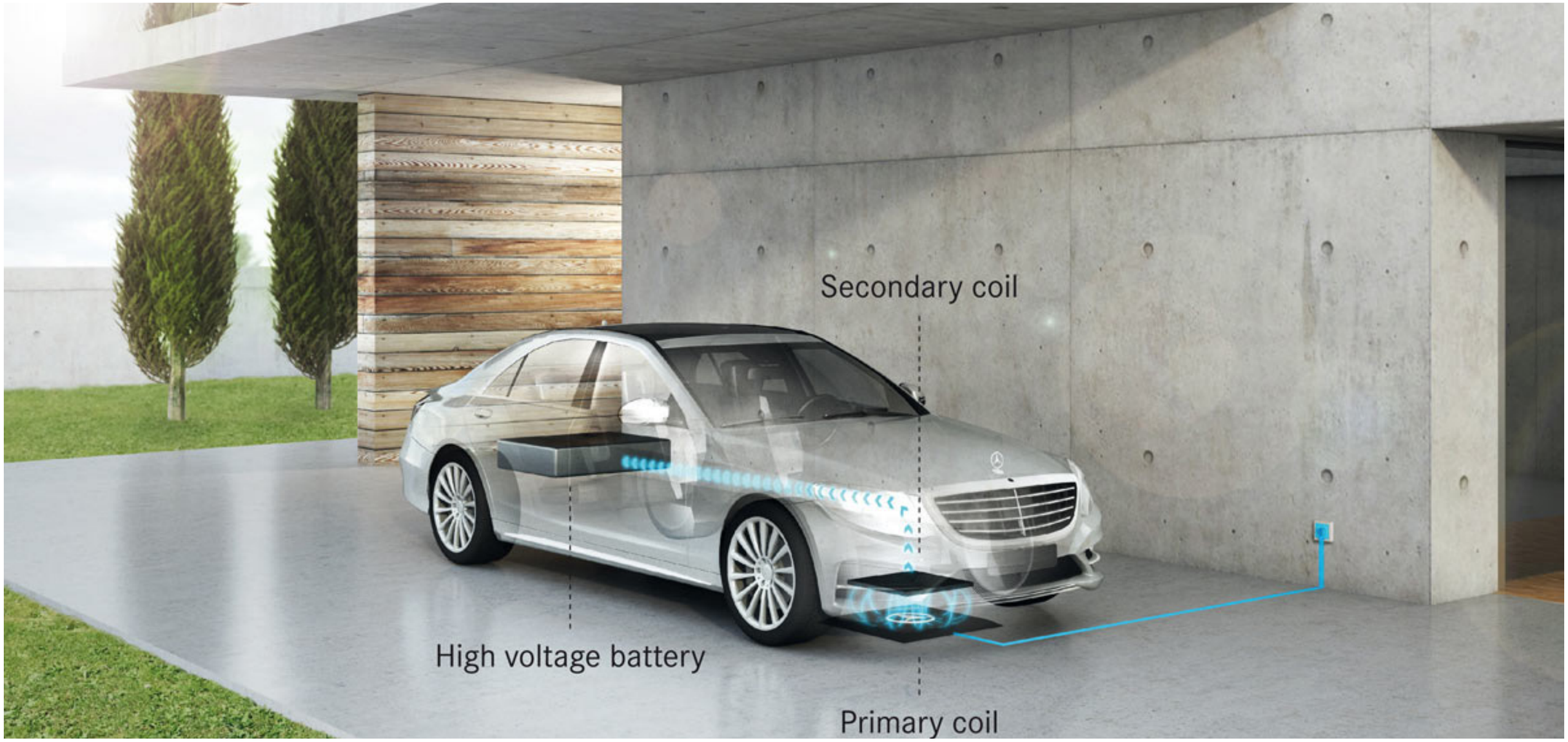
V2G system in Smart grid, Nissan



Research

Smart charging

Inductive charging, Mercedes-Benz



The car is no longer part of the the problem, but now becomes part of the solution to the environmental issue and the energy transition (ElaadNL, n.d.).

Research

Design principles

Directly
Architecture:
Integrated parking solution with automatic **valet parking** system and inductive charging in order to connect **V2G**.

Sustainability:
Possibility to calculate amount of **consumption** of energy of the building in relation to capacity of storage in cars.

As much **energy generation** with building as possible in order to make most **efficient** use of energy that is self-generated. Only if necessary use of the grid and if energy is redundant, giving back to the grid.

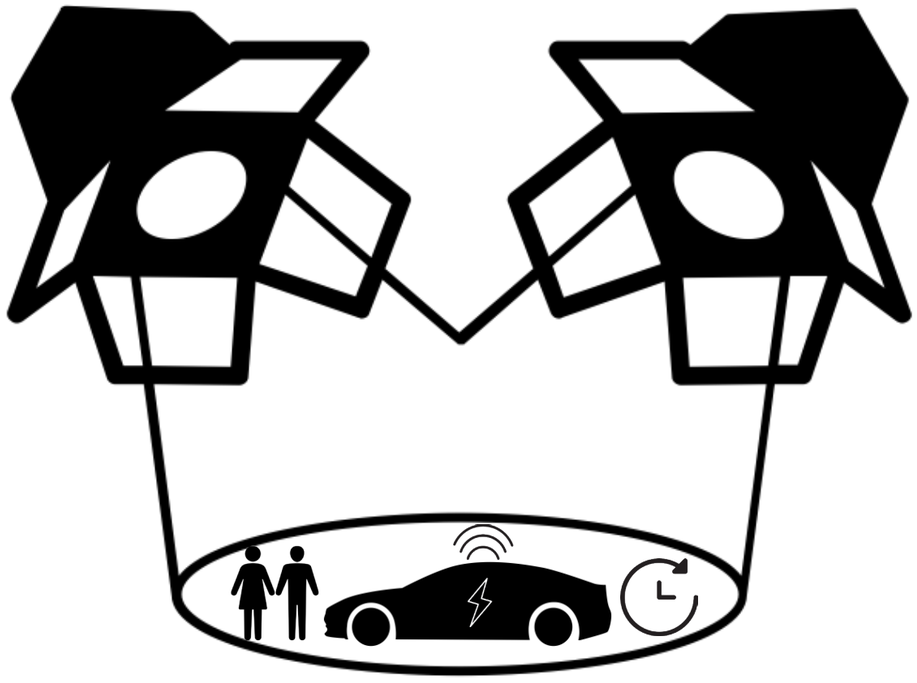
Indirectly
Energy efficient building strategy

Starting point and program

Starting point

Mixed program to showcase all facets of car use in everyday life:

- Apartments
- Offices
- Commercial
- Leisure
- Research (Involve TU-Delft)



Being prepared for the demands that future cars will have on architecture.

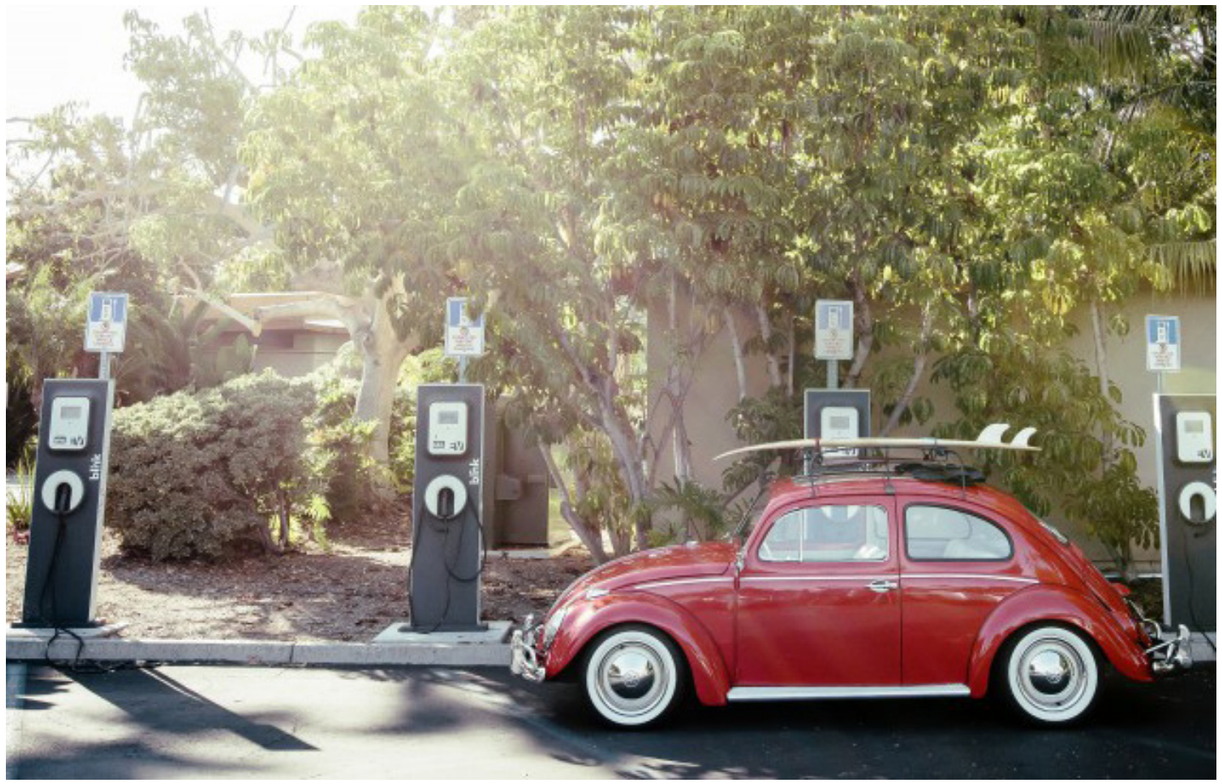
“The strategy of Tesla is to enter at the high end of the market, where customers are prepared to pay a premium, and then drive down market as fast as possible to higher unit volume and lower prices with each successive model”(Elon Musk, 2006)

Program

Added program

What about the beautiful cars that already exist?

Workshop where the beloved cars of today can be transformed to electric self-driving cars.



ZElectric cars, transform existing cars to electric

‘AutoX Has Built a Self-Driving Car That Navigates with a Bunch of $50 Webcams’

These cars need to be tested, which needs a test track and a save location.

Program

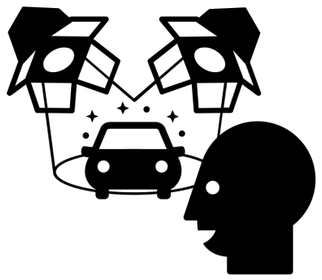
Luxury apartments
-Private car

Office
-External cars

Workshop
-Car transformation

Test/Race track
-Cars from Workshop

Exposition
-Showing cars of workshop



Restaurant
-External cars

Parking in apartmen
Parking in basement

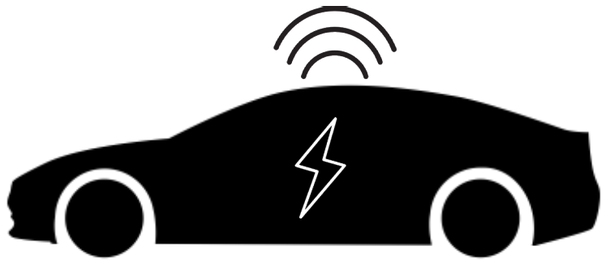
Parking in Garage

Own parking solution

Car vending machine

Parking in Garage

Parking in Garage
Parking outside



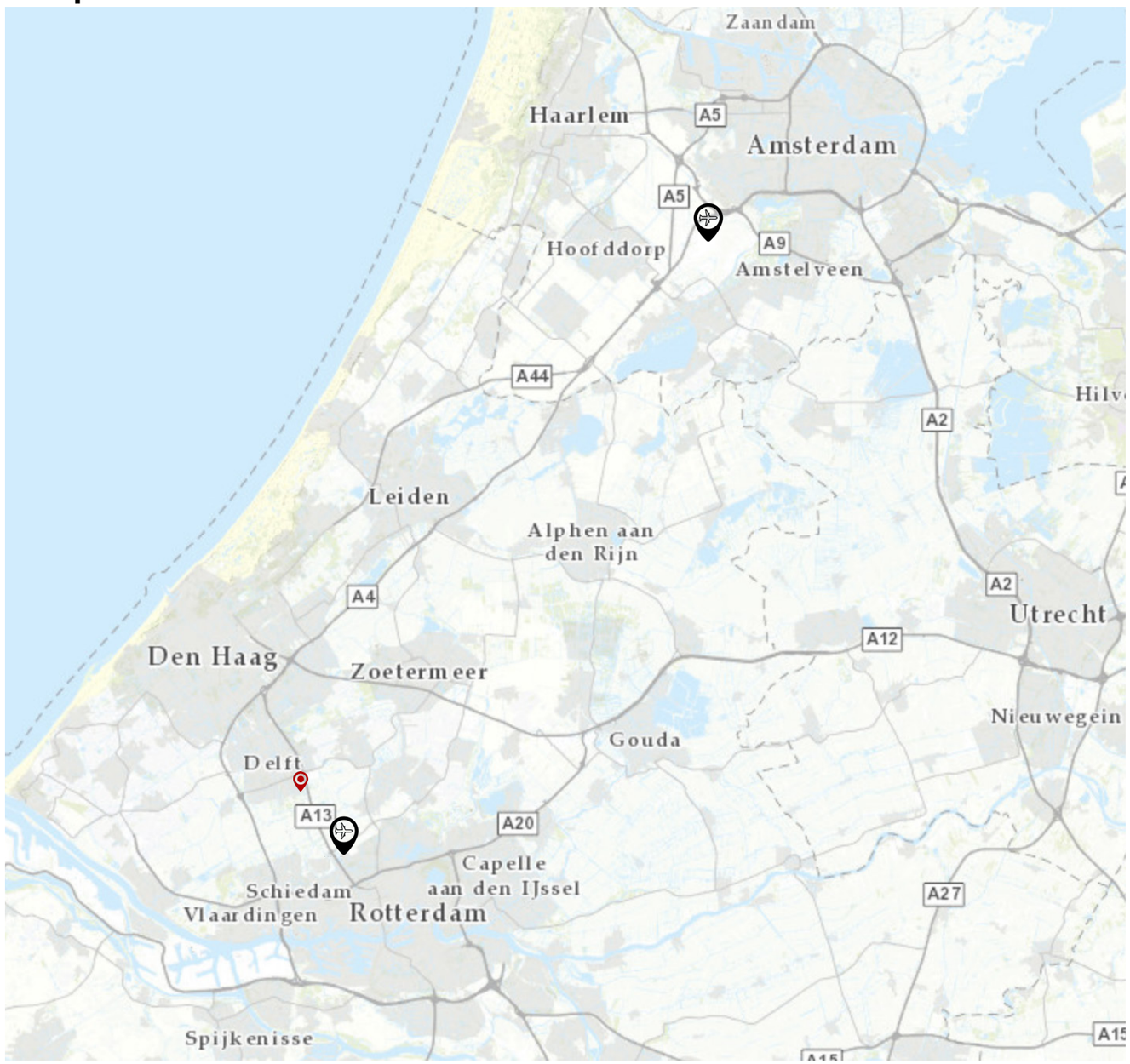
Types of car useres:

