UNITED NATIONS
HEADQUARTERS OF SUSTAINABILITY

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SADD – P5 PRESENTATION

23 JUNE 2011

TU Delft

CONTENTS

#SLIDES 85

THE ASSIGNMENT

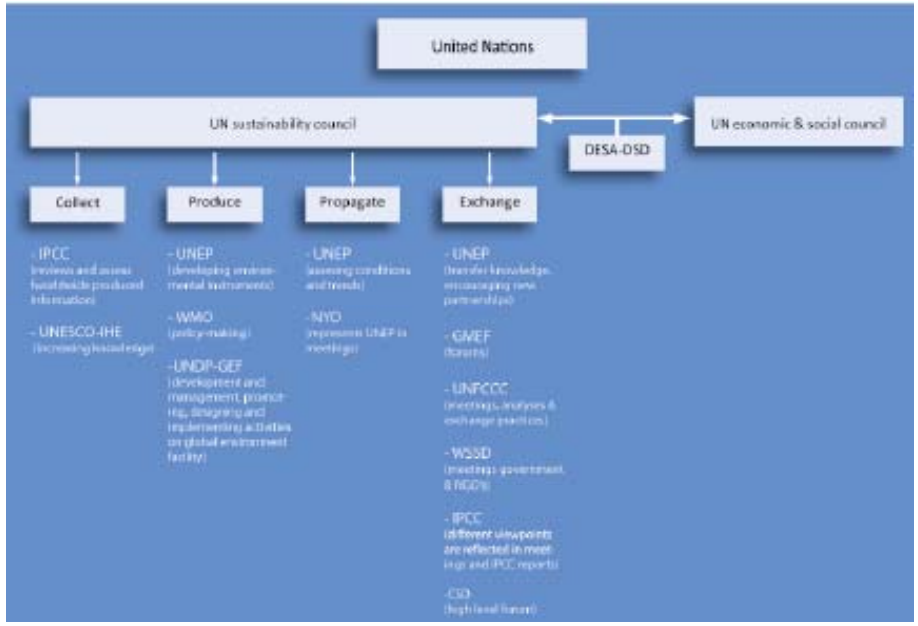
Design the Headqarters of Sustainability for the United Nations on the United Nations' plot in New York

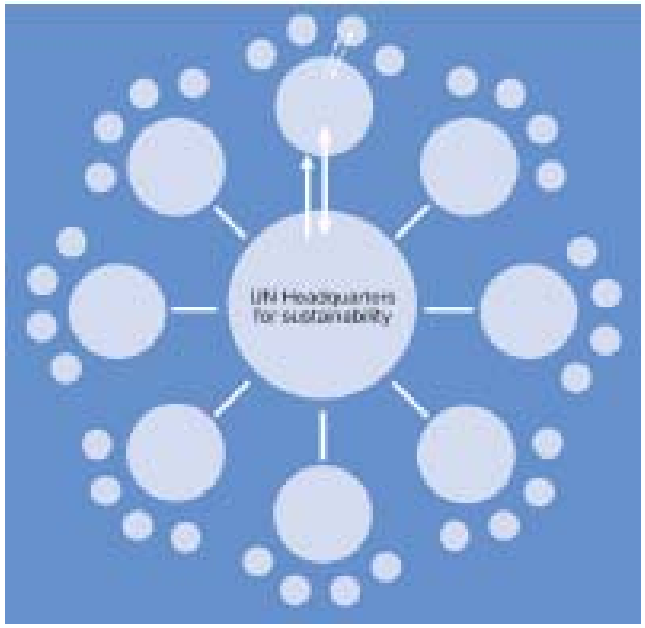
PROBLEM:
No world authority on the subject of Sustainability

GOAL:
Creating a Consensus on the topic of the future of our world and the measures needed to sustain it

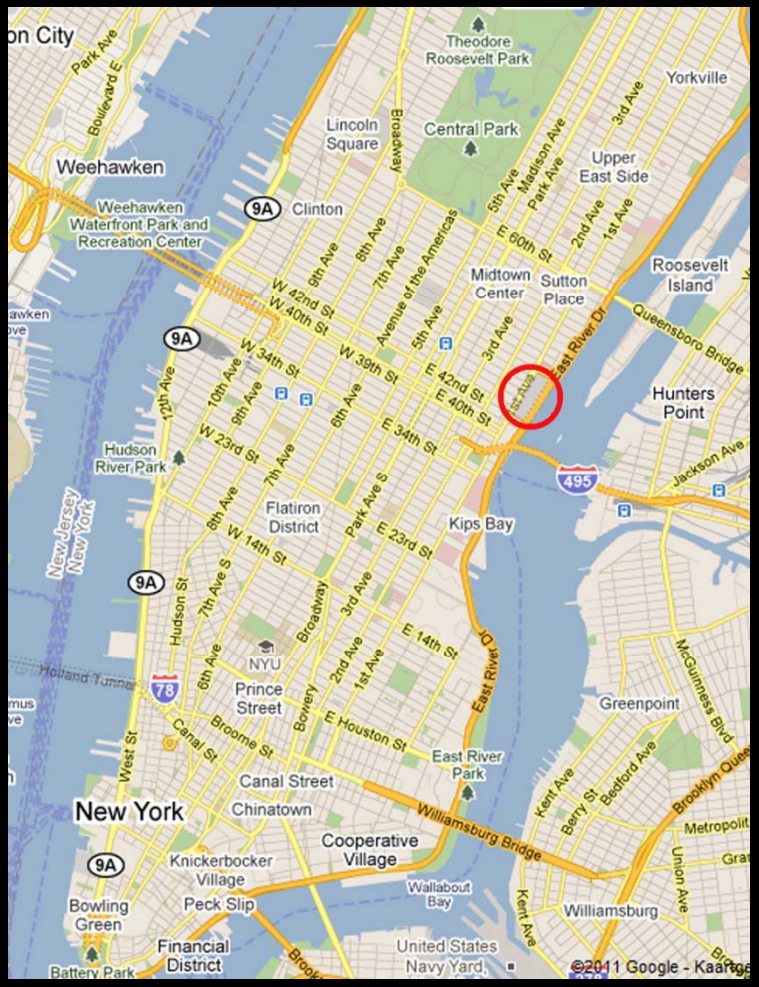
SOLUTION:
An esteblished organisation (United Nations) takes up the role as leading autority

WHY THE UNITED NATIONS?





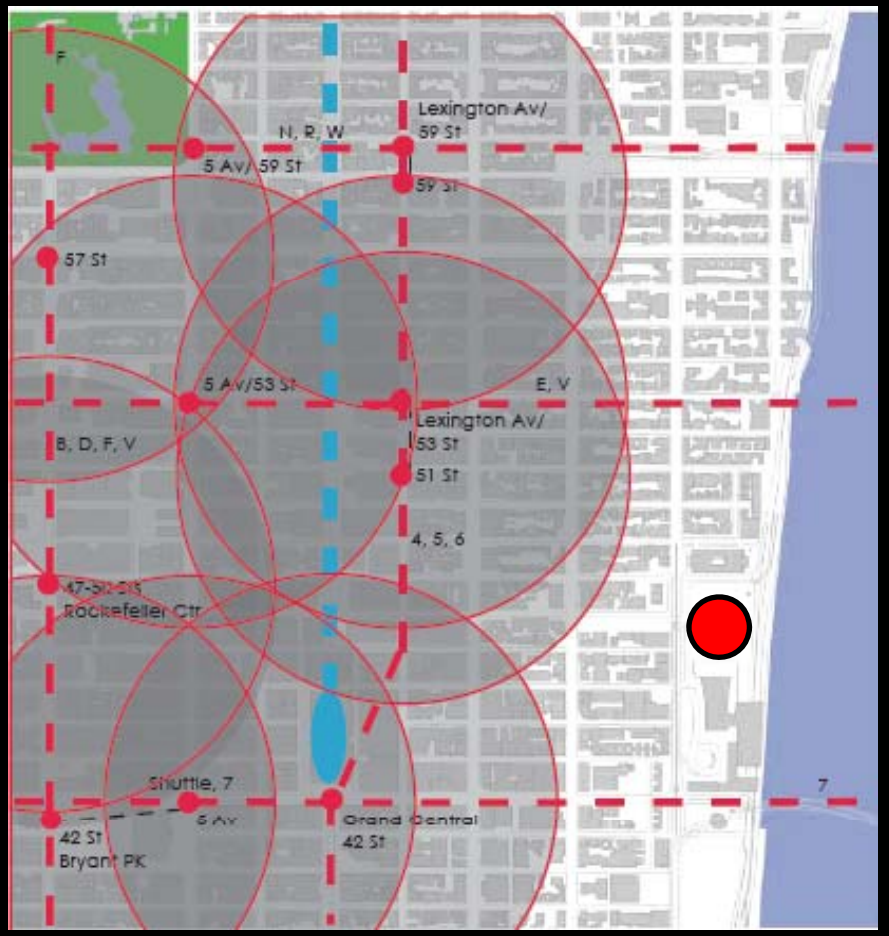
CONTEXT



MANHATTAN

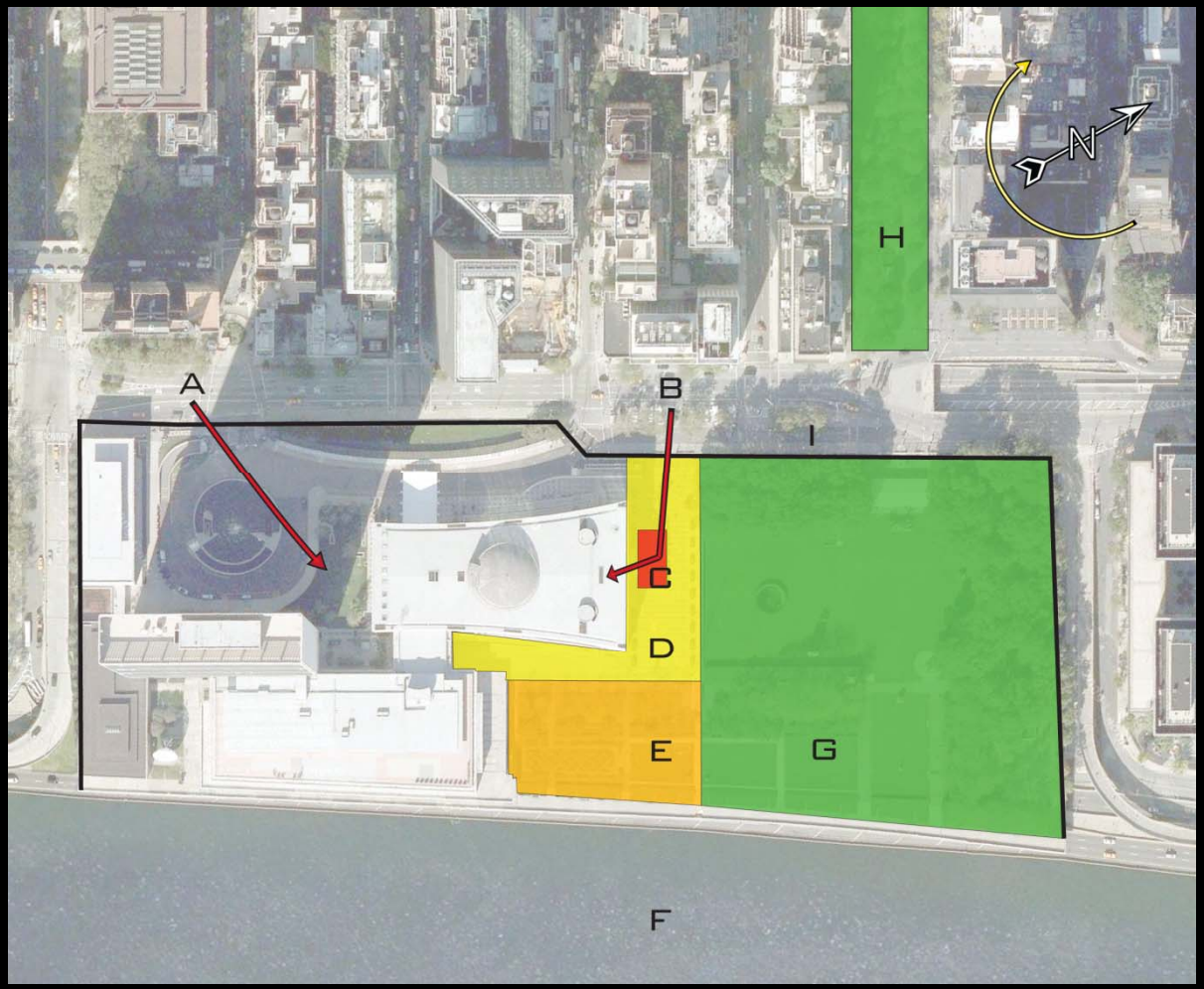
UNITED NATIONS PLOT

PUBLIC GREEN



SUBWAY STATIONS

CONTEXT



A: Fromal entrance

B: Public entrace

C: Security tent

D: raised platform

E: Rose garden

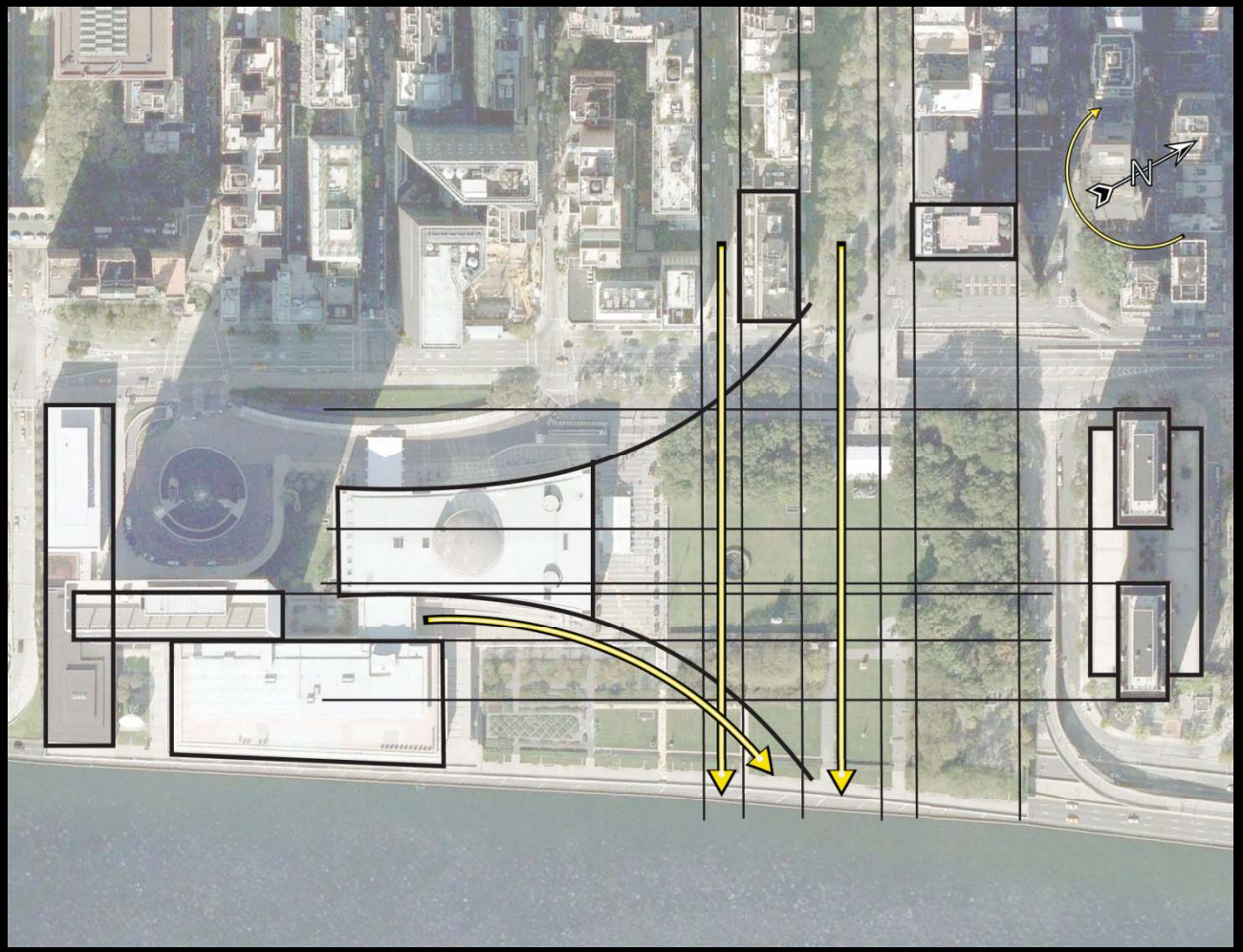
F: East river

G: Green area

H: Green strip

I : Fence

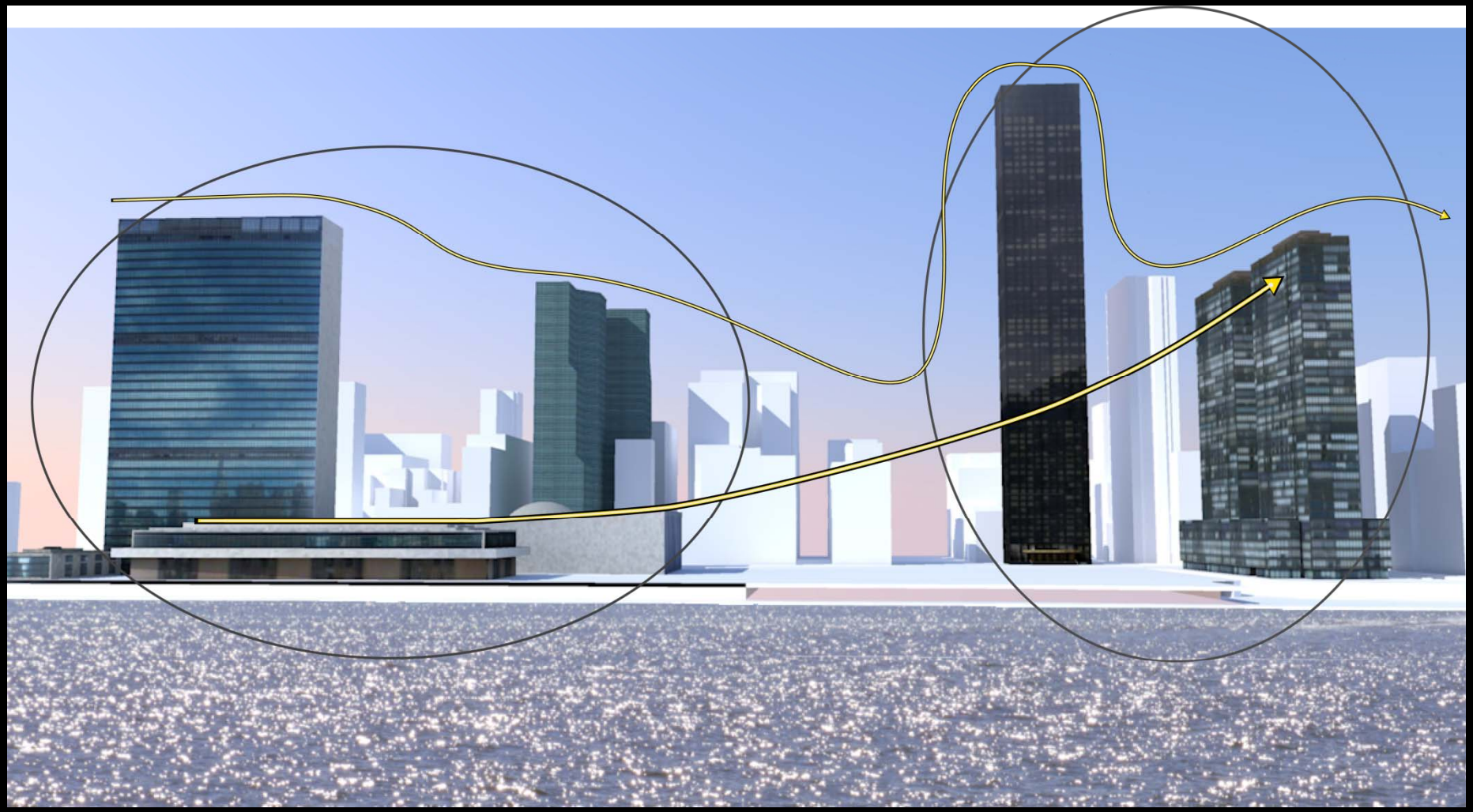
CONTEXT



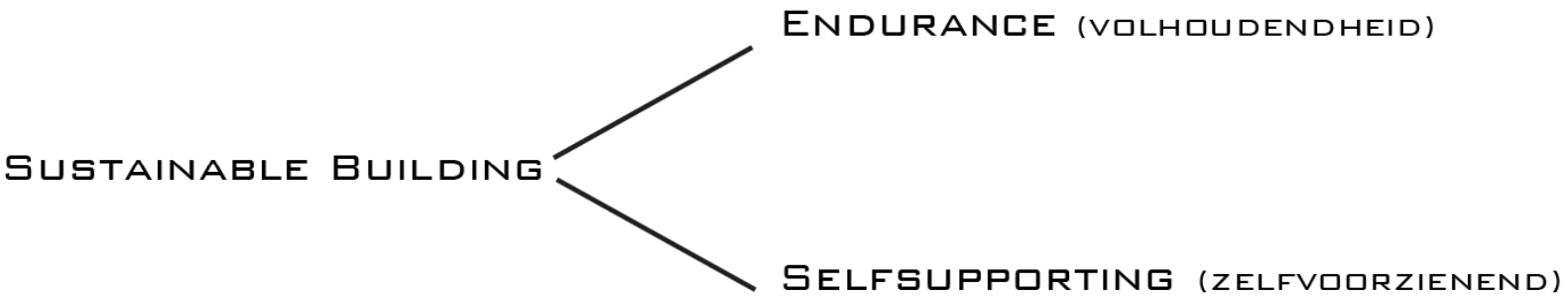
-Orthogonal grid

-Two axes cut the plot

-UN Assembly cuts through the grid



UN & SUSTAINABILITY



"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

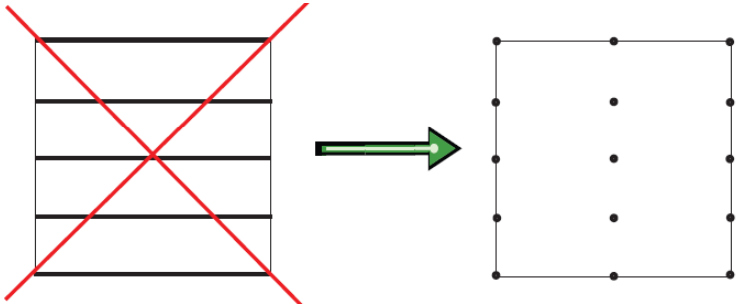
- Brundtland Commission of the United Nations, 1987

ENDURANCE:

-ADAPTABLE TO FUTURE USE

-FLEXIBLE FLOORPLAN

-HIGH CEILING



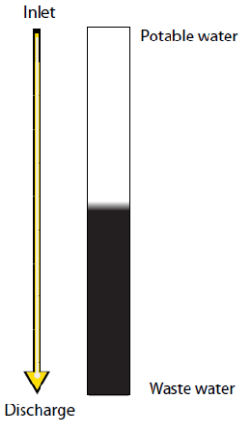
SELFSUPORTING:

-OFF THE GRID

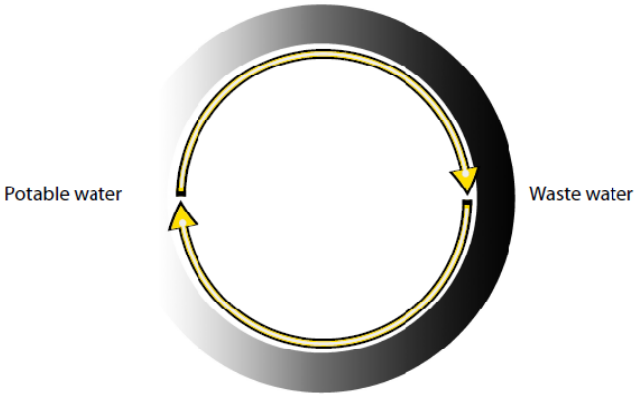
-OWN WATER TREATMENT / DRINKINGWATER PRODUCTION

-OWN ENERGY PRODUCTION

NEW YORK CITY COMBINED SEWER OVERFLOW



COVENTIONAL WATERUSE



SUSTAINABLE WATERUSE

DESIGN INTENTIONS

- Design from context (no object in a field)
- Authoritative design
- Re-open the park to the public
- Transparant design
- redesign the security check for the General Assembly
- energie and water neutral building