1. Private car owners
2. Internally shared car users
3. Visitors

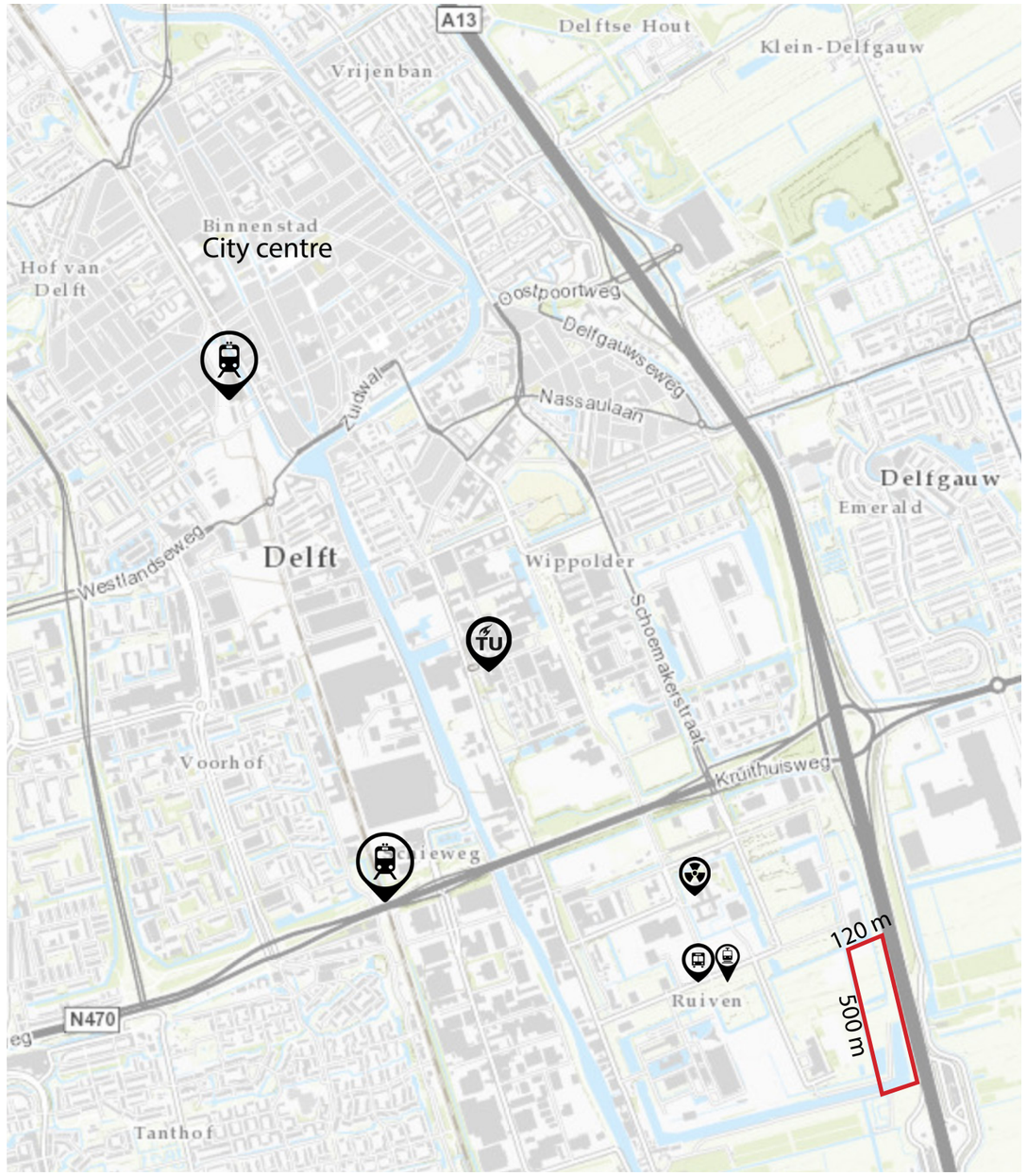
Location

Location

Airports



Delft



Location

Municipality of Deltft is envisioning a new business area on this location with large buildings and different functions in order to make it a new business and social place for the city.

Location

Google Earth towards The Hague

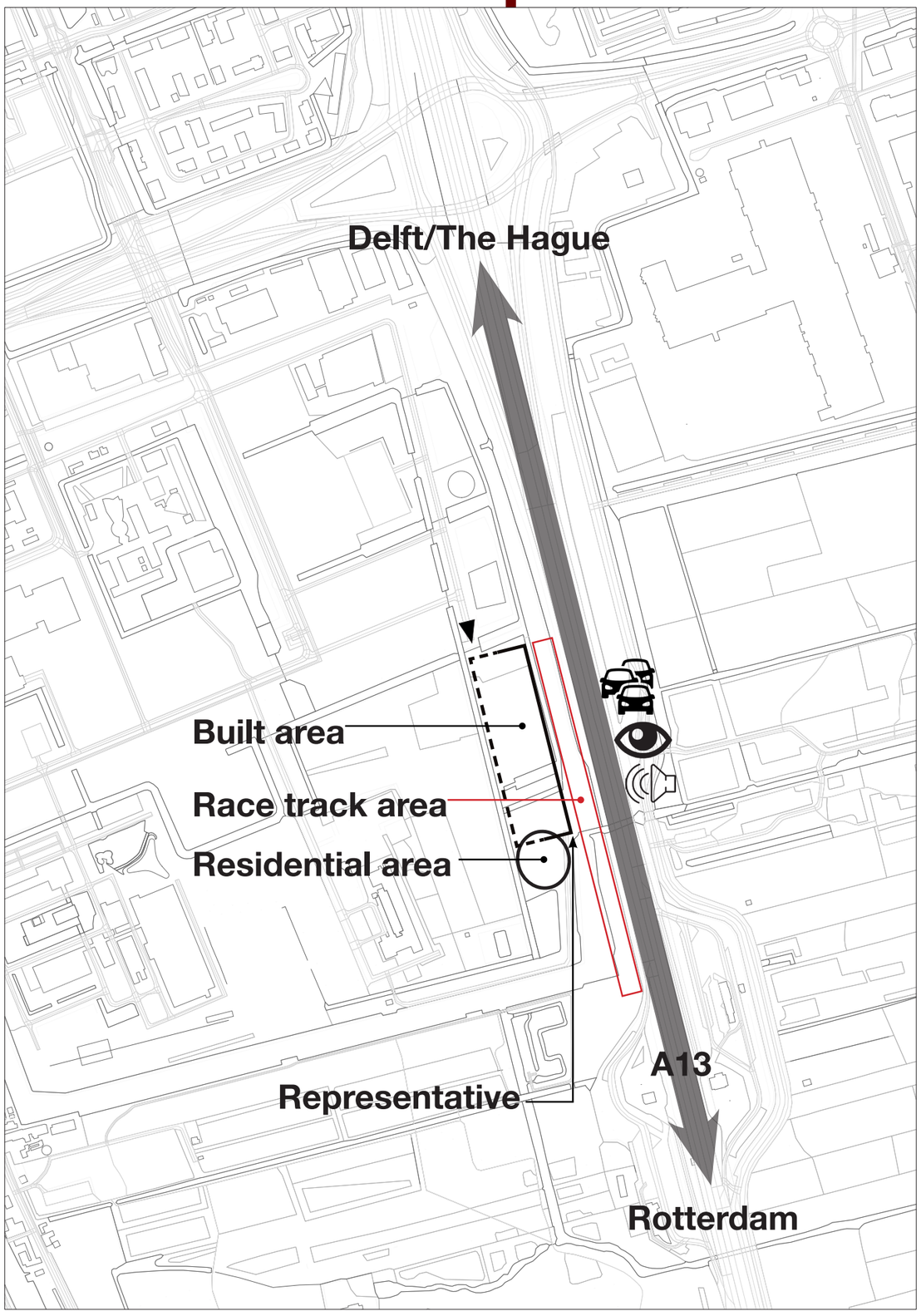
Photo from 20th floor EWI

Google Earth towards Rotterdam

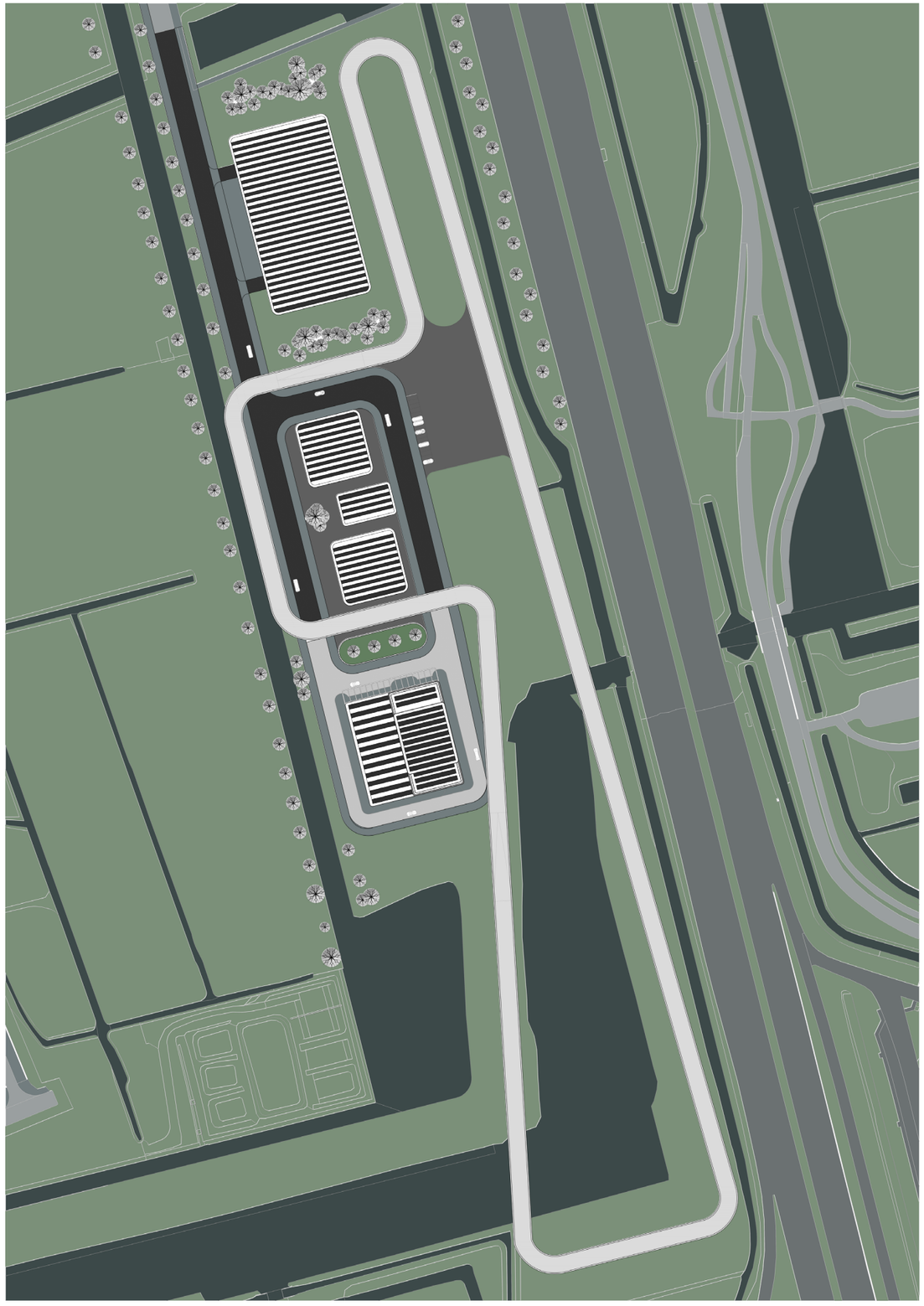
Photo from Exact 2nd floor

Urban plan

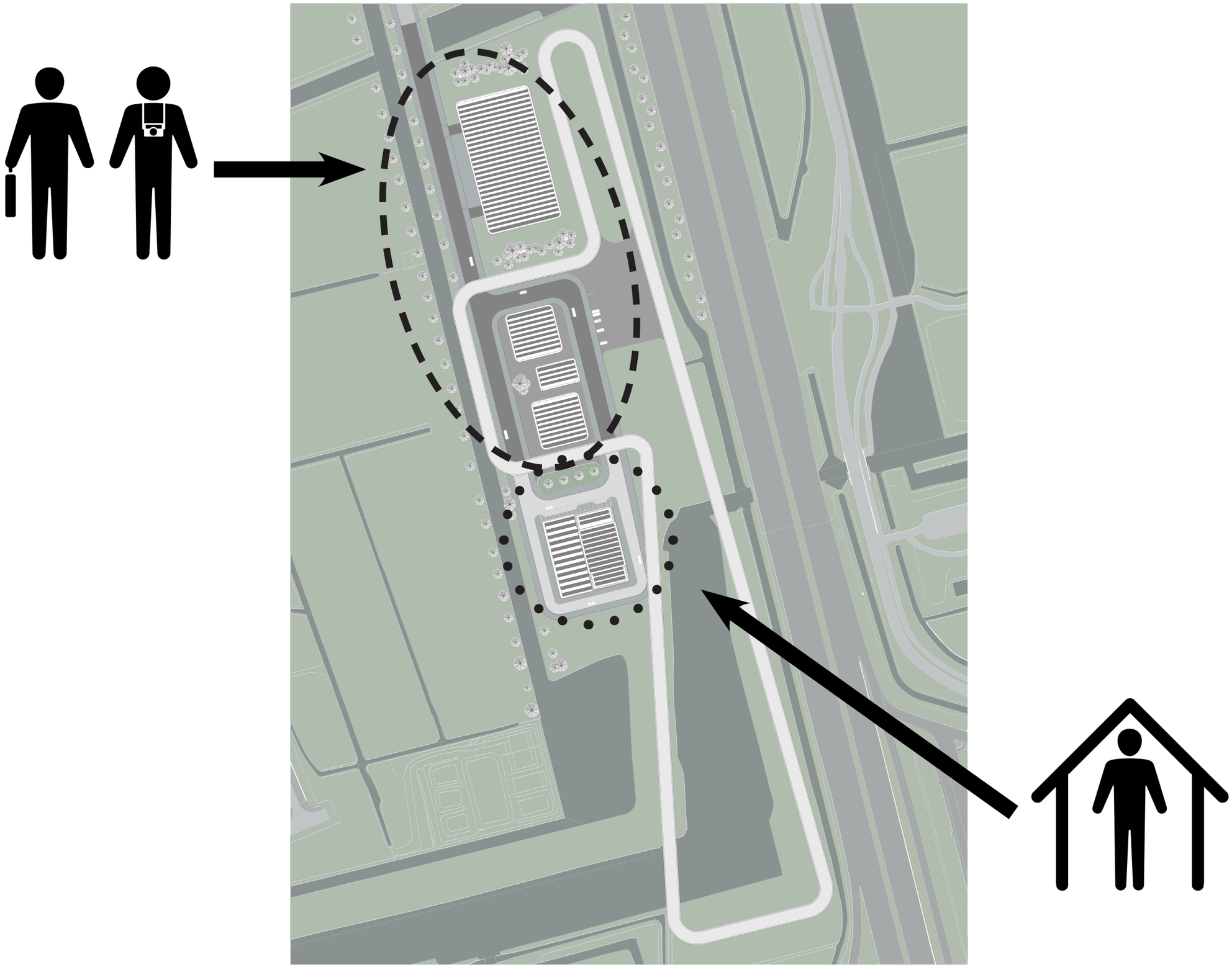
Urban plan


Delft/The Hague
Built area
Race track area
Residential area
Representative
A13
Rotterdam