SUSTAINABILITY

HELOPHYTE FILTER

-LARGE SURFACE NEEDED
-OUTDOOR SYSTEM
-LESS EFFECTIVE IN WINTER

IBA SYSTEM

-UNDERGROUND SYSTEM
-VISUALLY NOT INTERESTING
-SMALL SURFACE NEEDED

LIVING MACHINE

-INDOOR SYSTEM
-WETLANDS COMBINED WITH ANAEROBIC TANKS
-VISUALLY ATRACTIVE
-RELATIVE SMALL SURFACE NEEDED

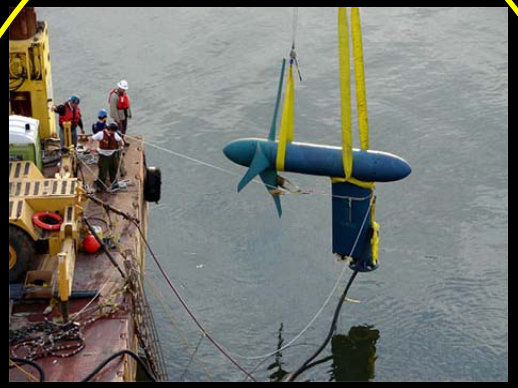
SUSTAINABILITY

PC CELLS

-UNSTABLE ENERGY SUPPLY
-LARGE SURFACE NEEDED
-CAN BE INCORPORATED INTO THE DESIGN

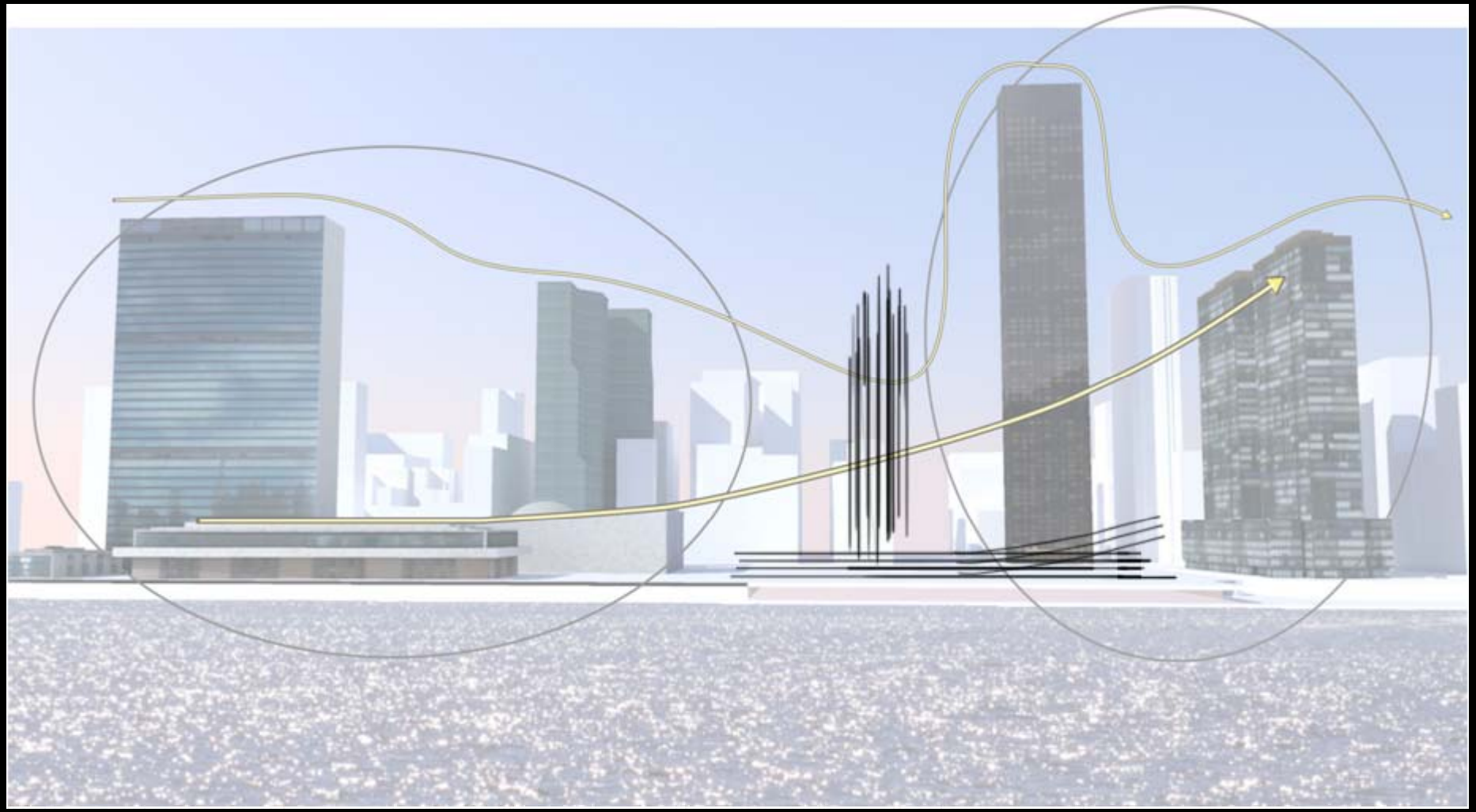
WIND TURBINE

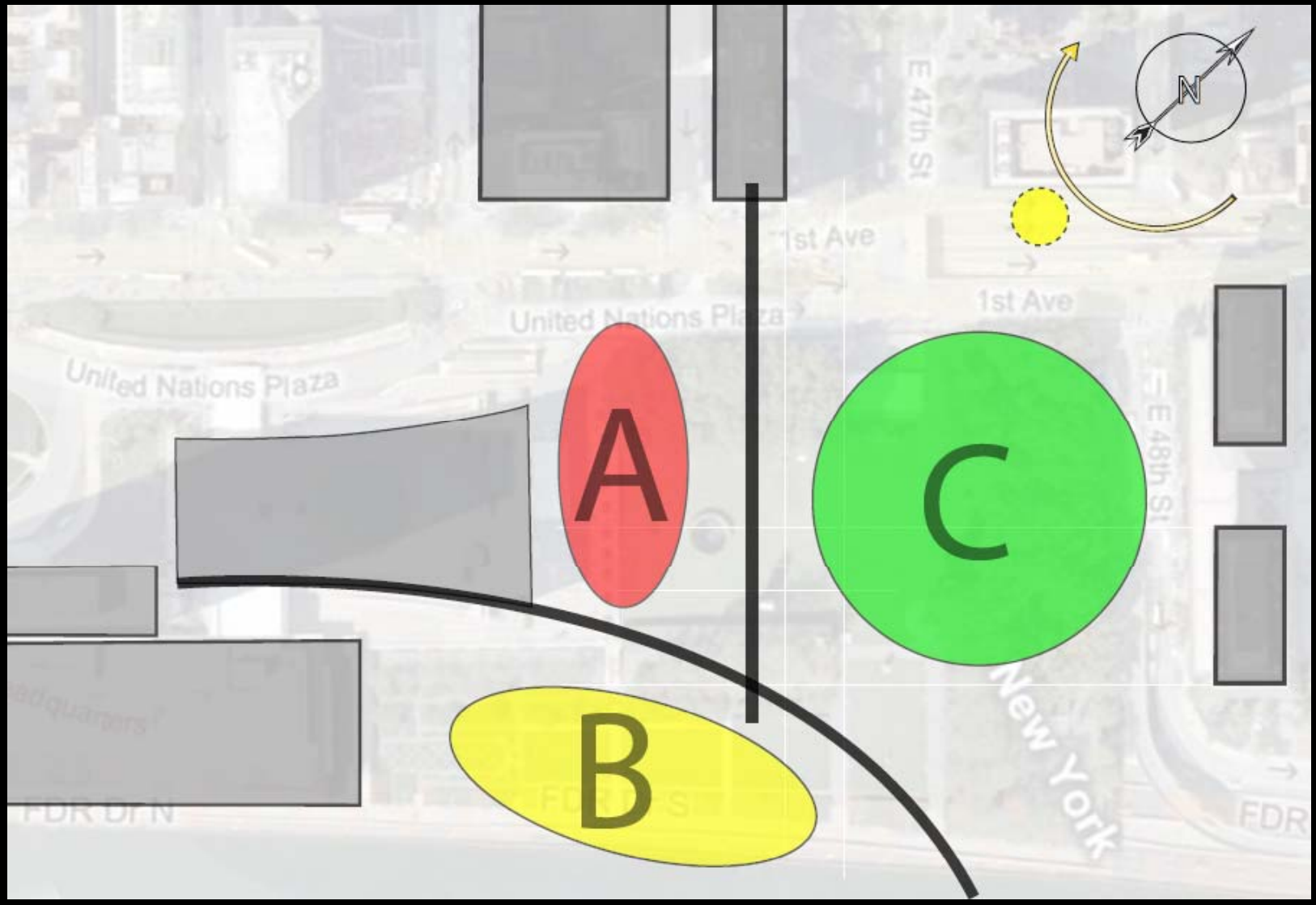
-LARGE ELEMENT
-SMALER TURBINES NOT INTERESTING IN TERMS OF ENERGY PRODUCTION

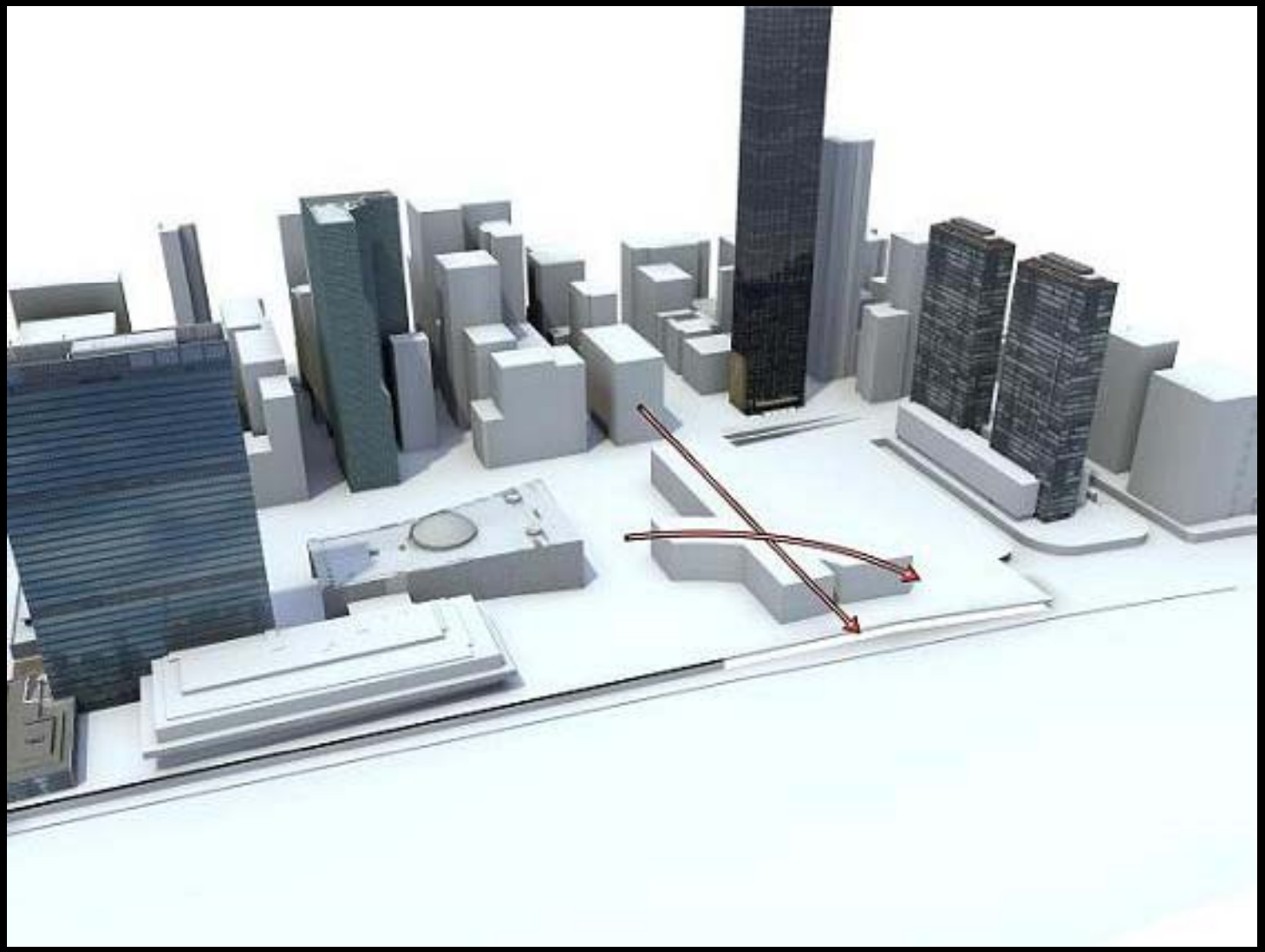


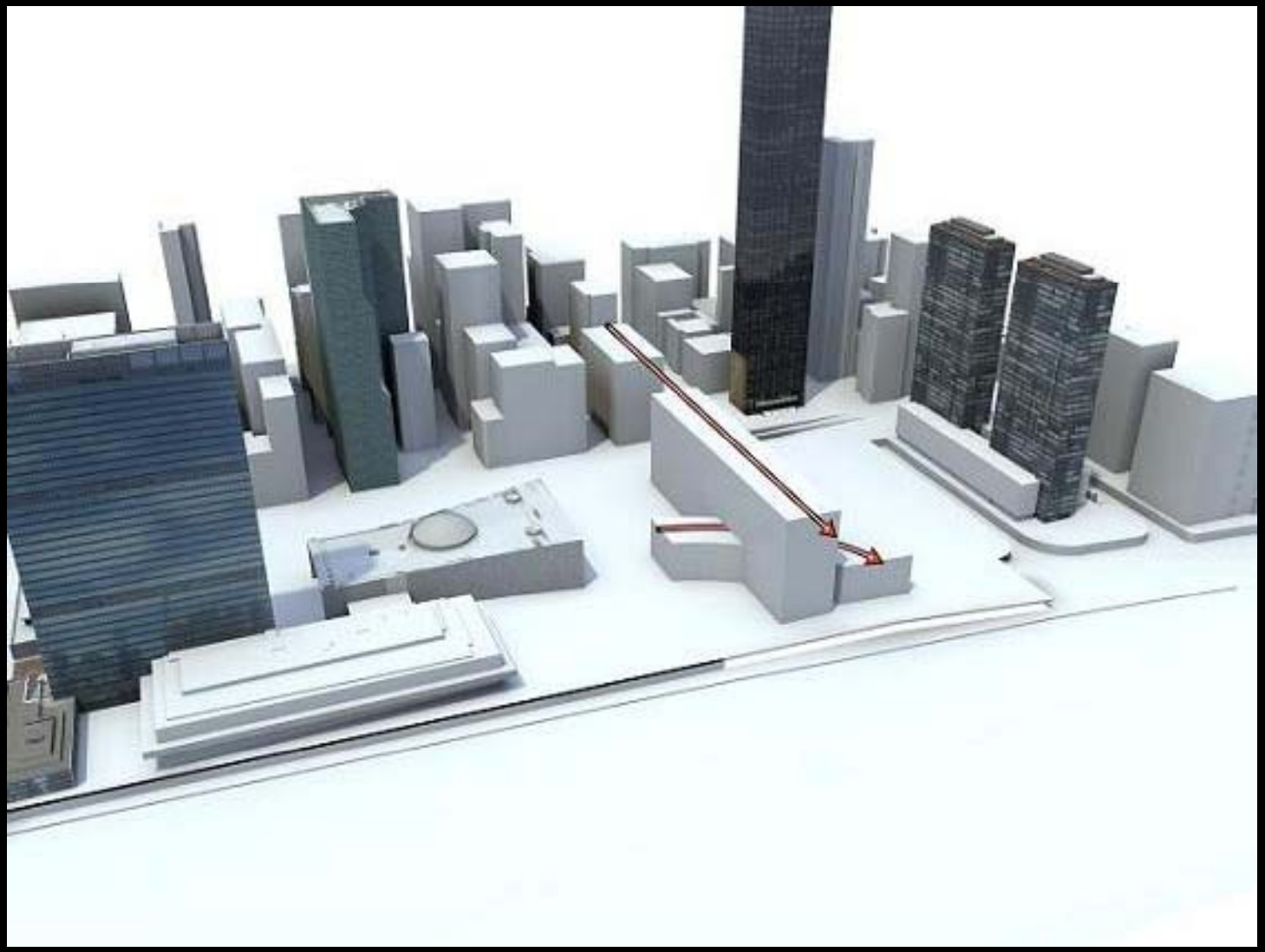
WATER TURBINE

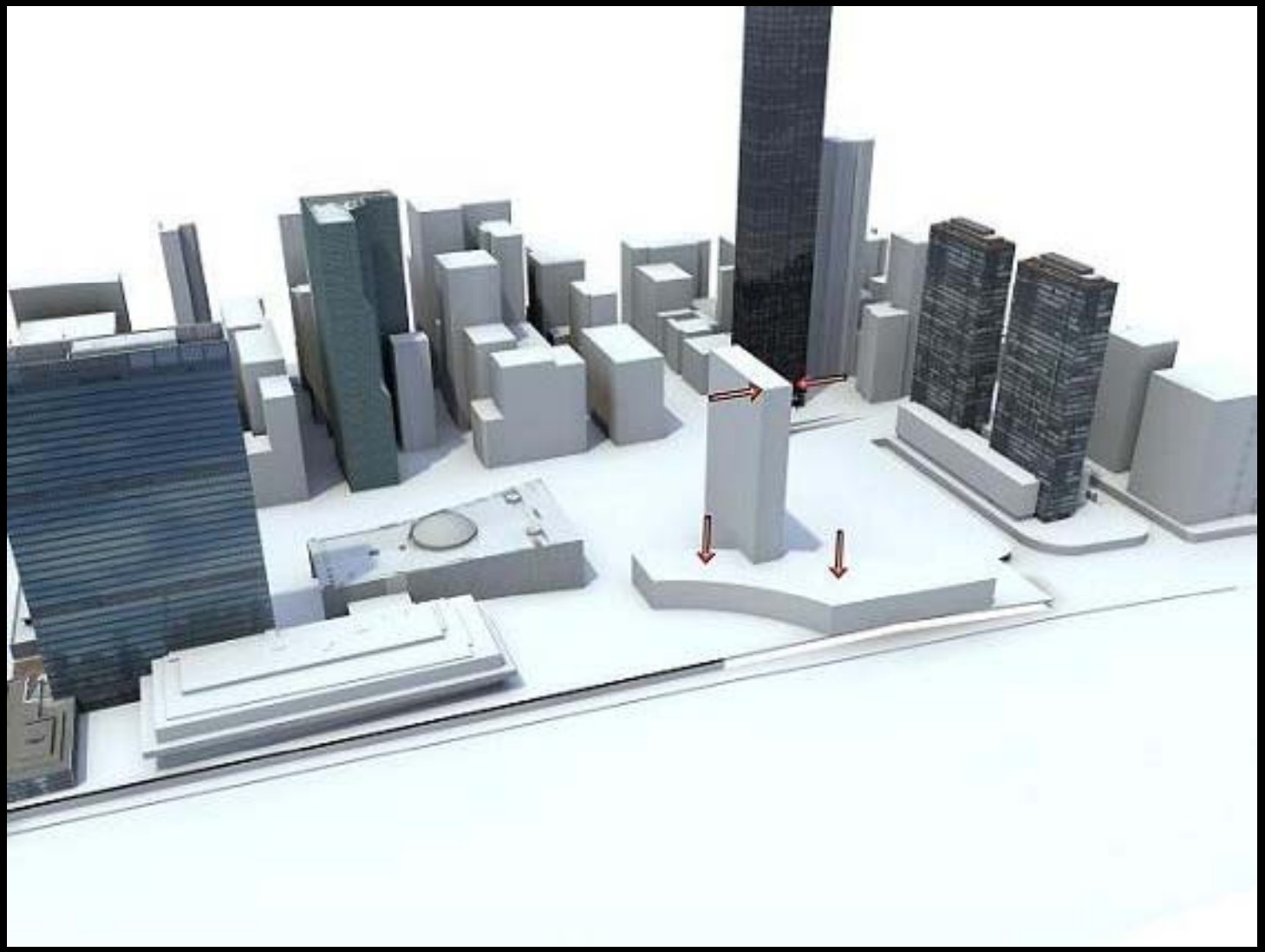
-STABLE ENERGY SUPPLY
-IDEAL FOR THE EAST RIVER
-VISUALLY UNATRACTIVE

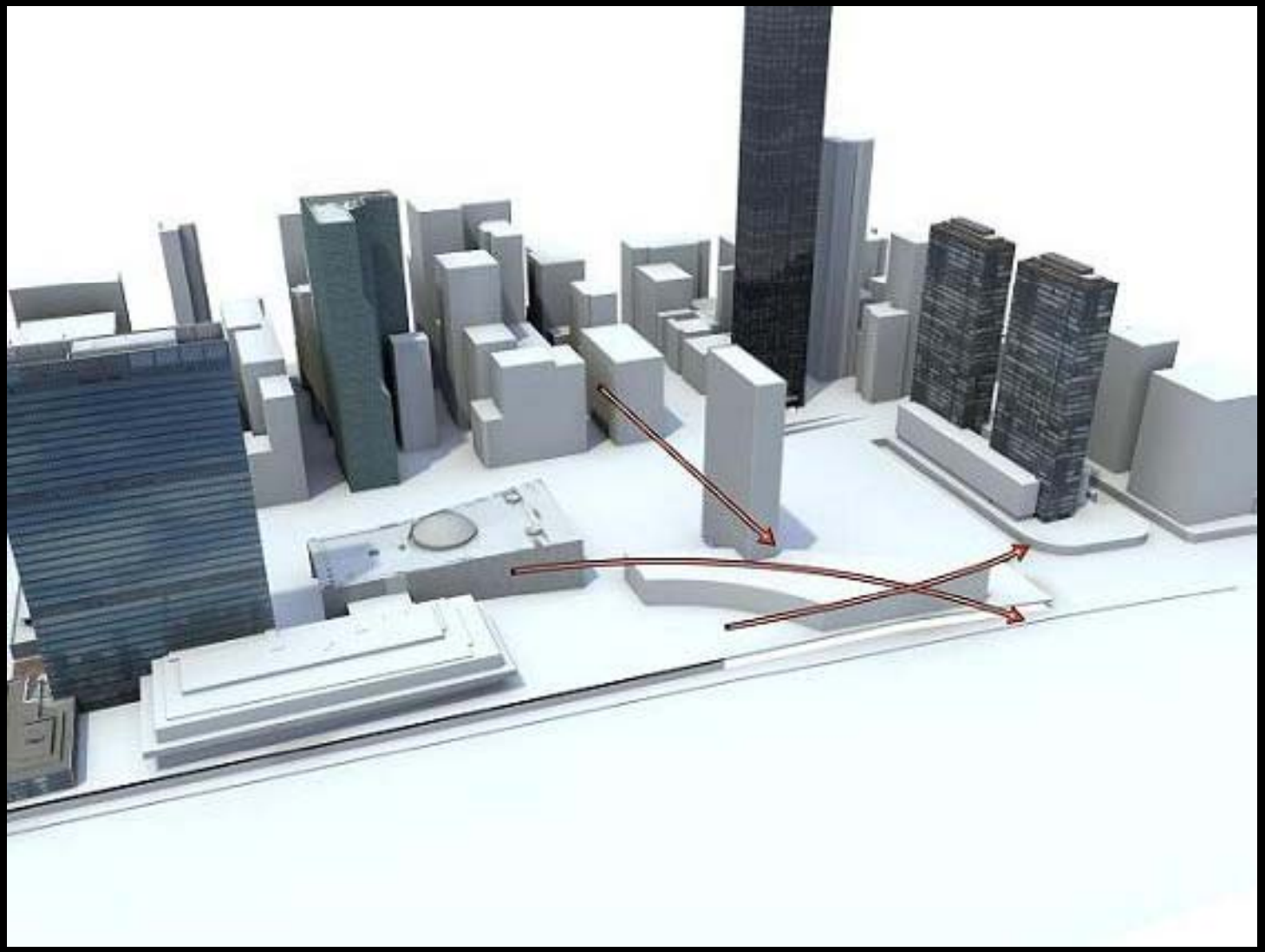



A
B
C
N
United Nations Plaza
1st Ave
E 47th St
E 48th St
FDR
New York

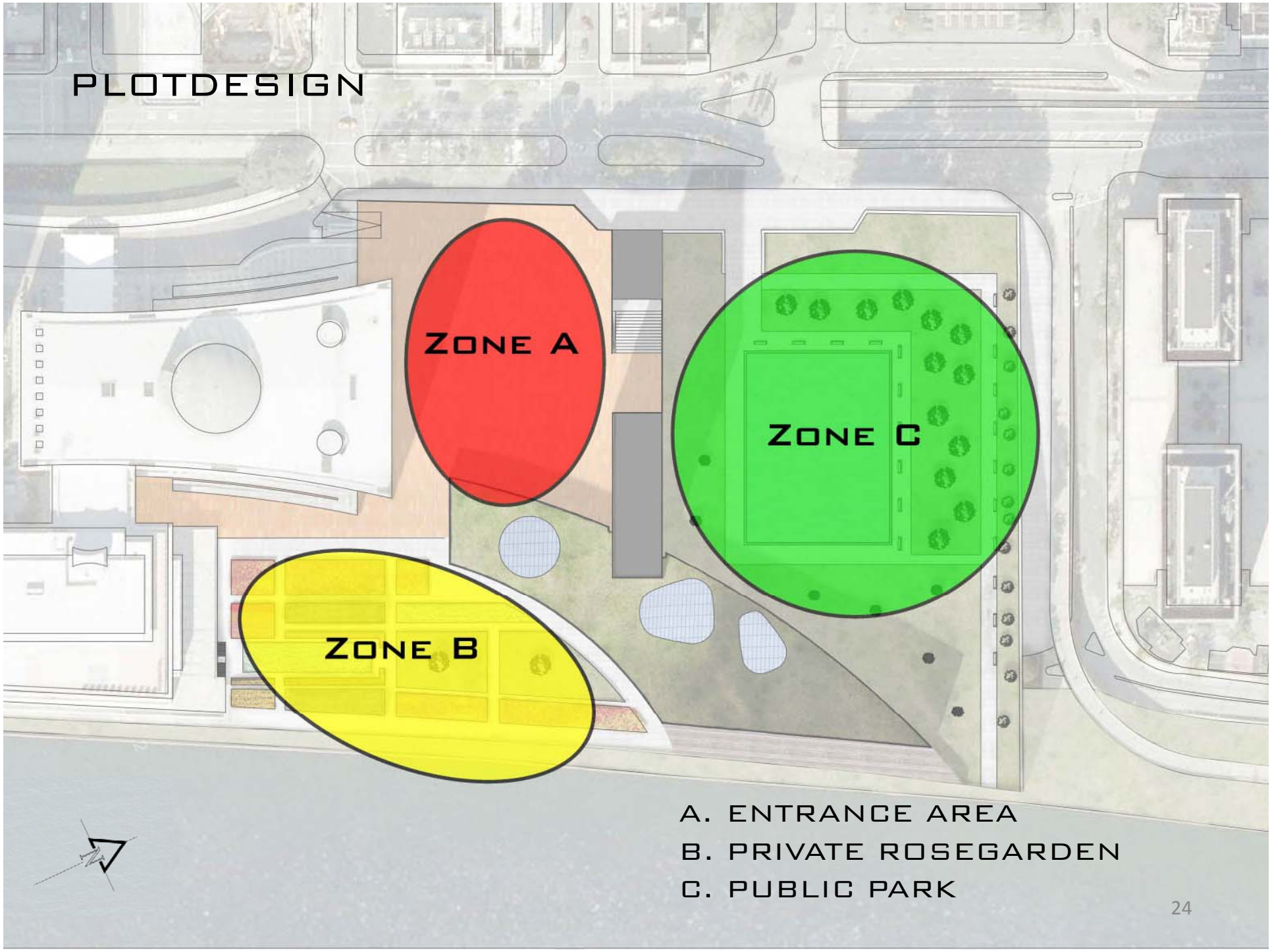




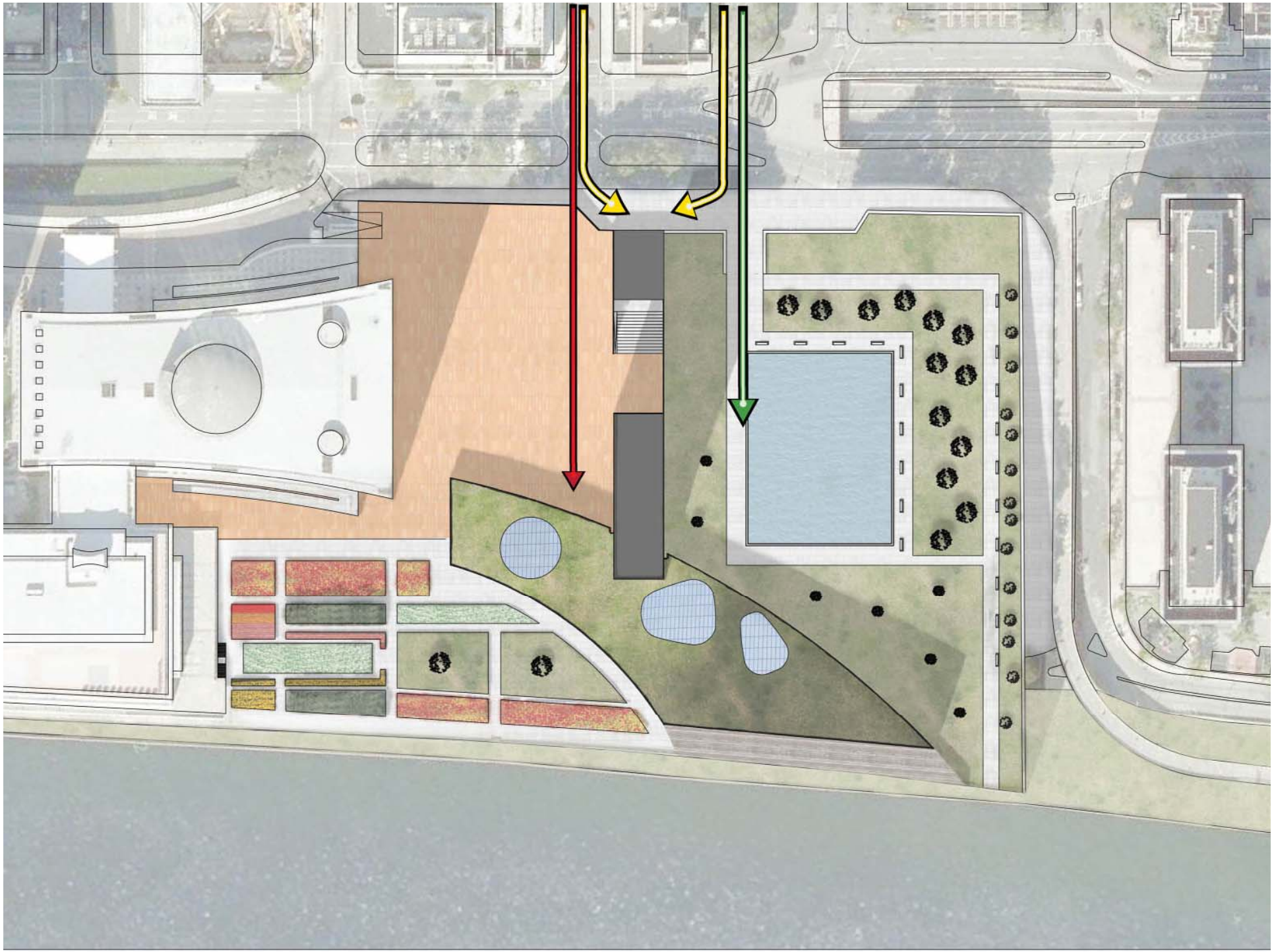


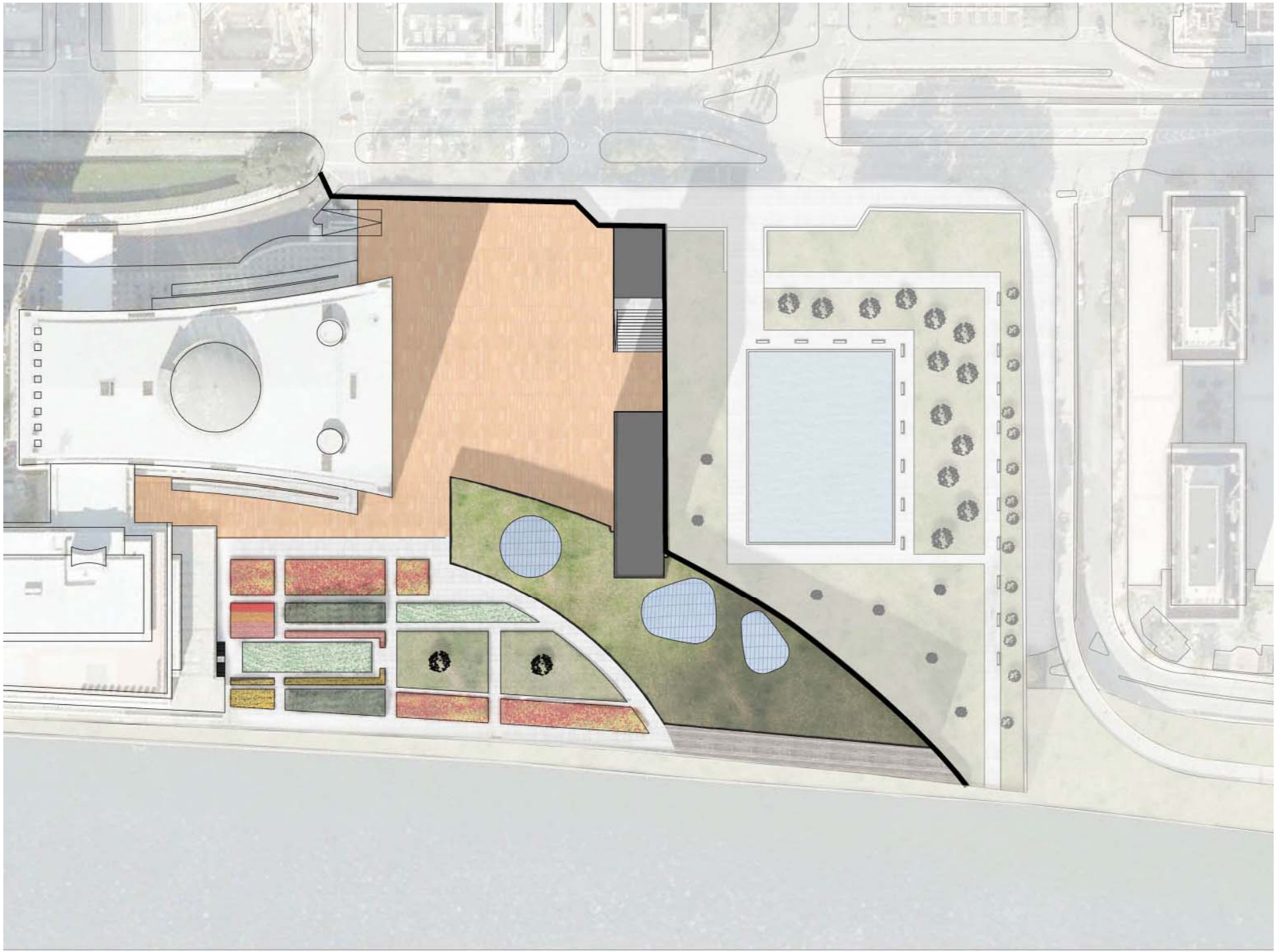


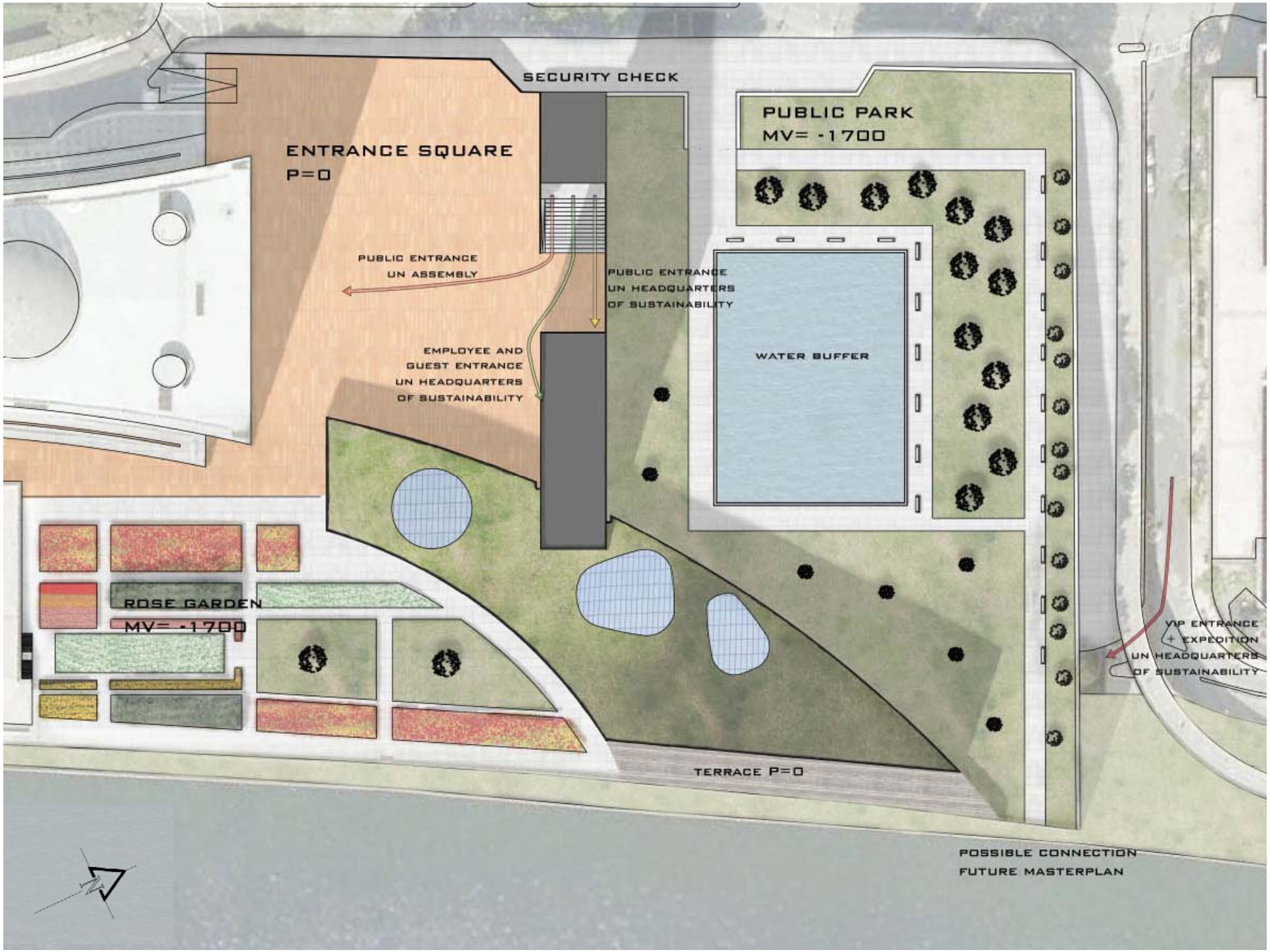
PLOTDESIGN

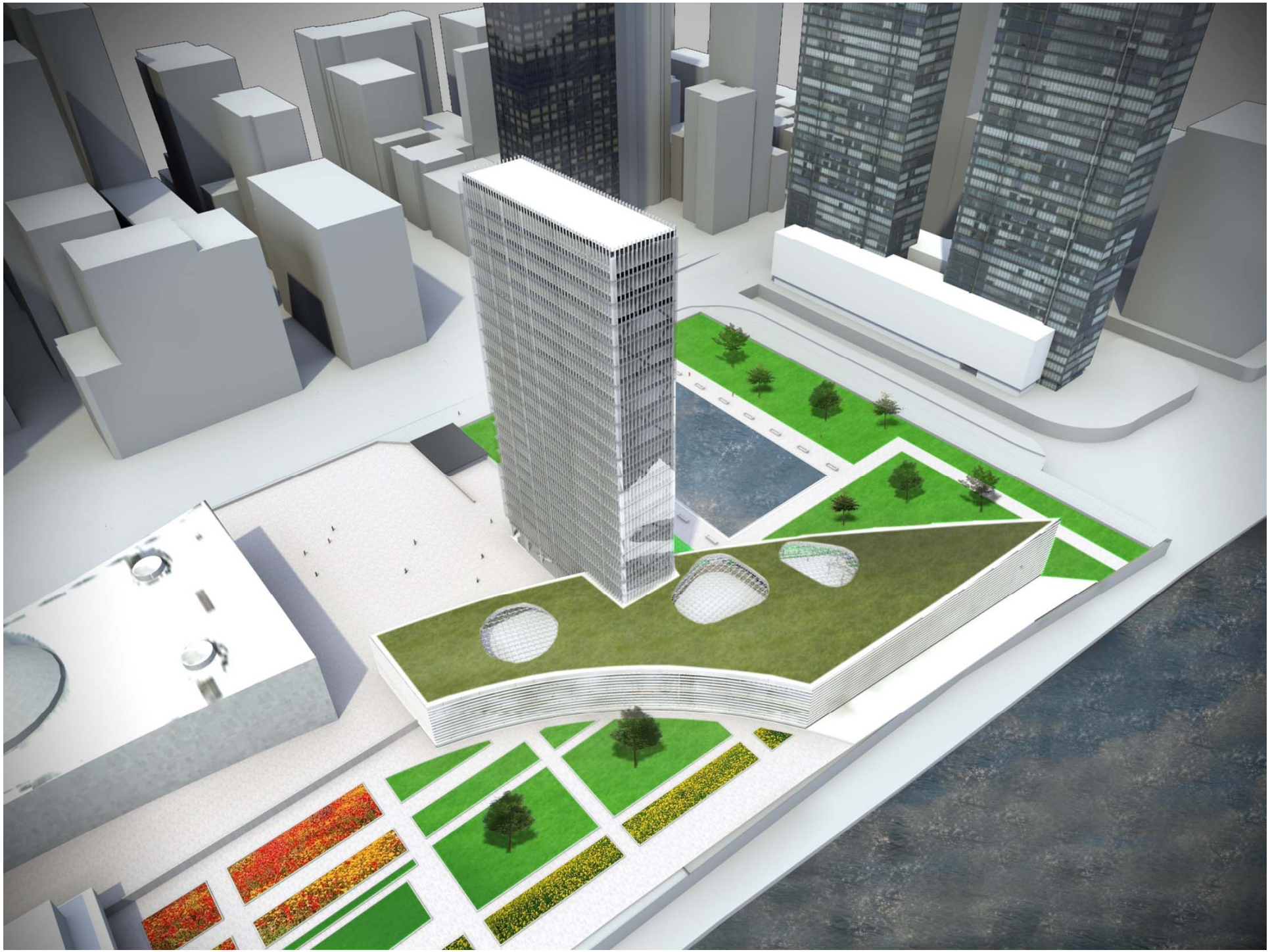


A. ENTRANCE AREA
B. PRIVATE ROSEGARDEN
C. PUBLIC PARK






SECURITY CHECK
PUBLIC PARK