Urban plan



Users

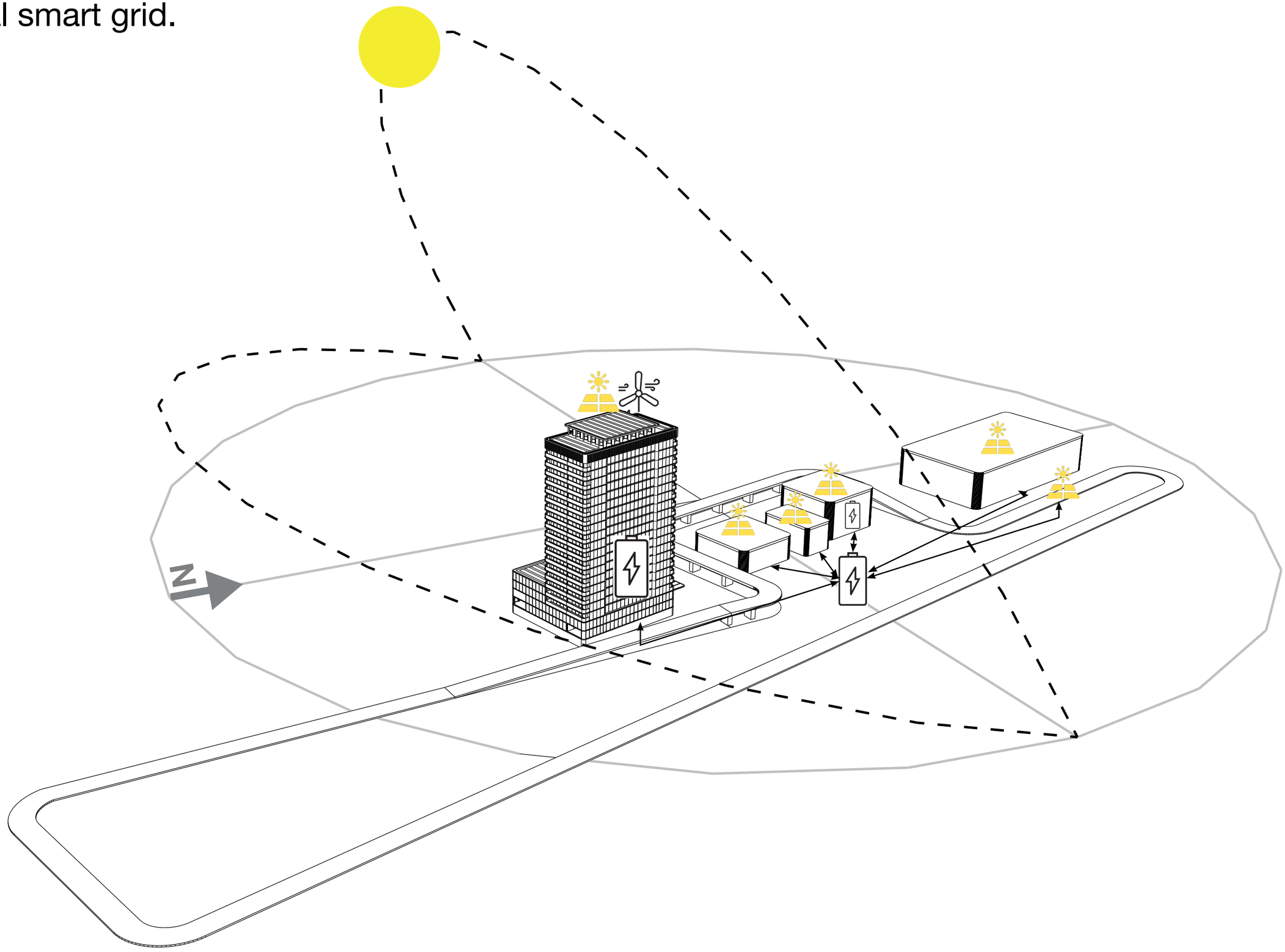


Urban plan

Uniformity in architectural language of all the buildings on the complex.

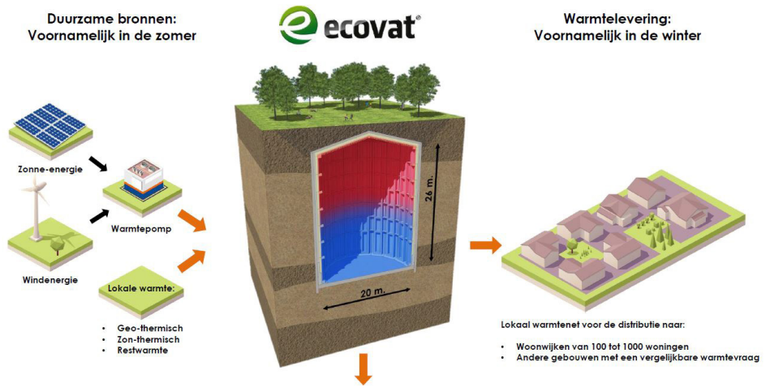
Urban plan

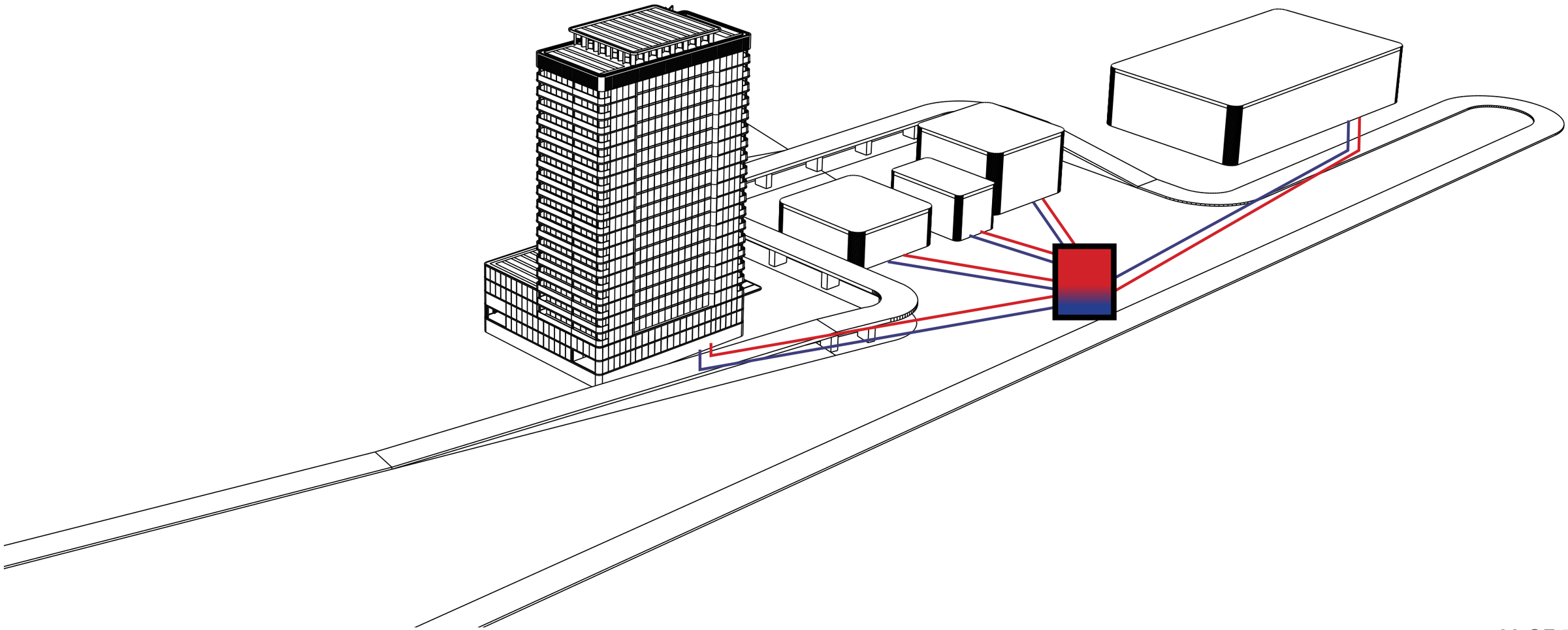
Local smart grid.



Urban plan

Not only a smart grid for electricity
Also for Heat and cold storage

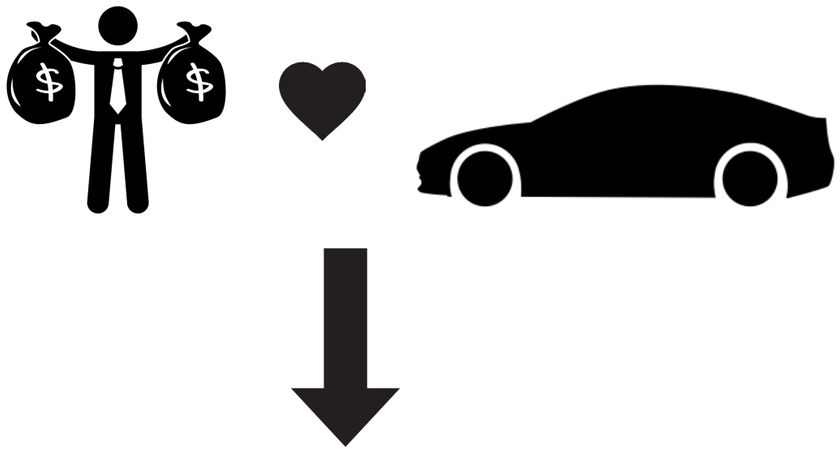


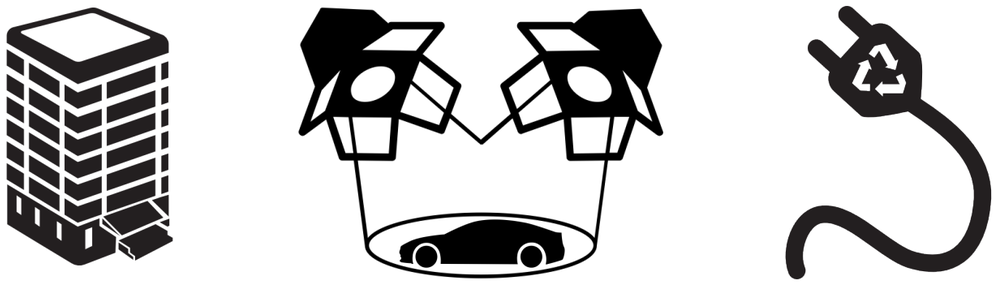


The building

Program

Luxury apartments for the car lovers





- High end Luxury
- High end Technology
- Enjoying the cars
- Luxury Amenities
- Reduce to minimun environmental pollution

Concept

The car as a building concept

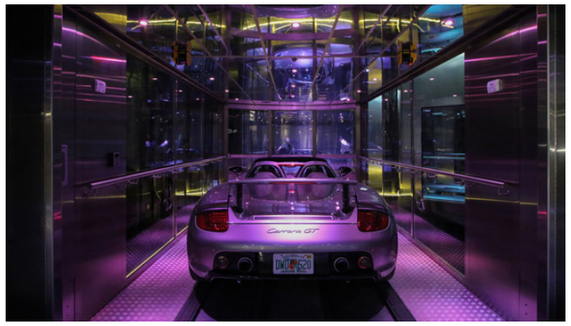
An efficient combination of smart technology in a vehicle

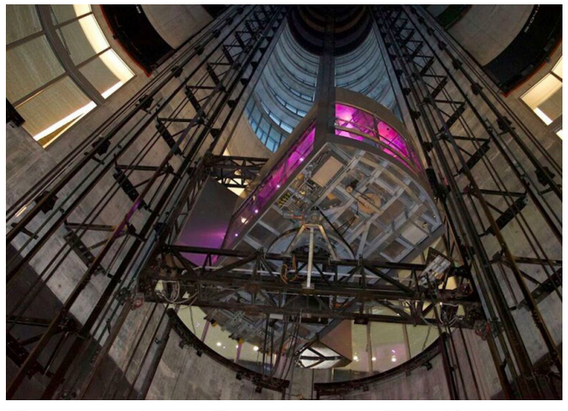
Attempted to use the same concept in a building

“A Rolls Royce of a building”

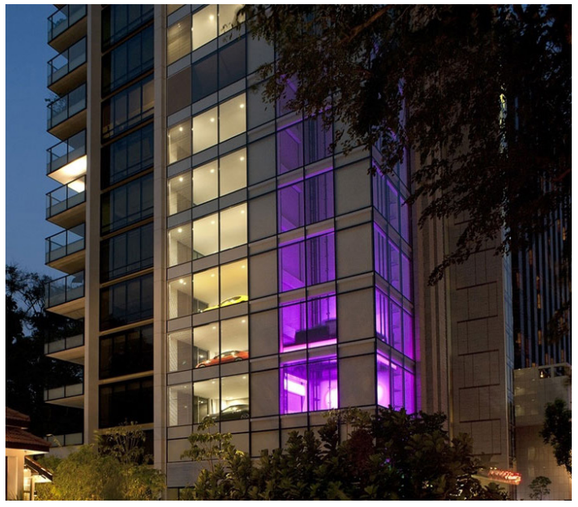
Like cars the building should be as dismountable as possible