MV= -1700
ENTRANCE SQUARE
P=0
PUBLIC ENTRANCE
UN ASSEMBLY
PUBLIC ENTRANCE
UN HEADQUARTERS
OF SUSTAINABILITY
EMPLOYEE AND
GUEST ENTRANCE
UN HEADQUARTERS
OF SUSTAINABILITY
WATER BUFFER
ROSE GARDEN
MV= -1700
VIP ENTRANCE
+ EXPEDITION
UN HEADQUARTERS
OF SUSTAINABILITY
TERRACE P=0
POSSIBLE CONNECTION
FUTURE MASTERPLAN



ORGANISATION

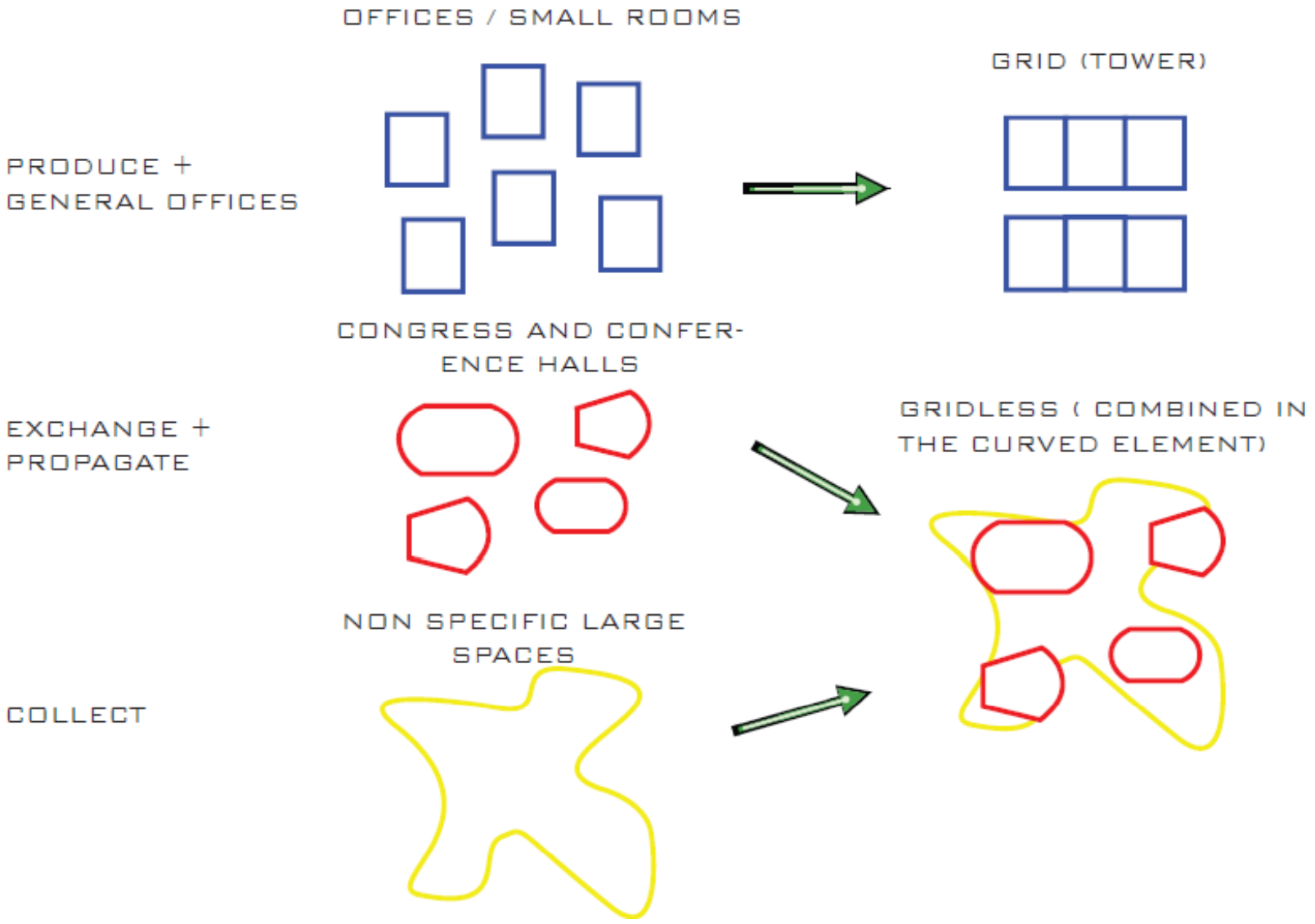
All possible information on the topic of sustainability both phisical and virtual data. Accessible for everyone.

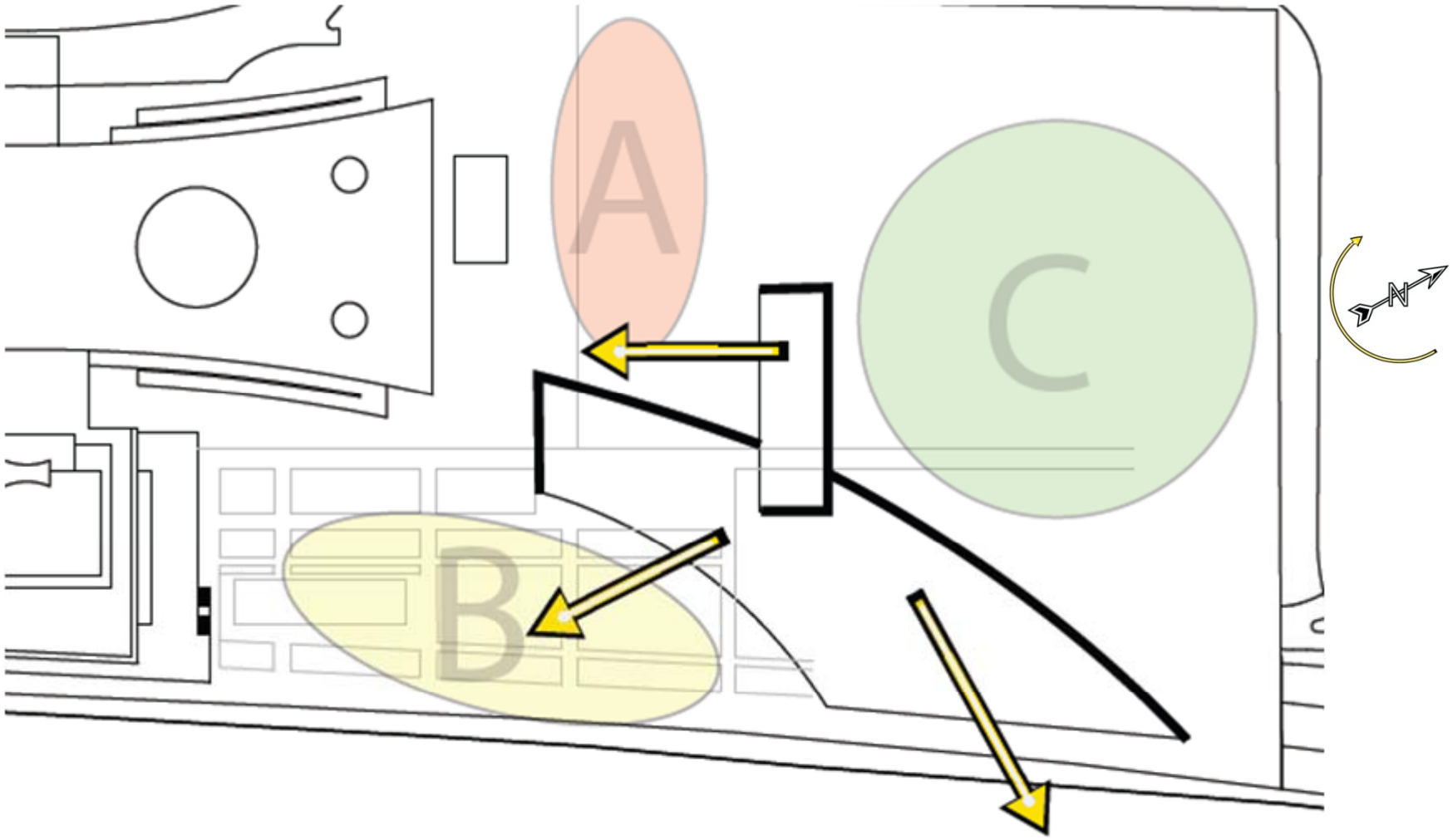
Production of missing knowledge and interpeting knew available information. Accessible only for employees.