References

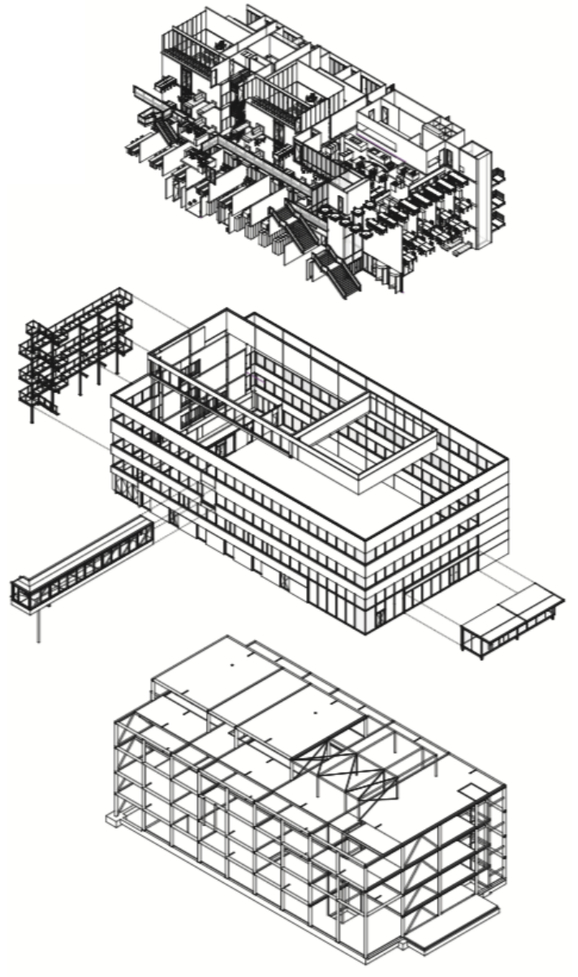




Porsche Design Building



Hamilton Scotts



Tijdelijke rechtbank

Design challenges

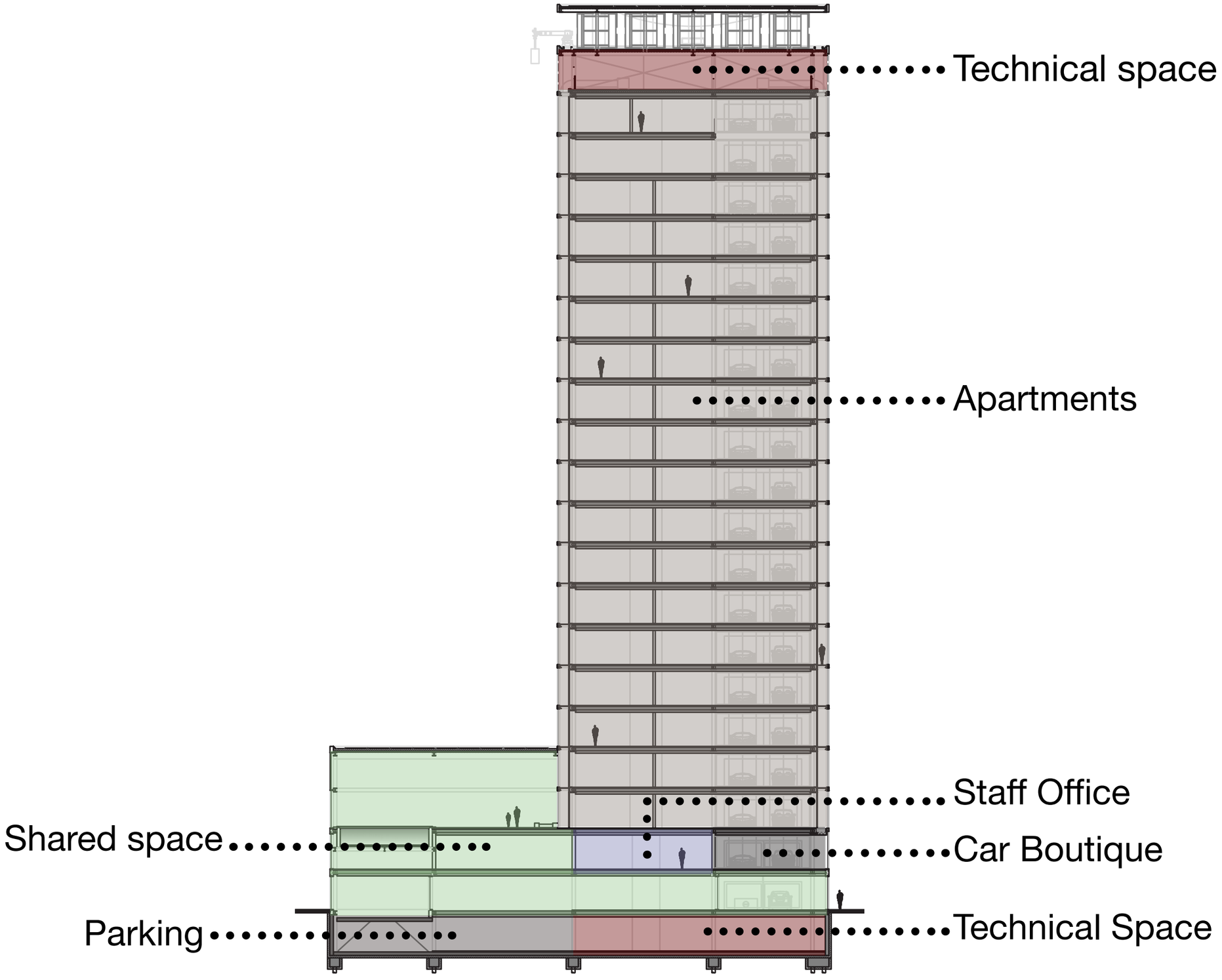
Showcase

- Cars in the appearance of the building
- Enjoying your car inside your livingroom

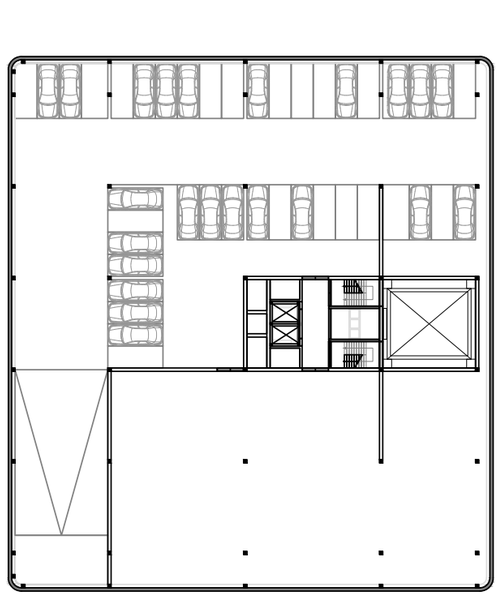
Elevator and car rooms become the backbone of the building

Designing a space for the cars that becomes part of the facade aswell as it becomes part of the interior of the apartment.

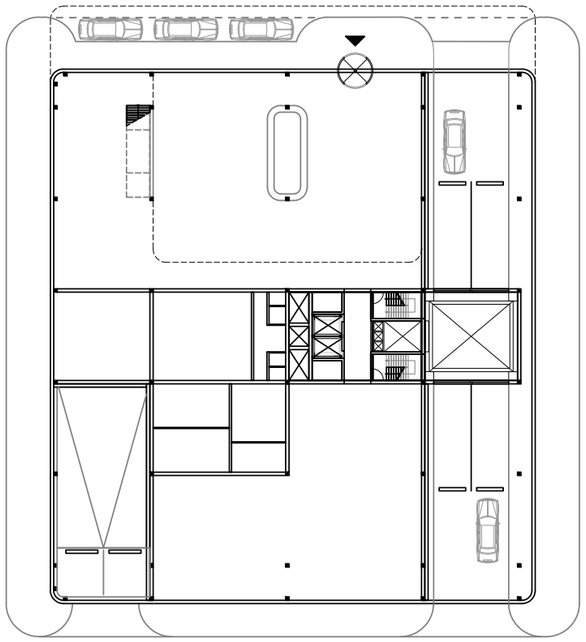
Organization



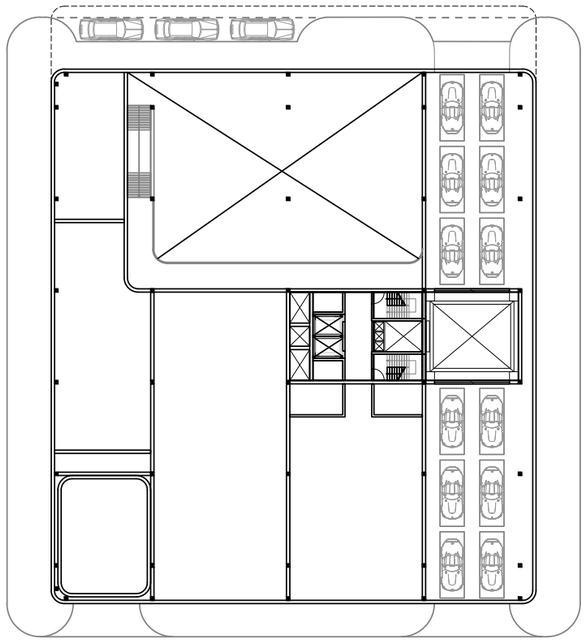
Floorplans



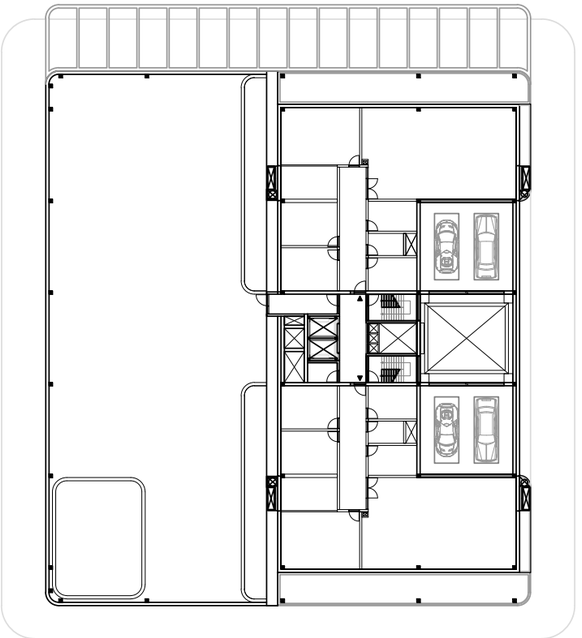
-1



Ground



1

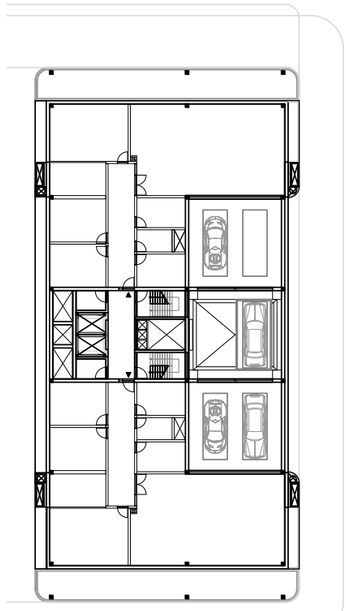


2

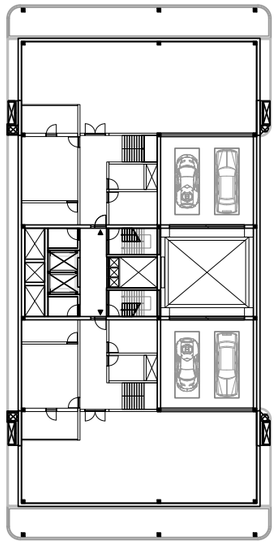
Amenities:

- Lobby
- Car park
- Bike storage
- Winter garden
- Pool
- Spa
- Gym
- Game room
- Cinema room
- Party room
- 24 hour staff and support

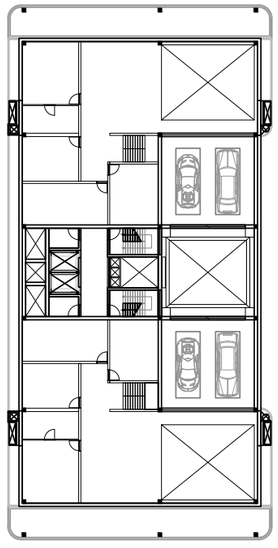
Floorplans



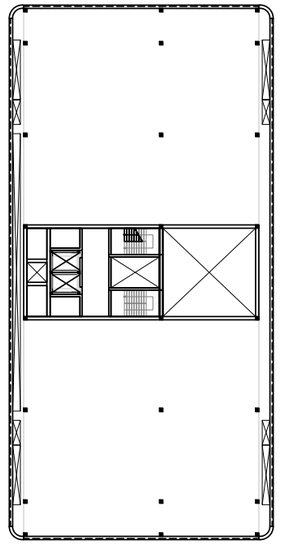
3-17



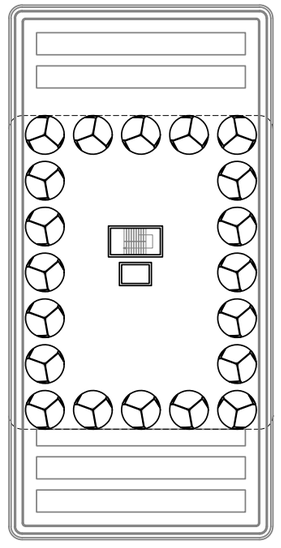
18



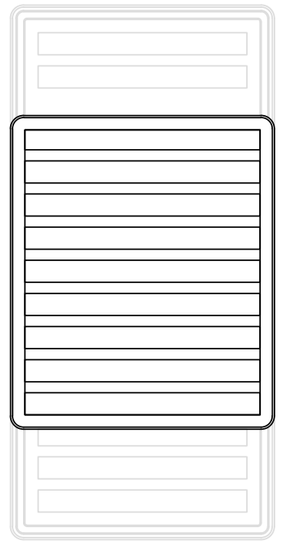
19



20

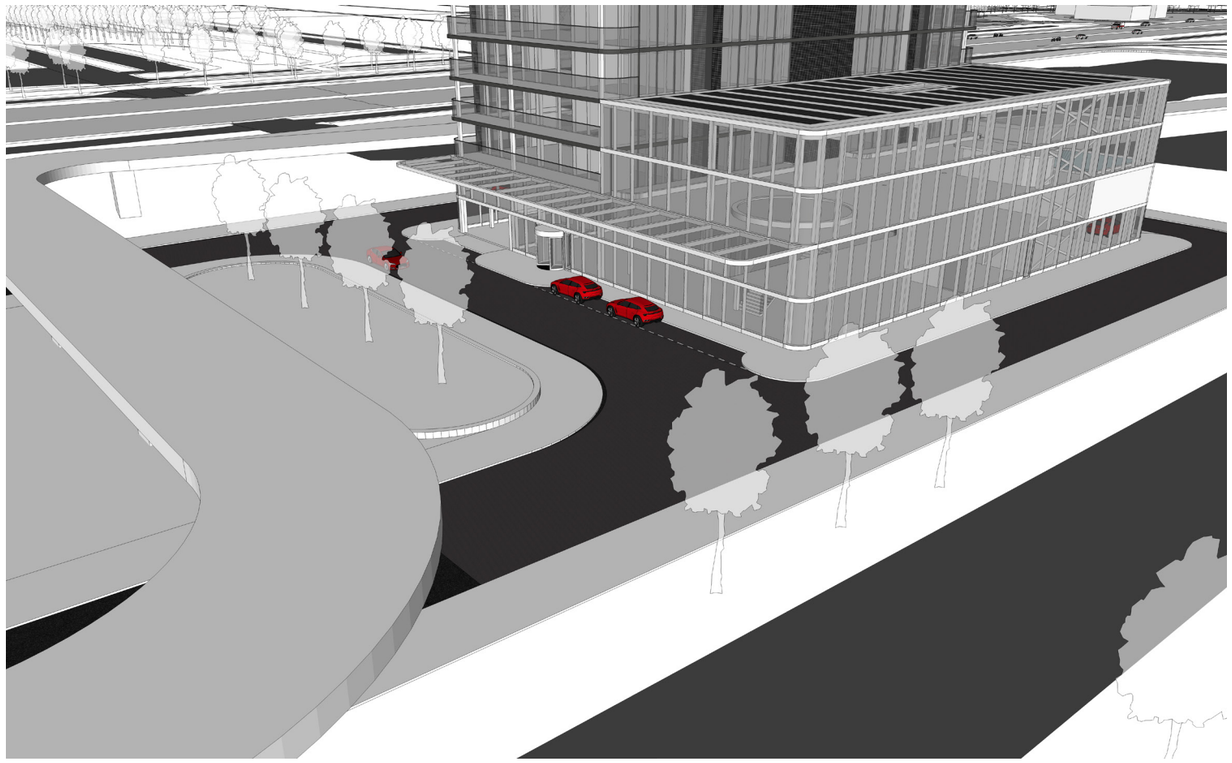


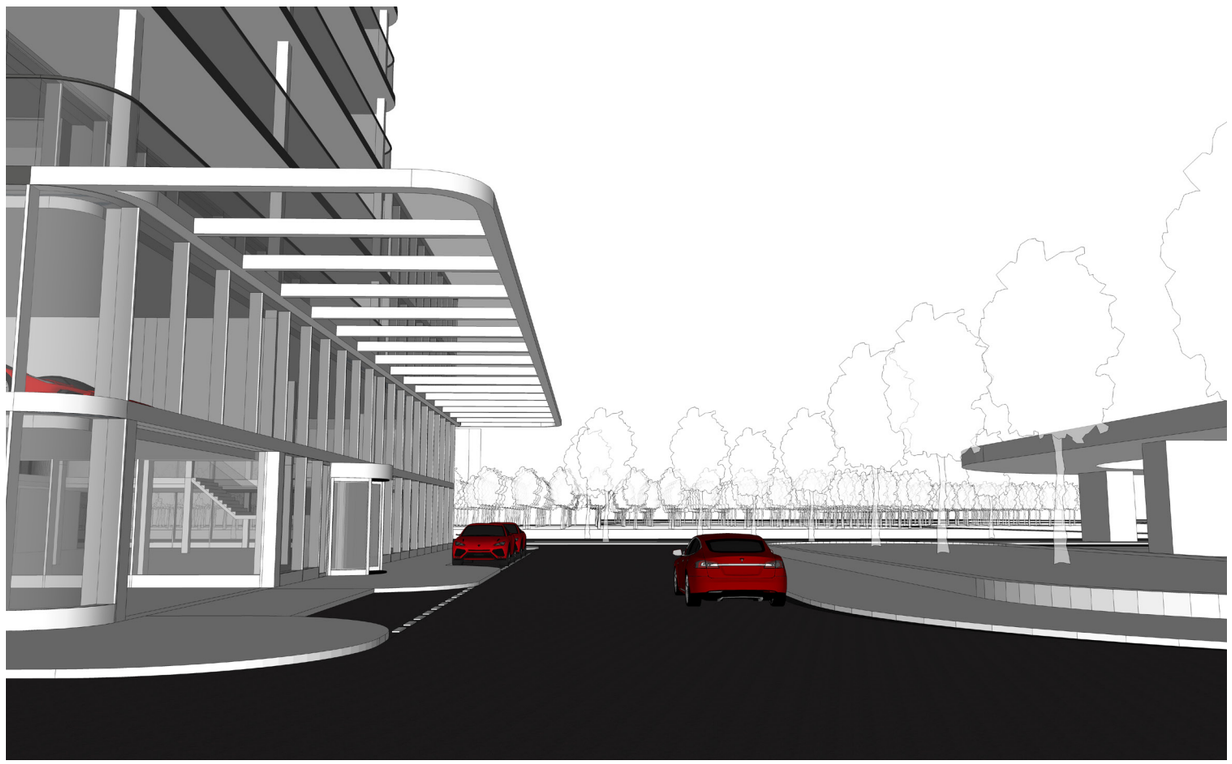
Roof 1

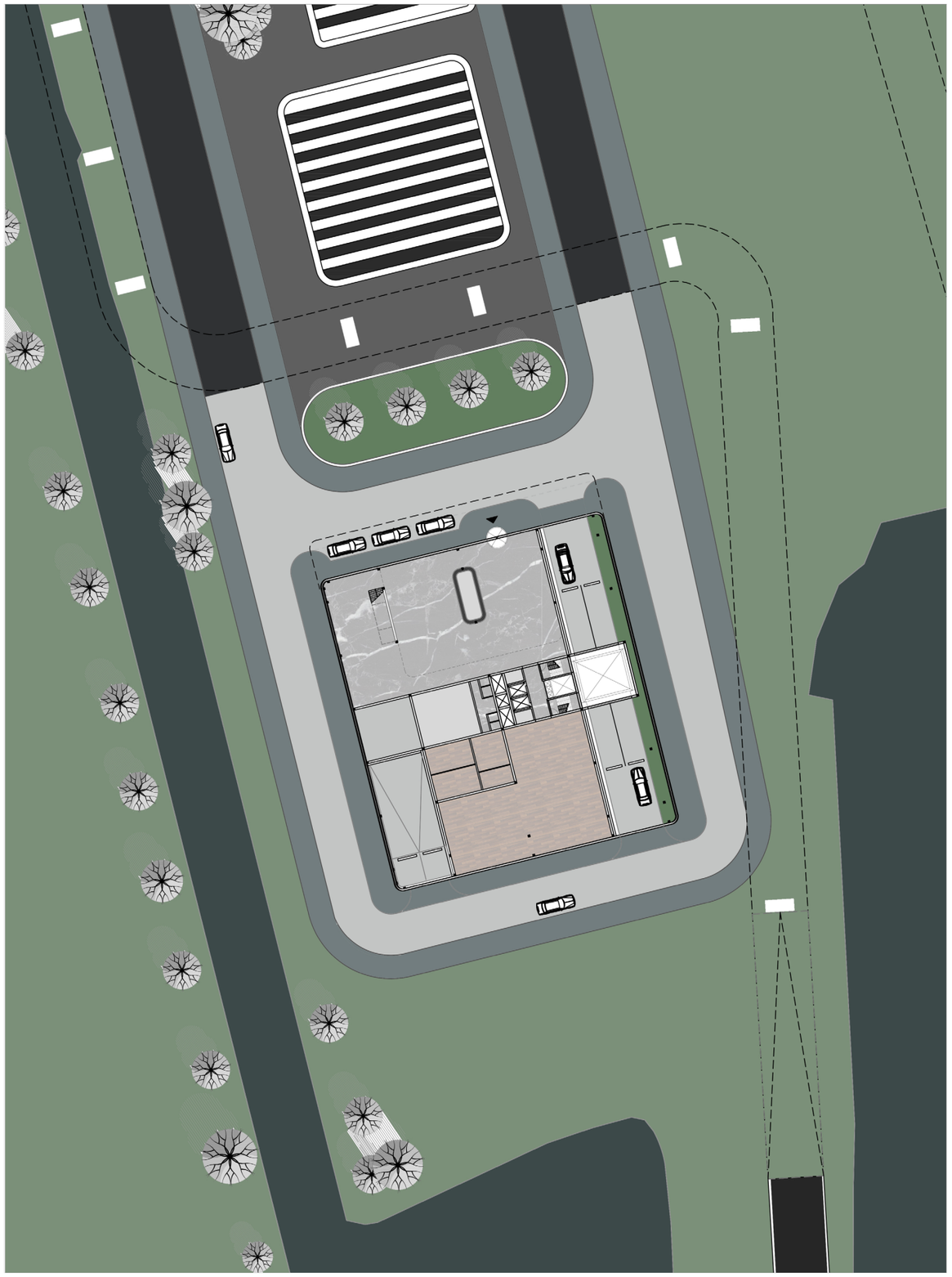


Roof 2

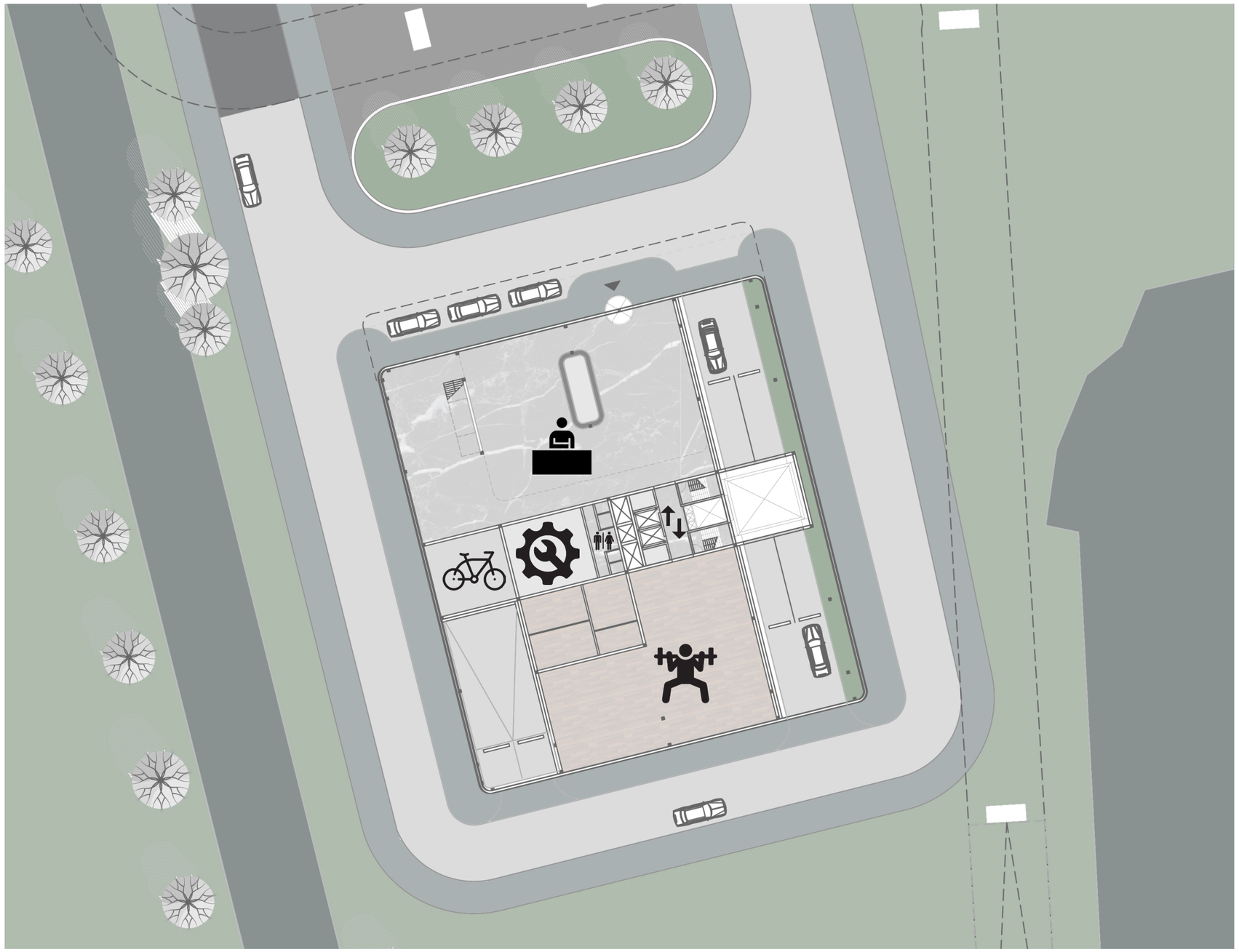
Ground floor