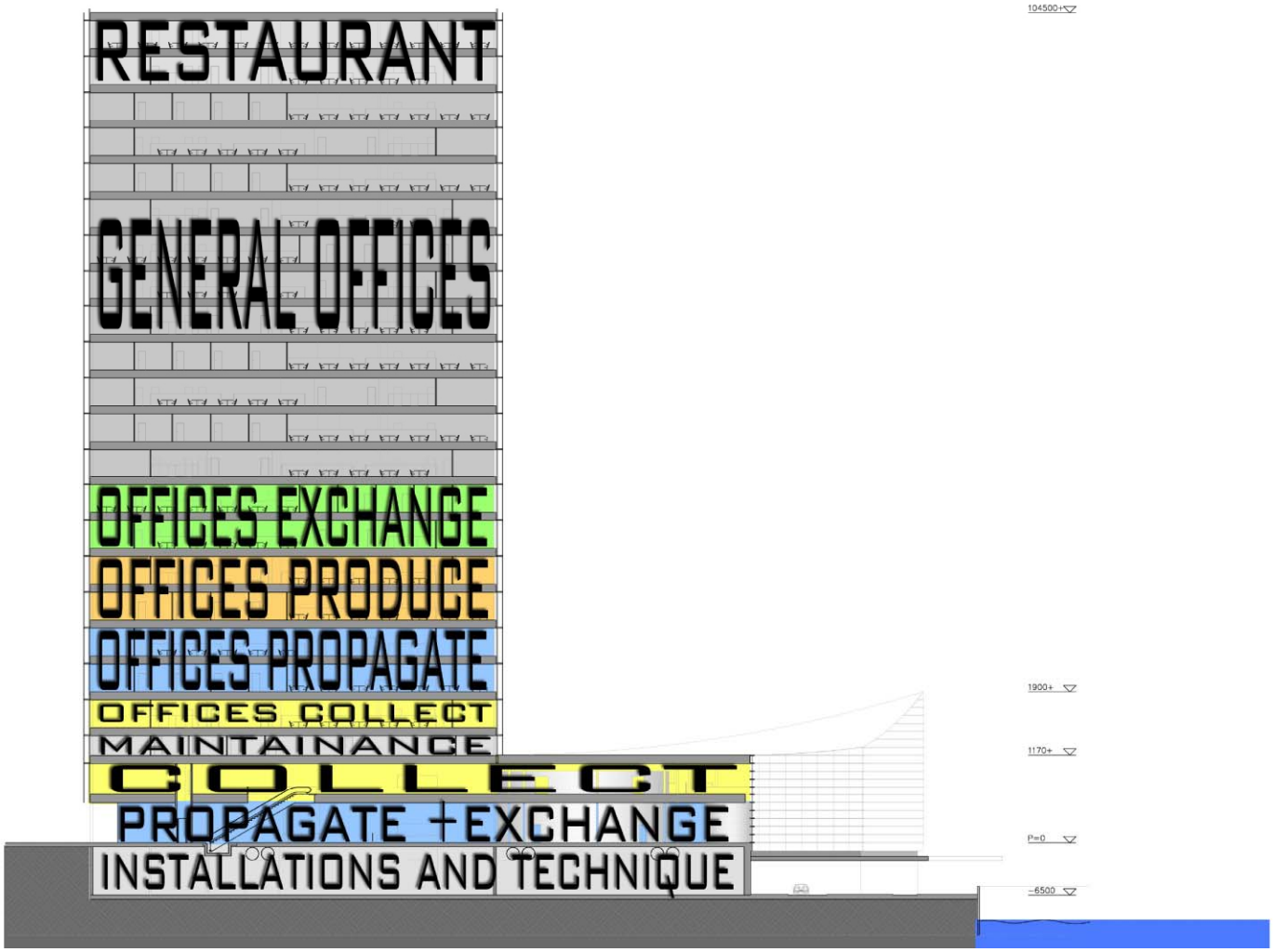
Communication with the outer world. Virtual information accessible for everyone as well as seminars for guests and press

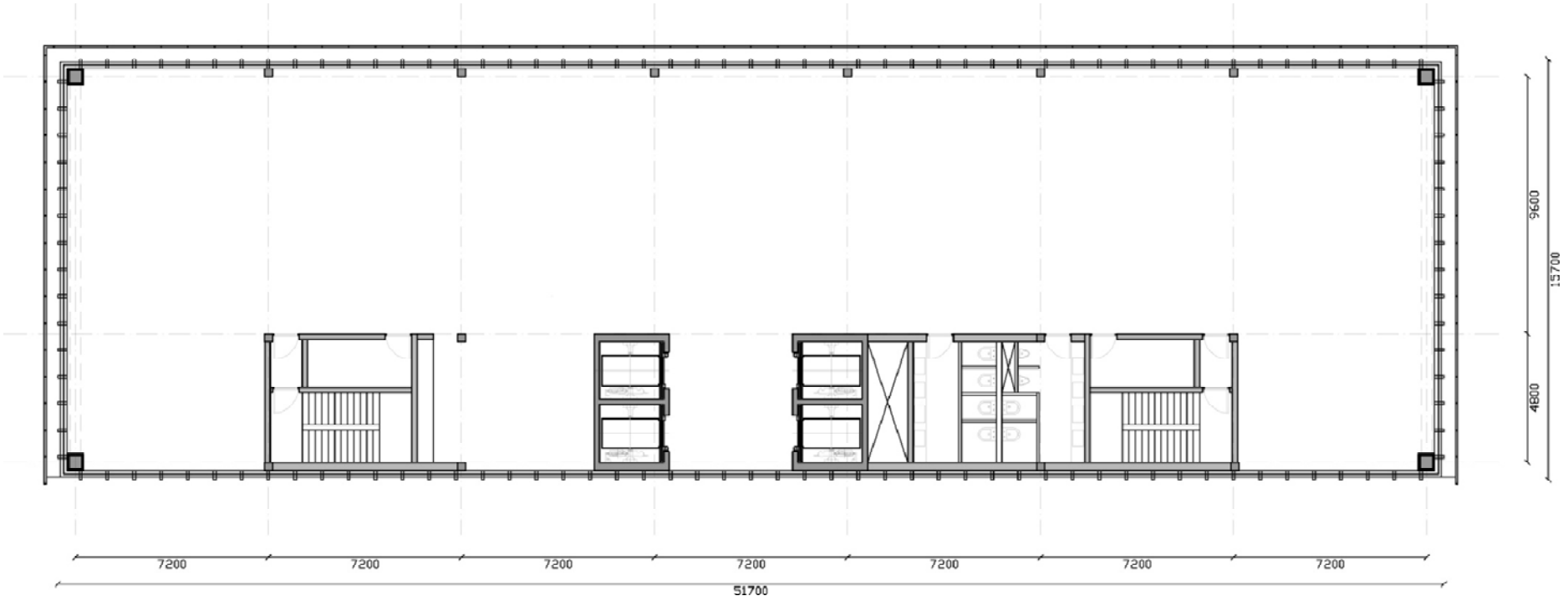
Exchange of knowledge. Topics disscussed in international conferences. Accessible for delegates and guests. Spectating for public and press is possible

PROGRAM & SHAPE



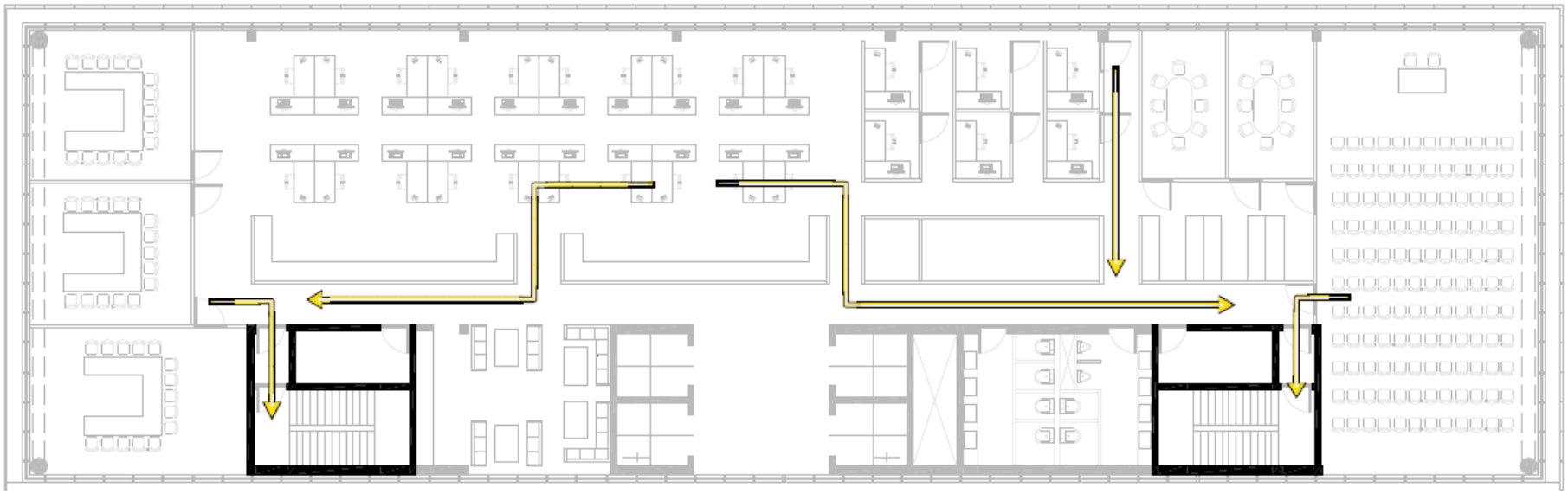

A
B
C
N


RESTAURANT
GENERAL OFFICES
OFFICES EXCHANGE
OFFICES PRODUCE
OFFICES PROPAGATE
OFFICES COLLECT
MAINTAINANCE
COLLECT
PROPAGATE +EXCHANGE
INSTALLATIONS AND TECHNIQUE
104500+
1900+
1170+
P=0
-6500