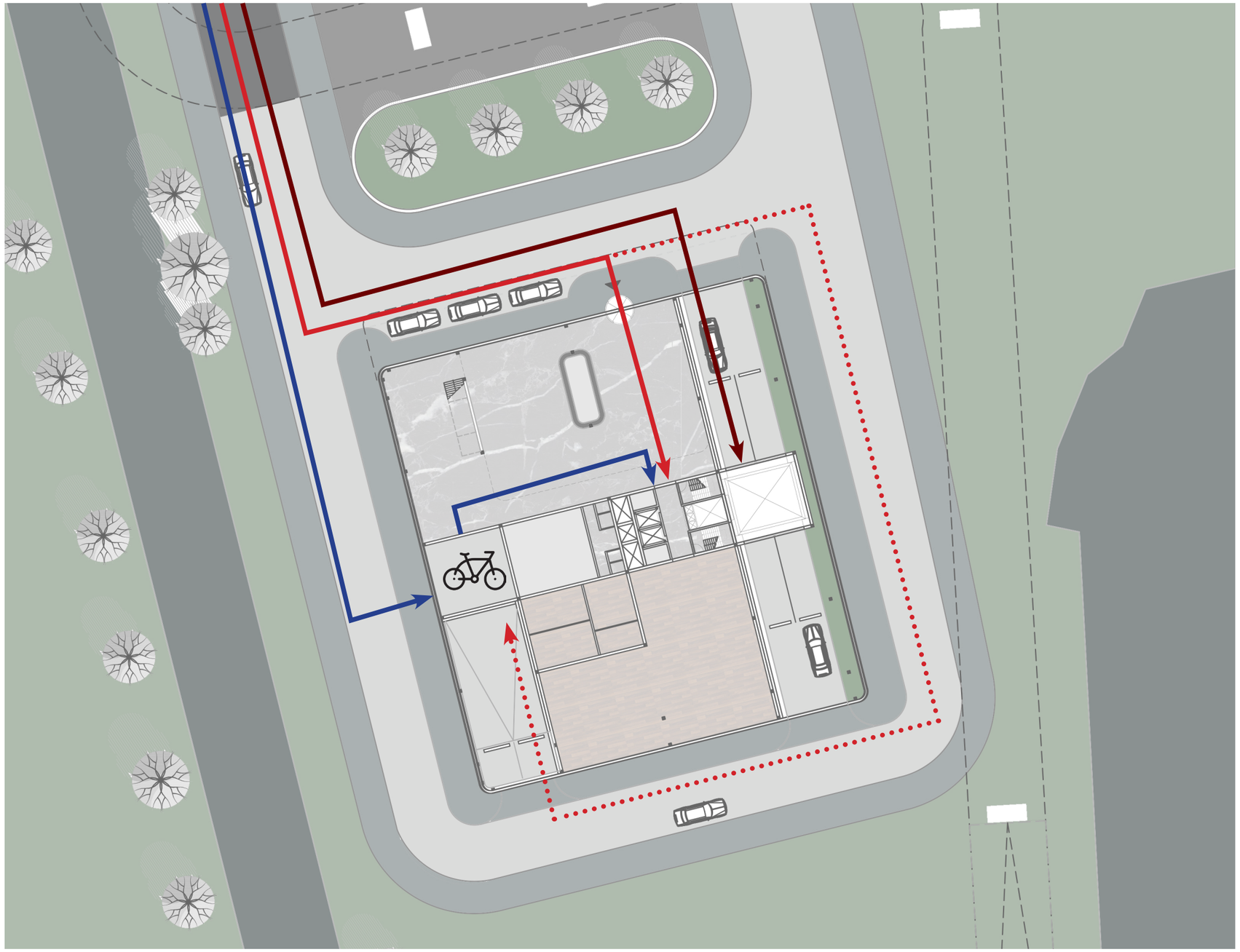




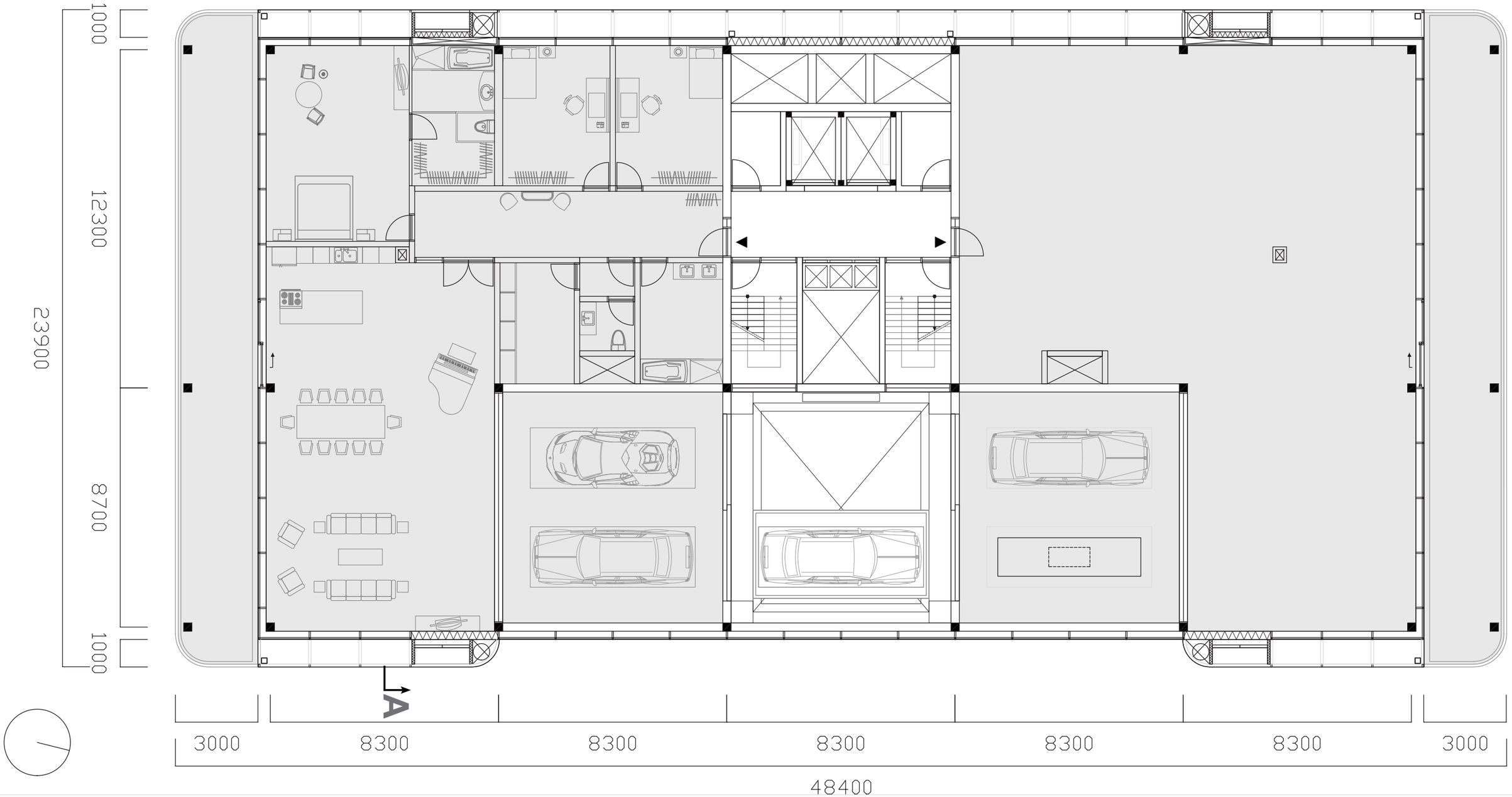
Ground floor



Residents



Floorplan apartments



Elevations

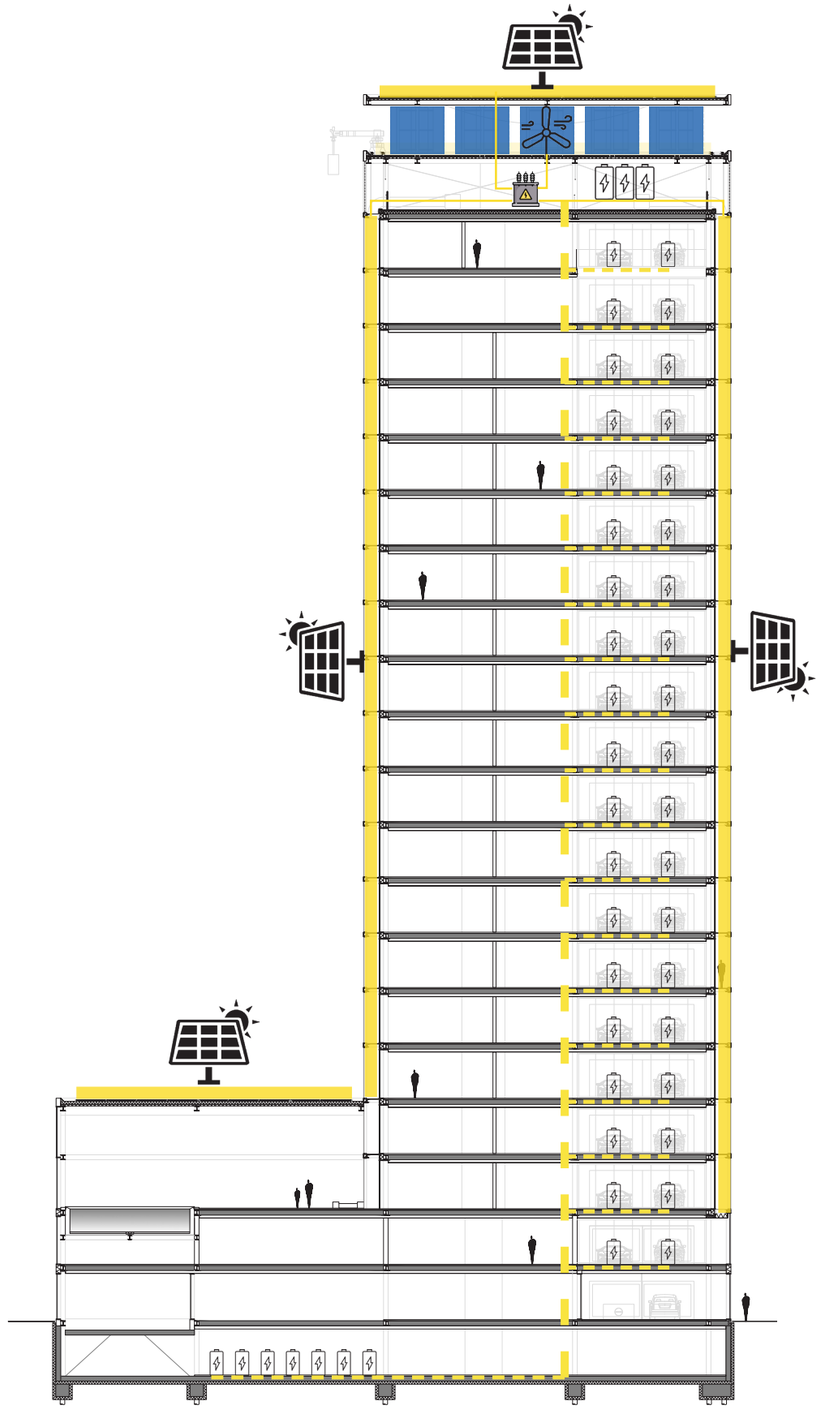
North

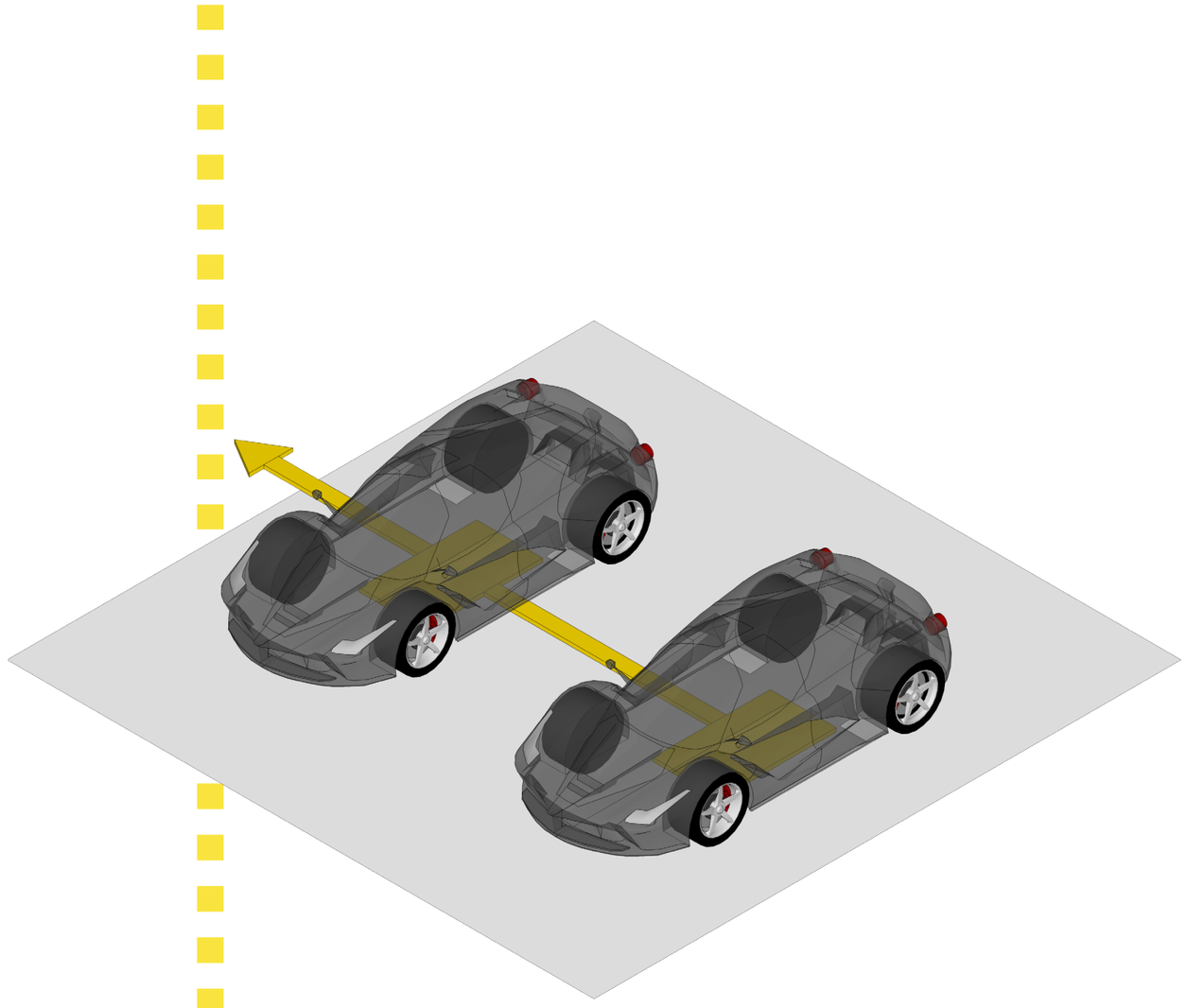
West

South

East

Energy

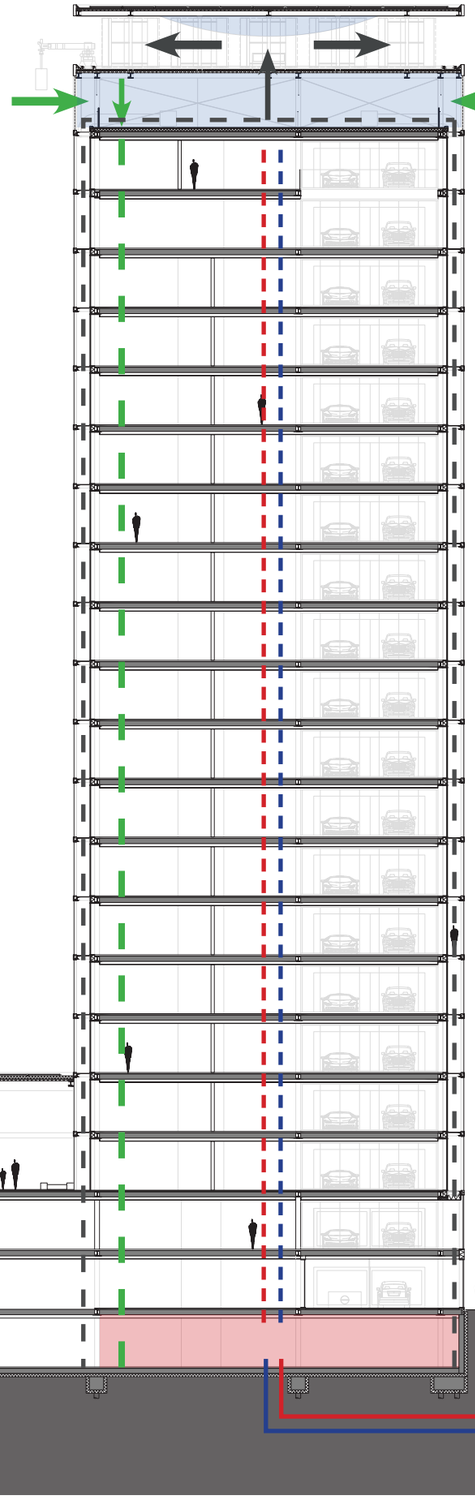




Cars function as the battery of the building
Backup battery for the building systems in technical space

Climate

Air exhaust
Air supply

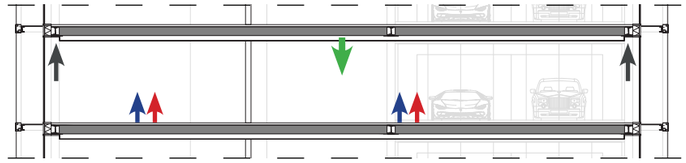


Venturi Roof

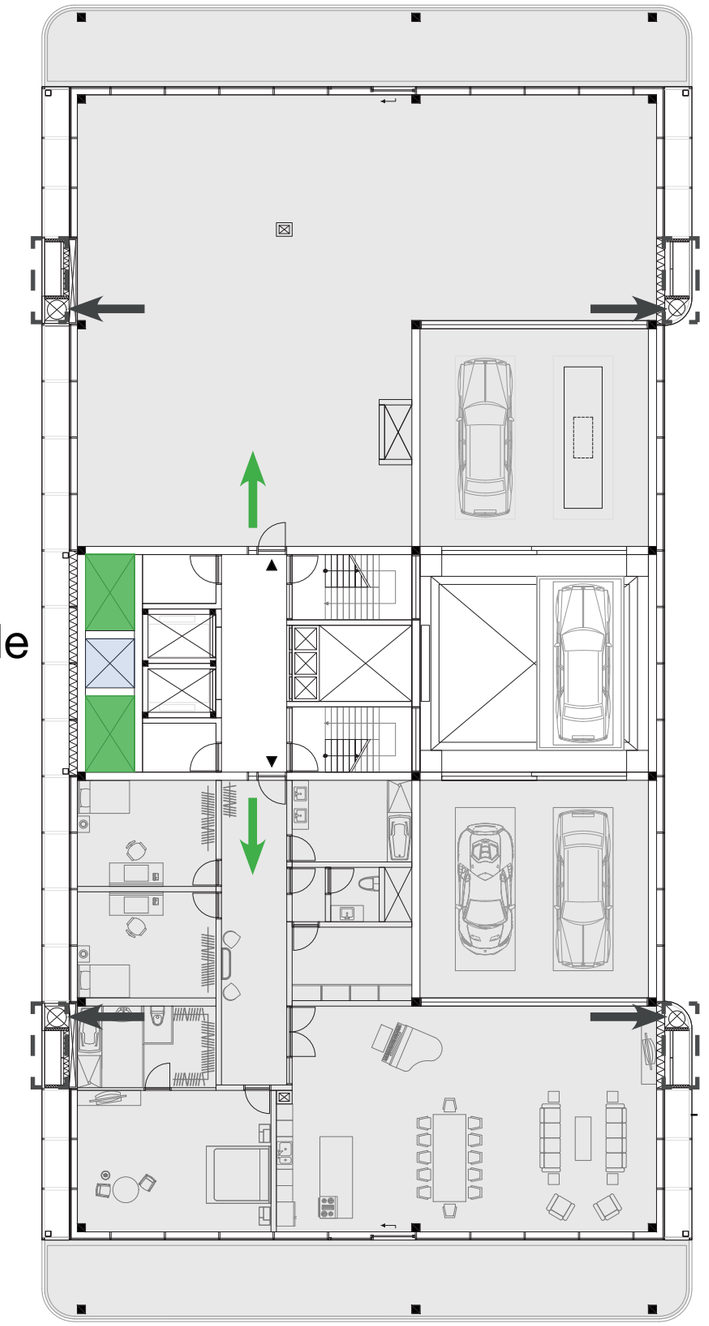
Heat exchange and necessary installations
Technical space floor