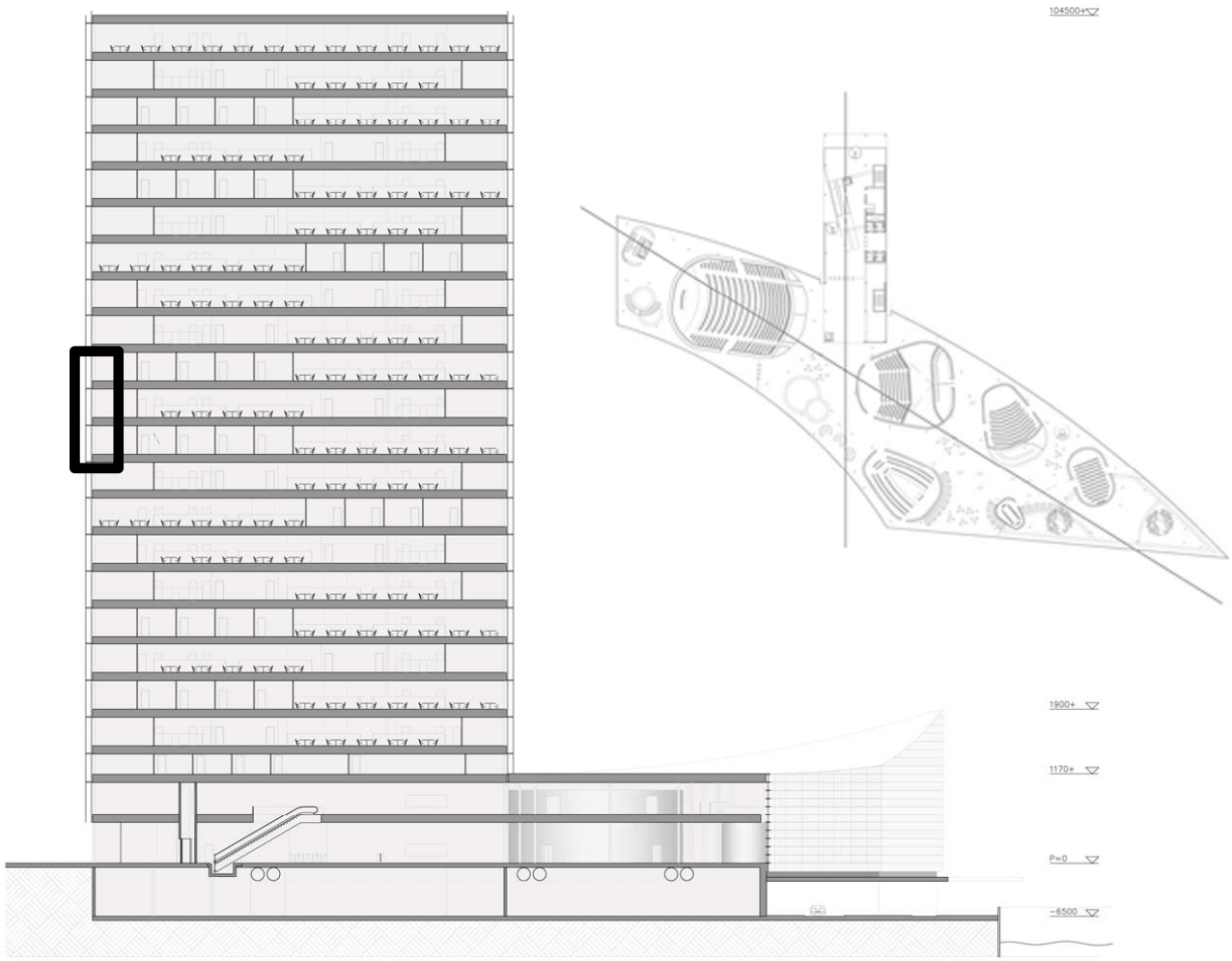

9600
4800
15700
7200
7200
7200
7200
7200
7200
7200
51700

POSSIBLE CONFIGURATION

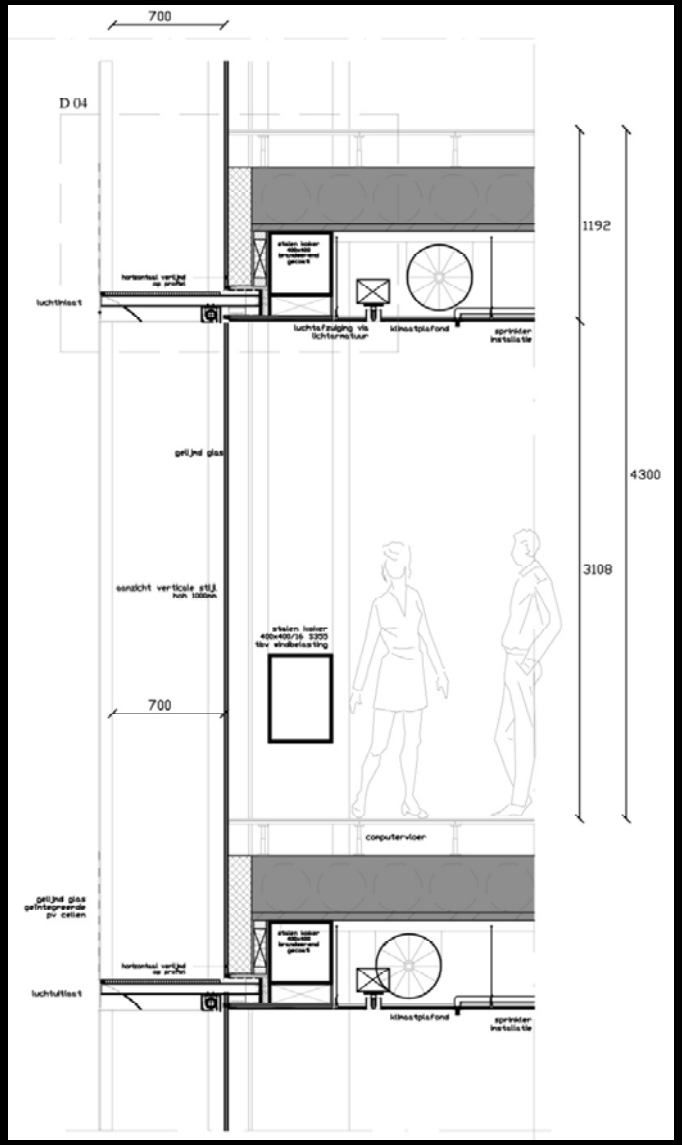
FIRE SAFETY TOWER

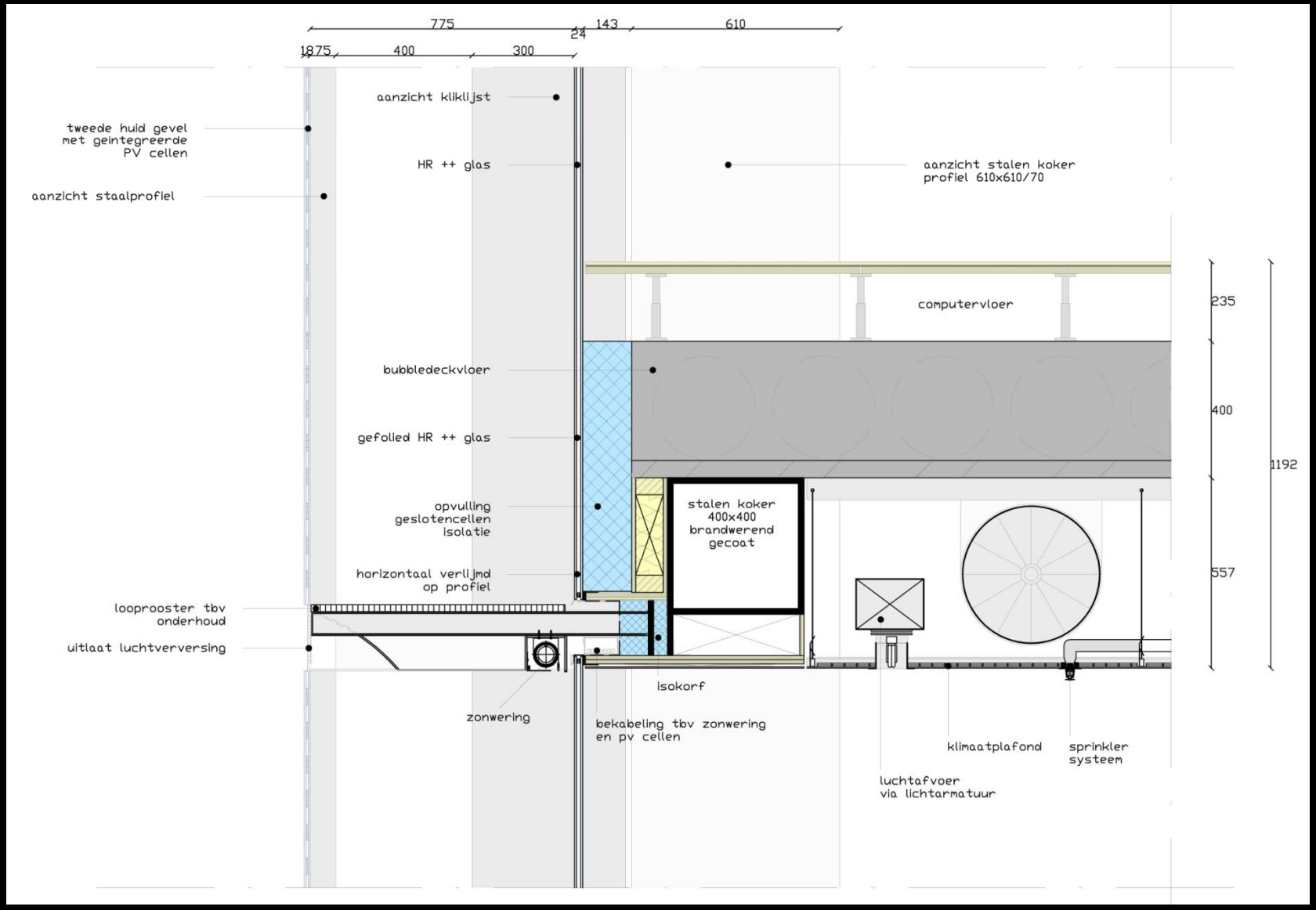


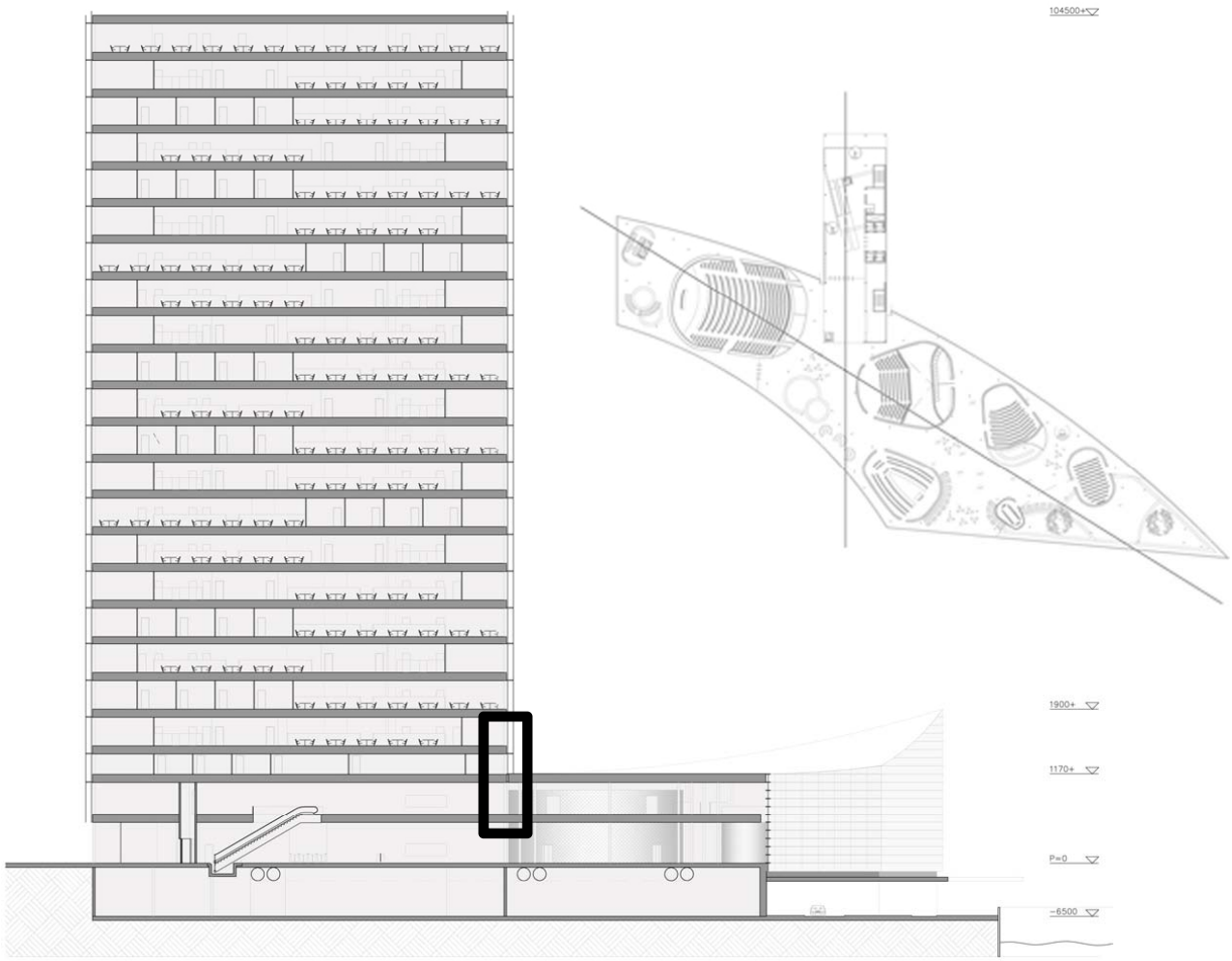
MILTIPLE FIRE EXITS COMBINED WITH A SPRINKLER SYSTEM


104500+
1900+
1170+
P=0
-6500

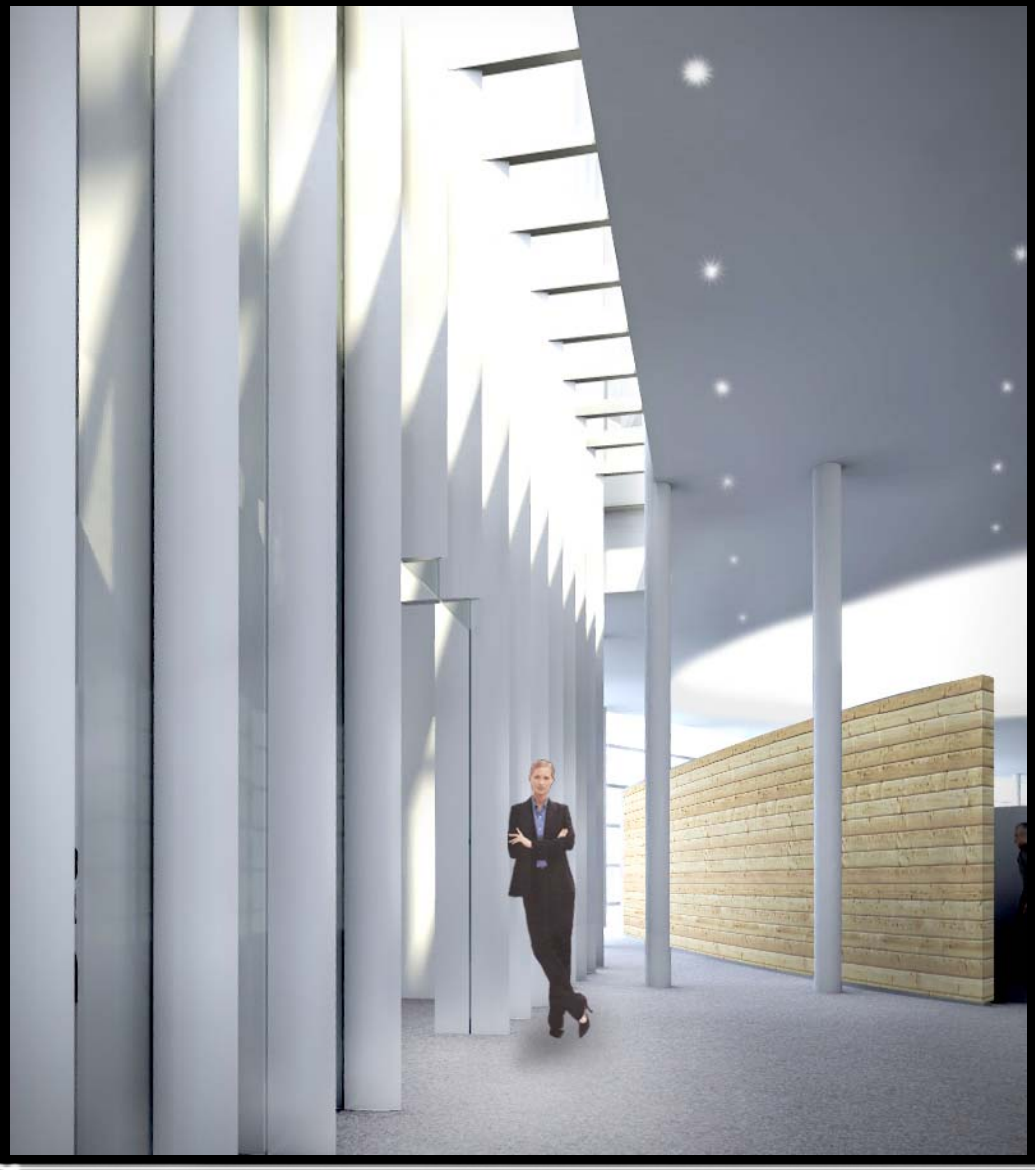
DETAILING TOWER

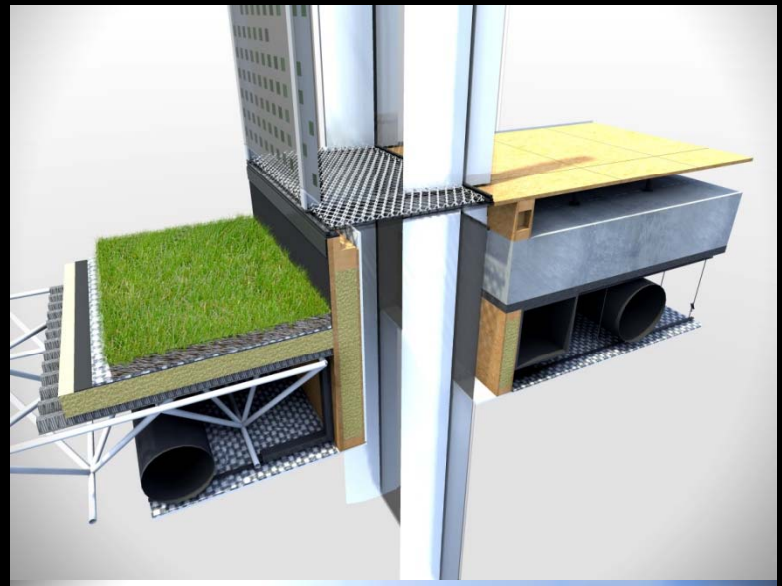


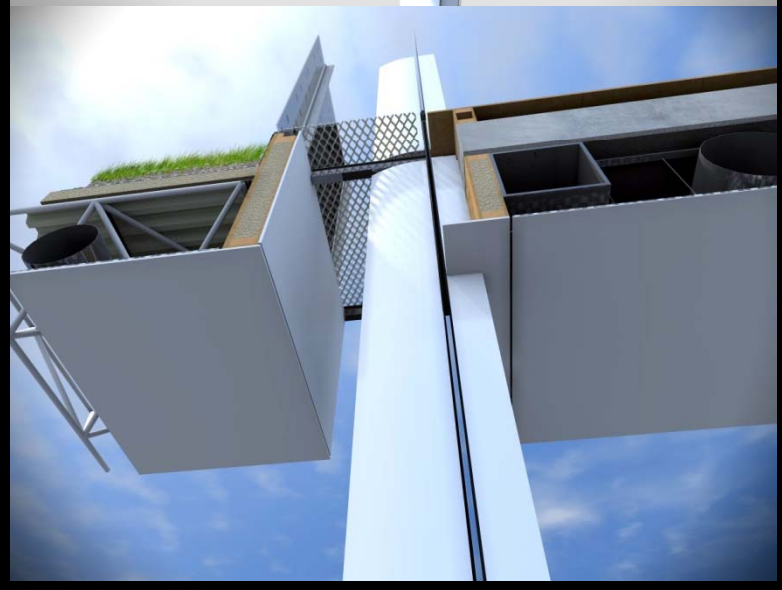

775
24
143
610
1875
400
300
aanzicht kliklijst
tweede huid gevel
met geintegreerde
PV cellen
HR ++ glas
aanzicht staalprofiel
aanzicht stalen koker
profiel 610x610/70
computervloer
235
bubbledeckvloer
400
gefolied HR ++ glas
1192
opvulling
gesloten cellen
isolatie
stalen koker
400x400
brandwerend
gecoat
557
horizontaal verlijmd
op profiel
looprooster tbv
onderhoud
uitlaat luchtverversing
isokorf
zonwering
bekabeling tbv zonwering
en pv cellen
klimaatplafond
sprinkler
systeem
luchtafvoer
via lichtarmatuur