Ecovat

Floor heating/ cooling

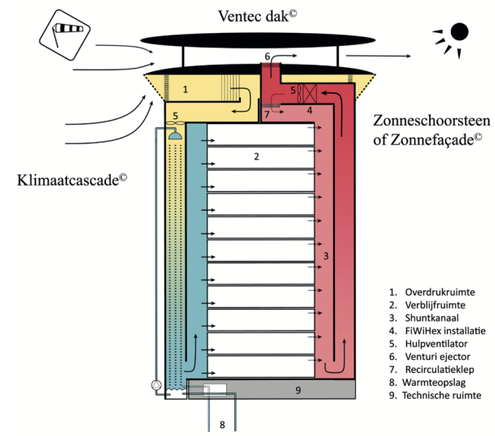


Solar chimney
Shunt channel

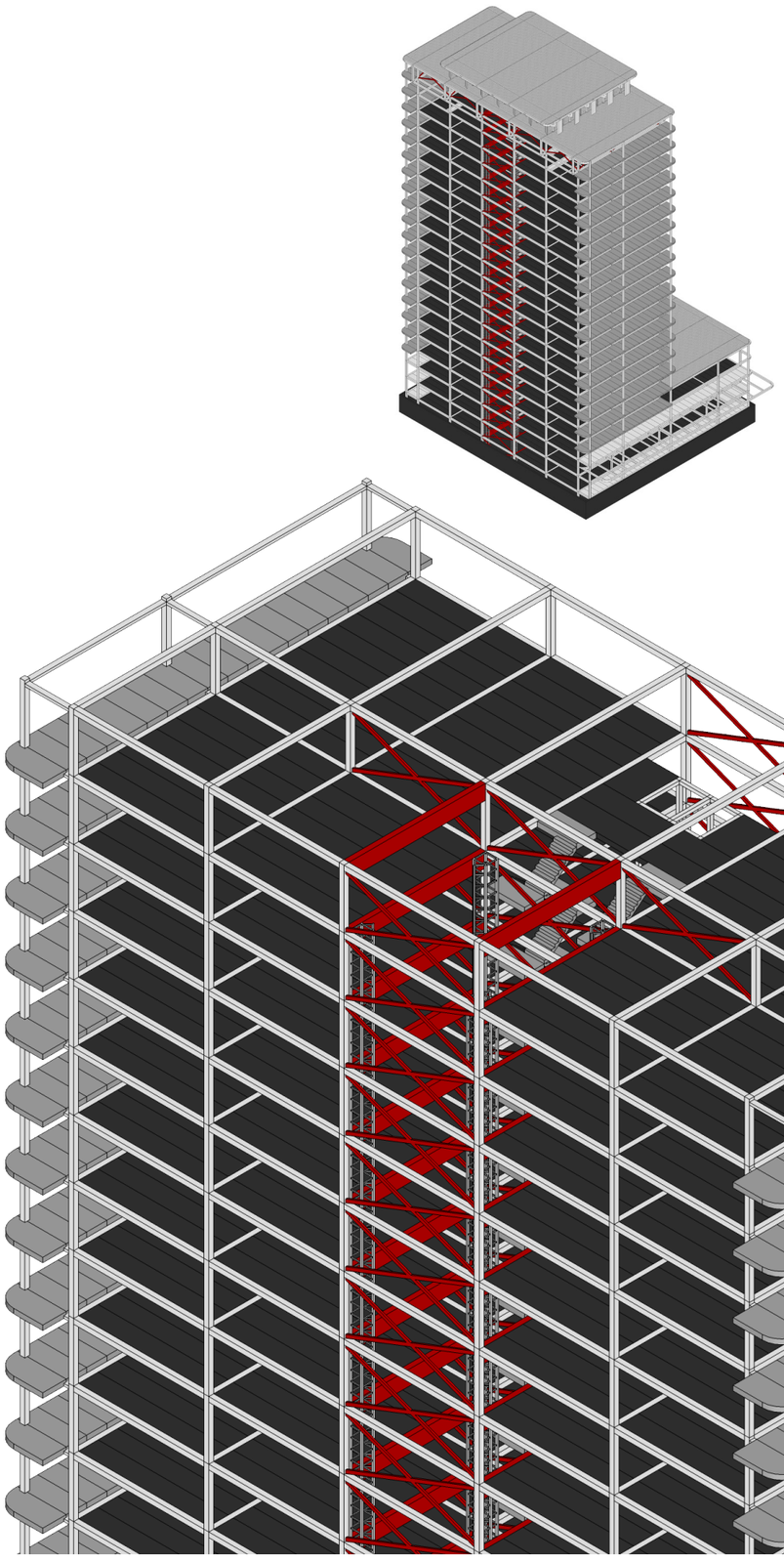


Climate cascade
Air supply

Earth Wind & Fire, Ben Bronsema

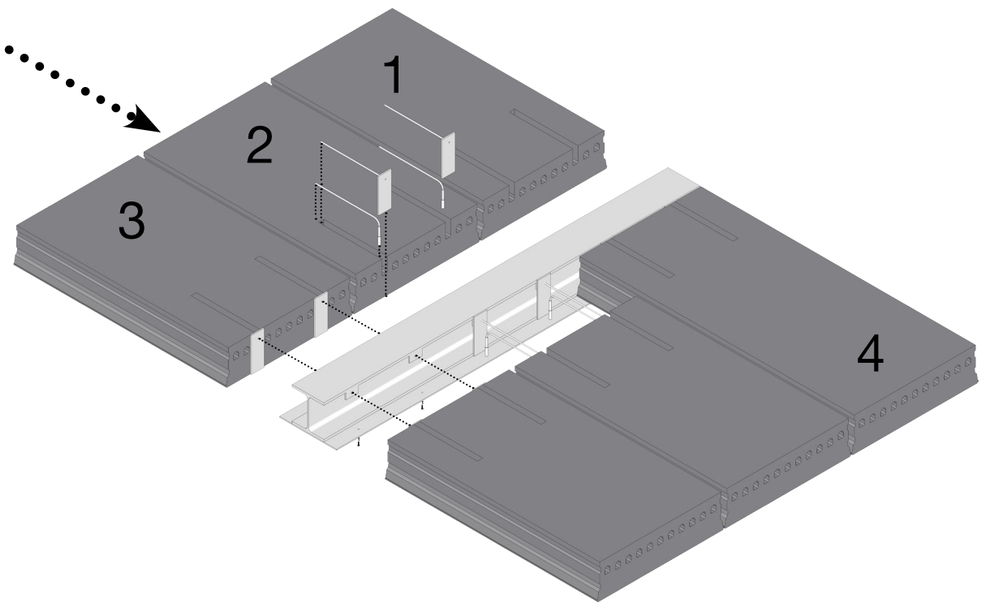


Structure



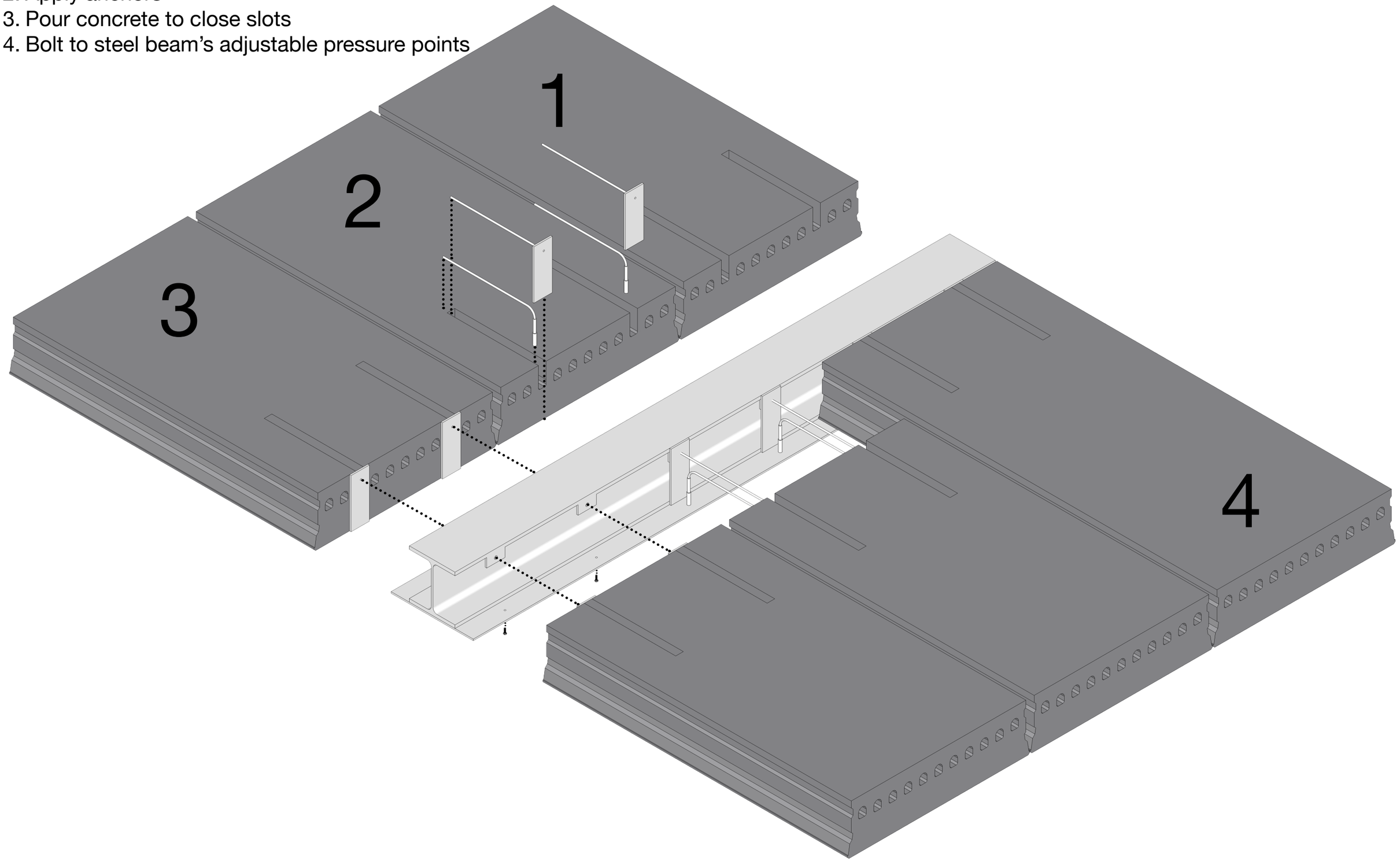
Dismountable structure

- Steel columns
- Steel beams
- Steel stability crosses
- Hollow core slabs

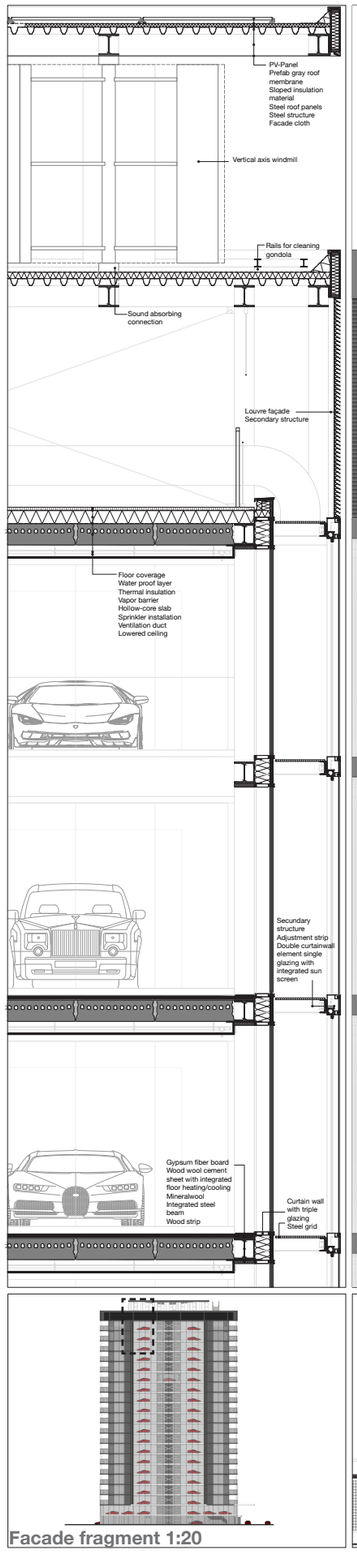


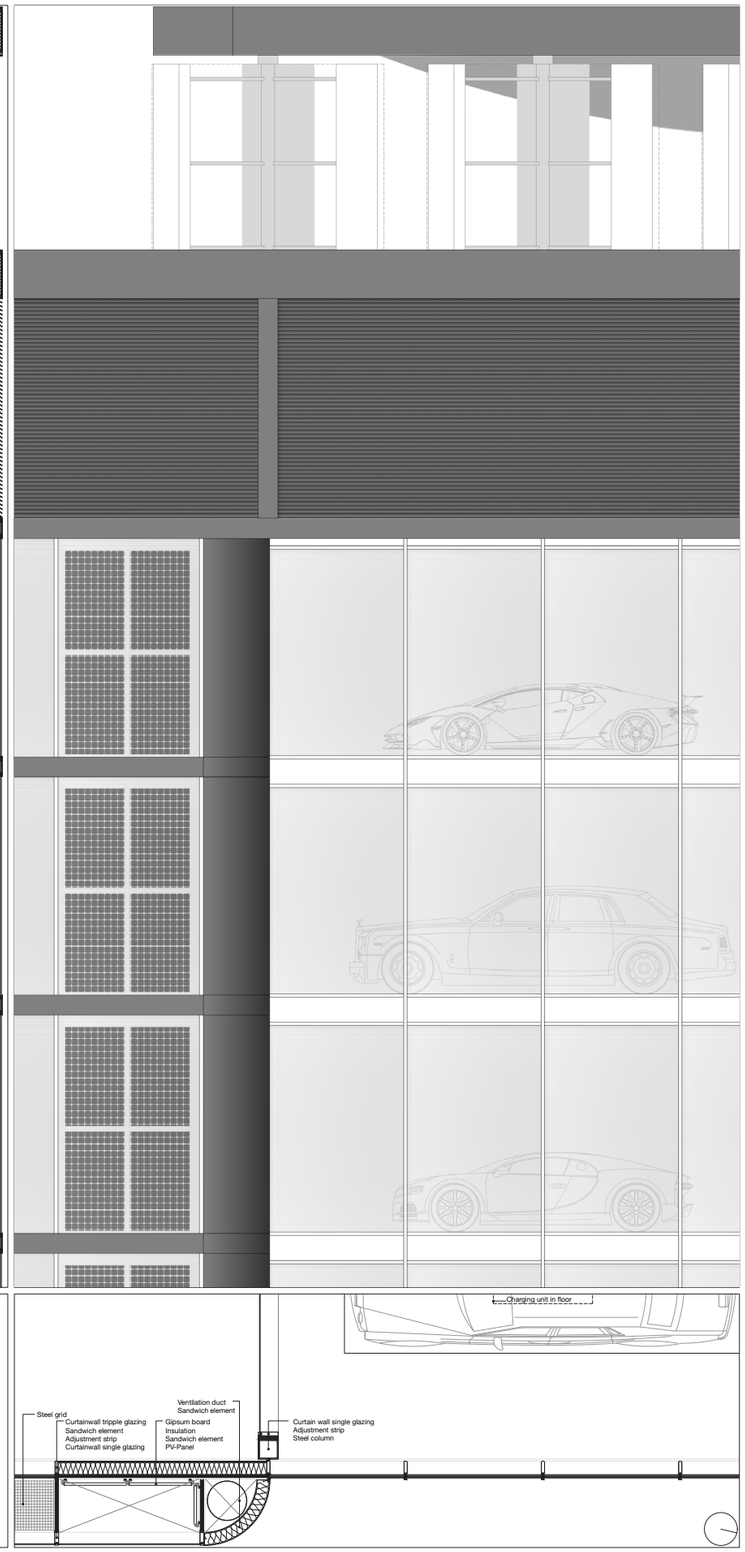
Structure

1. Slots in 2 hollows of the hollow core slab
2. Apply anchors
3. Pour concrete to close slots
4. Bolt to steel beam’s adjustable pressure points



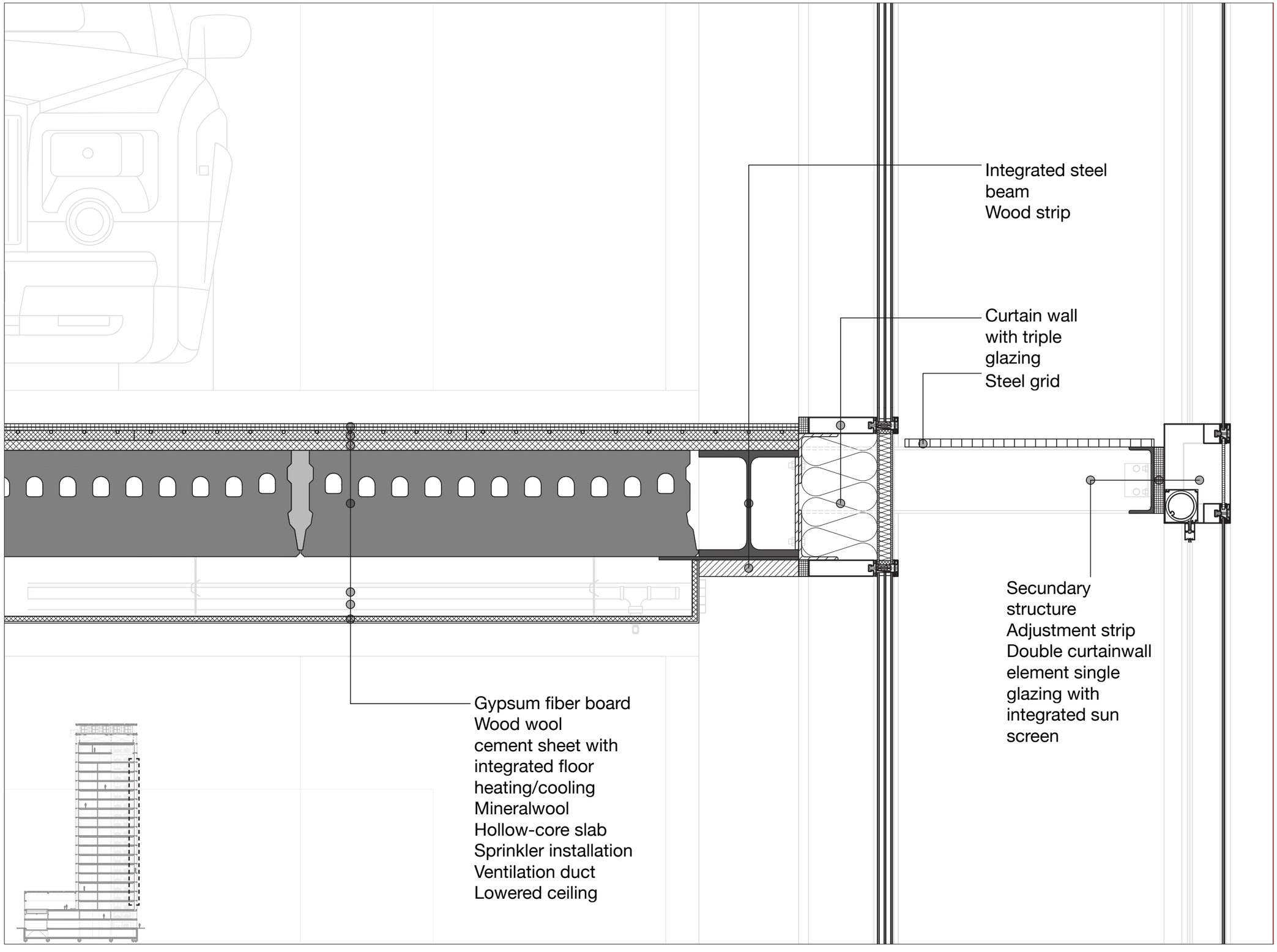
Facade Fragment





Facade fragment 1:20

Detail


Integrated steel beam
Wood strip
Curtain wall with triple glazing
Steel grid
Secundary structure
Adjustment strip
Double curtainwall element single glazing with integrated sun screen
Gypsum fiber board
Wood wool cement sheet with integrated floor heating/cooling
Mineralwool
Hollow-core slab
Sprinkler installation
Ventilation duct
Lowered ceiling

Detailing

Inside

- Dismountable
- High comfort
- Clean appearance
- Addaptable to the wishes of the resident inside the apartment

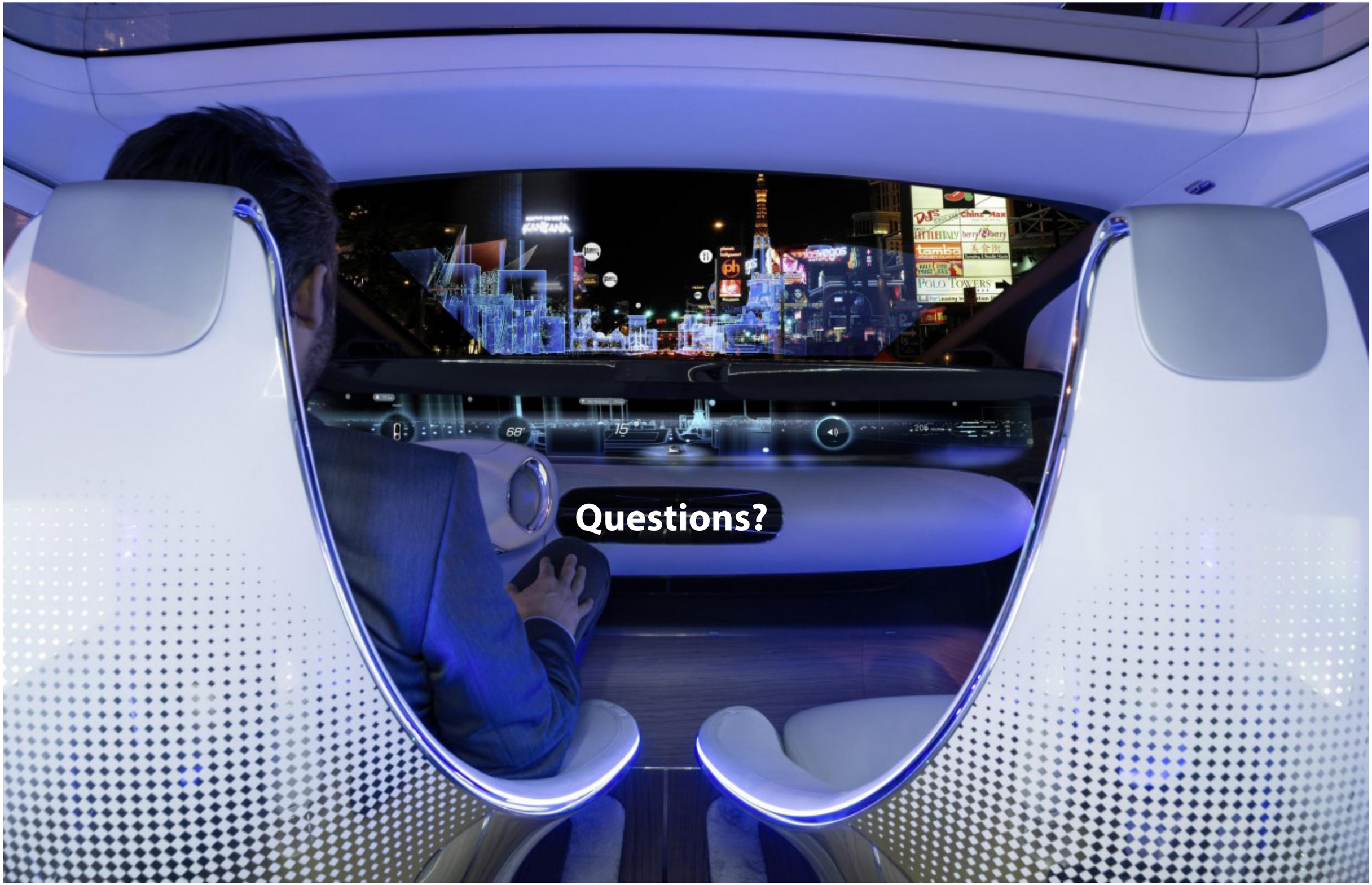
Outside

- Appearance of the building as one unit
- Rounded corners and the layers well visible
- Luxury appearance

Impressions

Video 2

Thank you



Bibliography

3
Rolls royce. Retrieved June 12, 2017, from http://wallpaperswide.com/rolls_royce_2-wallpapers.html
Hamilton Scotts apartments. Retrieved June 12, 2017, from http://www.home-designing.com/2012/09/super-luxury-singapore-apartment-with-in-room-car-parking

10
Robbie House floorplan. Retrieved June 12, 2017, from http://www.greatbuildings.com/buildings/Robie_Residence.html
Floorplan Villa Savoye. Retrieved June 12, 2017, from http://www.archdaily.com/84524/ad-classics-villa-savoye-le-corbusier
Mercedes F 015. Retrieved June 12, 2017, from https://www.mercedes-benz.com/en/mercedes-benz/innovation/research-vehicle-f-015-luxury-in-motion/
SAE levels of autnomy. Retrieved June 12, 2017, from www.sae.org/autodrive

13
Iphone X. Retrieved May 10, 2018, from https://www.apple.com/nl/iphone-x/

14
Foster+partners Nissan Leaf concept. Retrieved June 12, 2017, from http://www.fosterandpartners.com/news/archive/2016/03/nissan-and-foster-plus-partners-reveal-fuel-station-of-the-future-concept-at-geneva-motor-show/
Lomboxnet Utrecht. Retrieved June 12, 2017, from http://www.lomboxnet.nl/smart-solar-charging

16
Nissan Vehicle-to-grid. Retrieved June 05, 2017, from http://newsroom.nissan-europe.com/eu/en-gb/media/pressreleases/140287/photos

17
Mercedes-Benz Inductive Charging. Retrieved June 05, 2017, from https://www.mercedes-benz.com/en/taubenheim-13/taubenheim13blog/look-no-wires/

21
Classic Volkwagen Beatle charging. Retrieved June 12, 2017, from http://www.zelectricmotors.com
AutoX webcam car autonomy. Retrieved June 12, 2017, from https://www.technologyreview.com/s/604006/autox-has-built-a-self-driving-car-that-navigates-with-a-bunch-of-50-webcams/

24
Maps. Retreived September 20, 2017, from http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

25
Municipal Plan for Technopolis Delft. Retreived September 20, 2017, from https://docplayer.nl/3927143-Gemeente-delft-bestemmingsplan-technopolis.html

26
Google earth 3D. Retrieved May 10, 2018, from https://earth.google.com/web/

33
Ecovat. Retrieved May 20, 2018, from https://www.ecovat.eu/over-ecovat/werkingsprincipe-energie-opslag/

36
Car in parts. Retrieved May 20, 2018, from https://evannex.com/blogs/news/tesla-effect-german-carmakers-are-having-their-iphone-moment

37
Porsche Design Tower. Retrieved May 10, 2018, from https://www.designtowermiami.com/porschedesigntower
Hamilton Scotts. Retrieved May 10, 2018, from https://www.propertyguru.com.sg/listing/19734216/for-rent-reignwood-hamilton-scotts
Tijdelijke Rechtbank. Retrieved May 10, 2018, from https://www.cepezed.nl/projects/170-tijdelijke-rechtbank-amsterdam

48
Earth Wind and Fire. Retrieved May 10, 2018, from http://bronconsult.org/wp-content/uploads/2014/10/Eindrapport-IV-Binnenmilieu-Symbiose-van-Architectuur-en-Klimaattechniek.pdf

All pictograms. Retrieved June 25, 2018, from https://thenounproject.com and https://www.flaticon.com