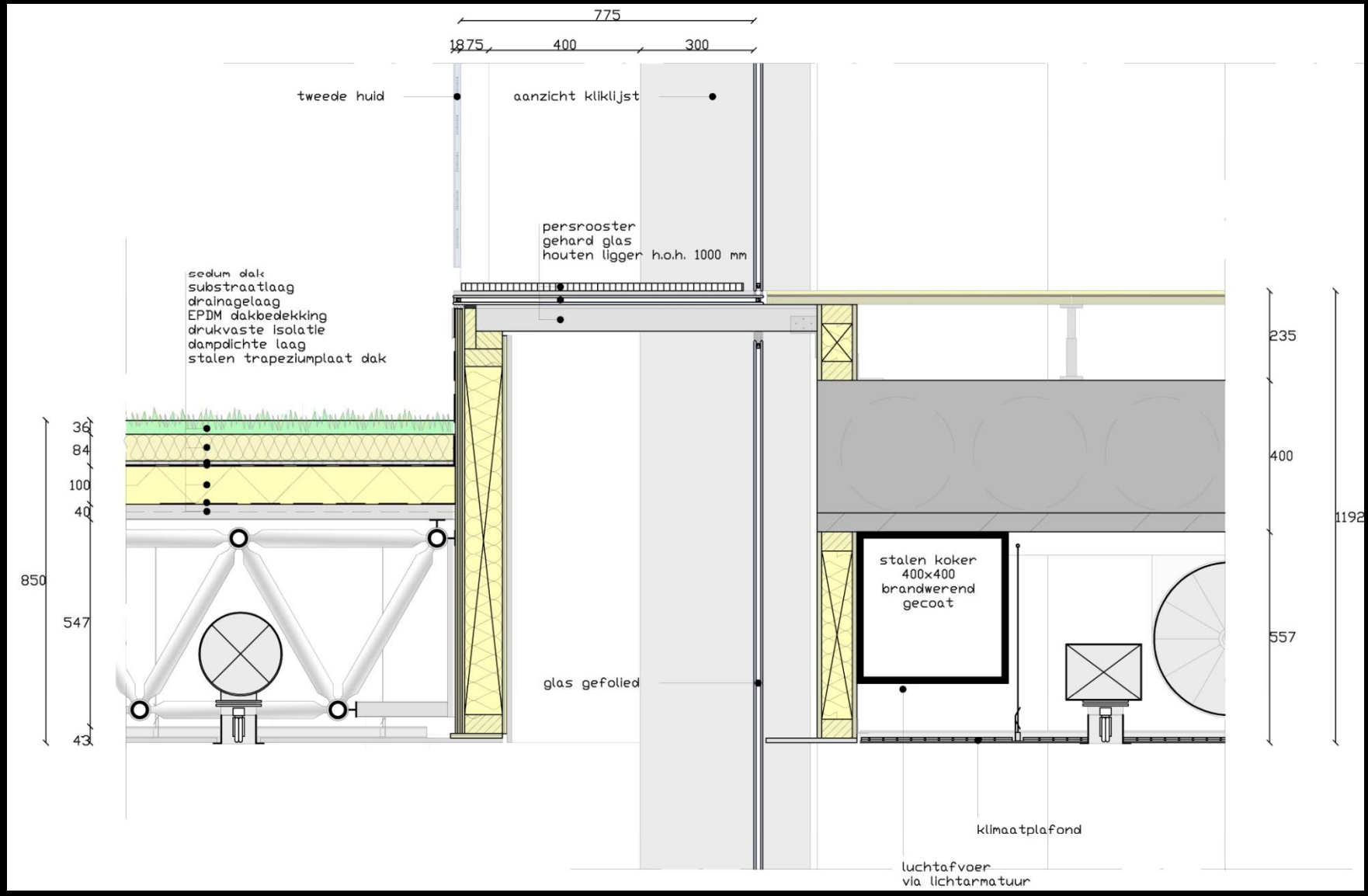

104500+
1900+
1170+
P=0
-6500

DETAILLING TOWER

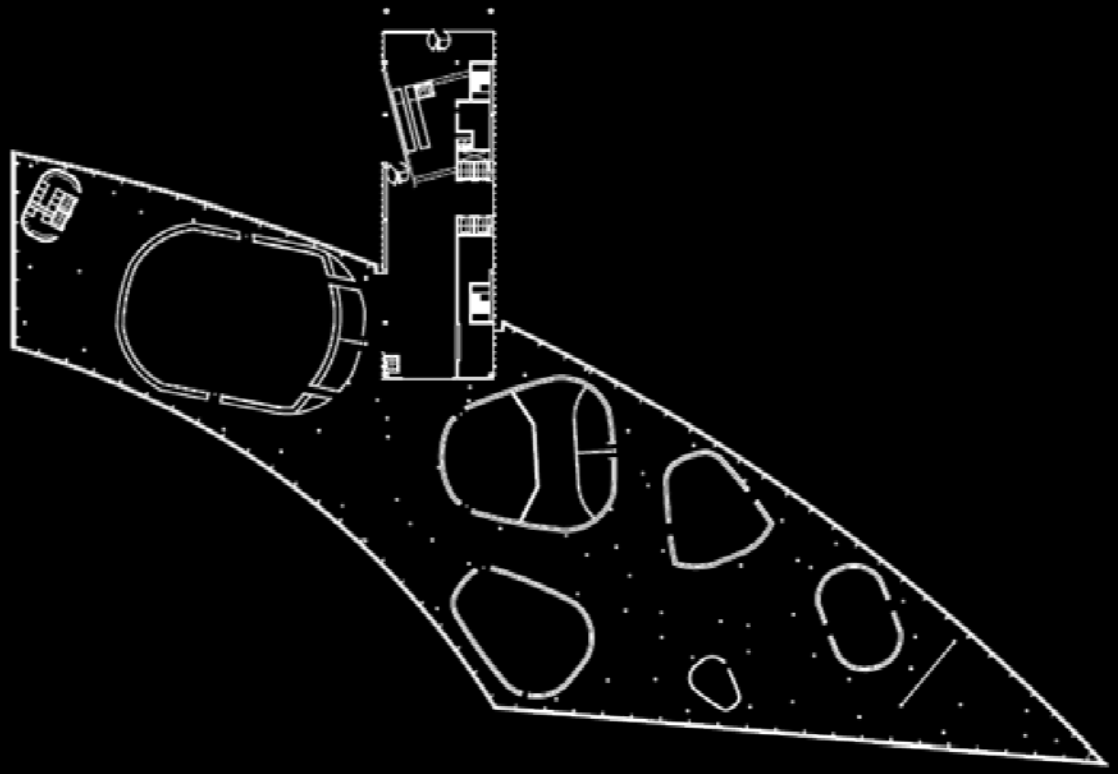







775
1875
400
300
tweede huid
aanzicht kliklijst
persrooster
gehard glas
houten ligger h.o.h. 1000 mm
sedum dak
substraatlaag
drainagelaag
EPDM dakbedekking
drukvaste isolatie
dampdichte laag
stalen trapeziumplaat dak
36
84
100
40
850
547
43
235
400
1192
557
stalen koker
400x400
brandwerend
gecoat
glas gefolied
klimaatplafond
luchtafvoer
via lichtarmatuur

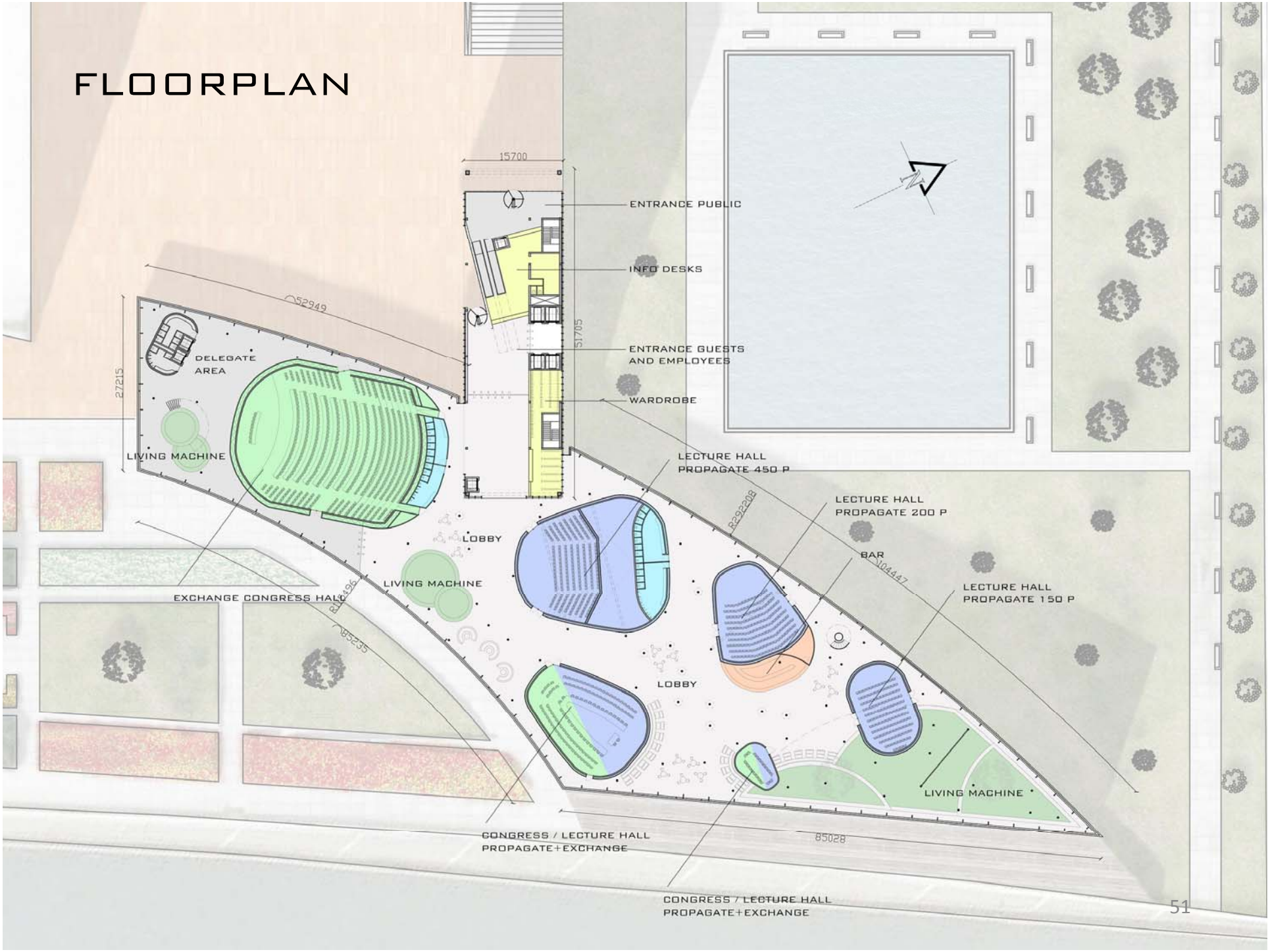
STRUCTURE

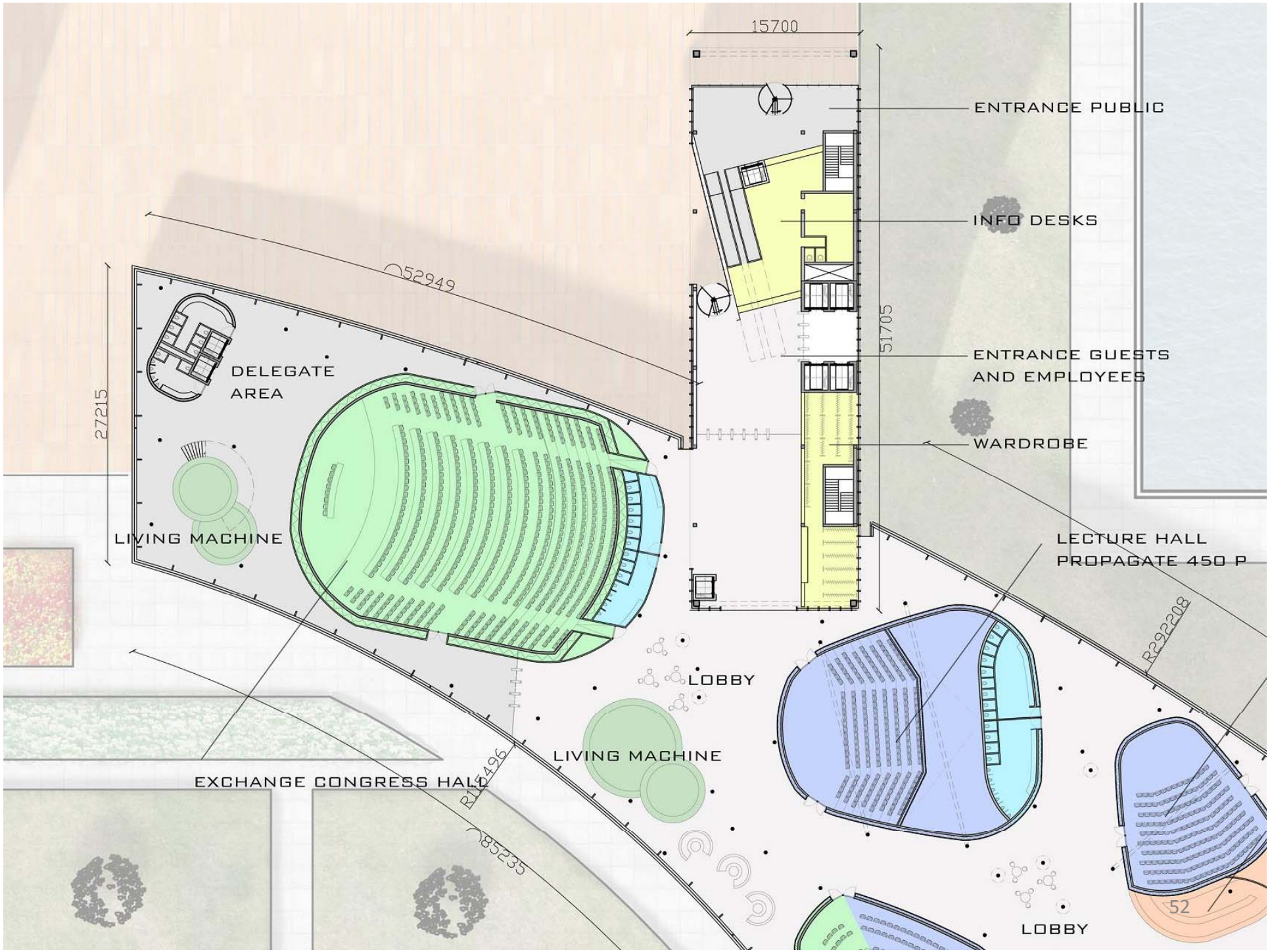


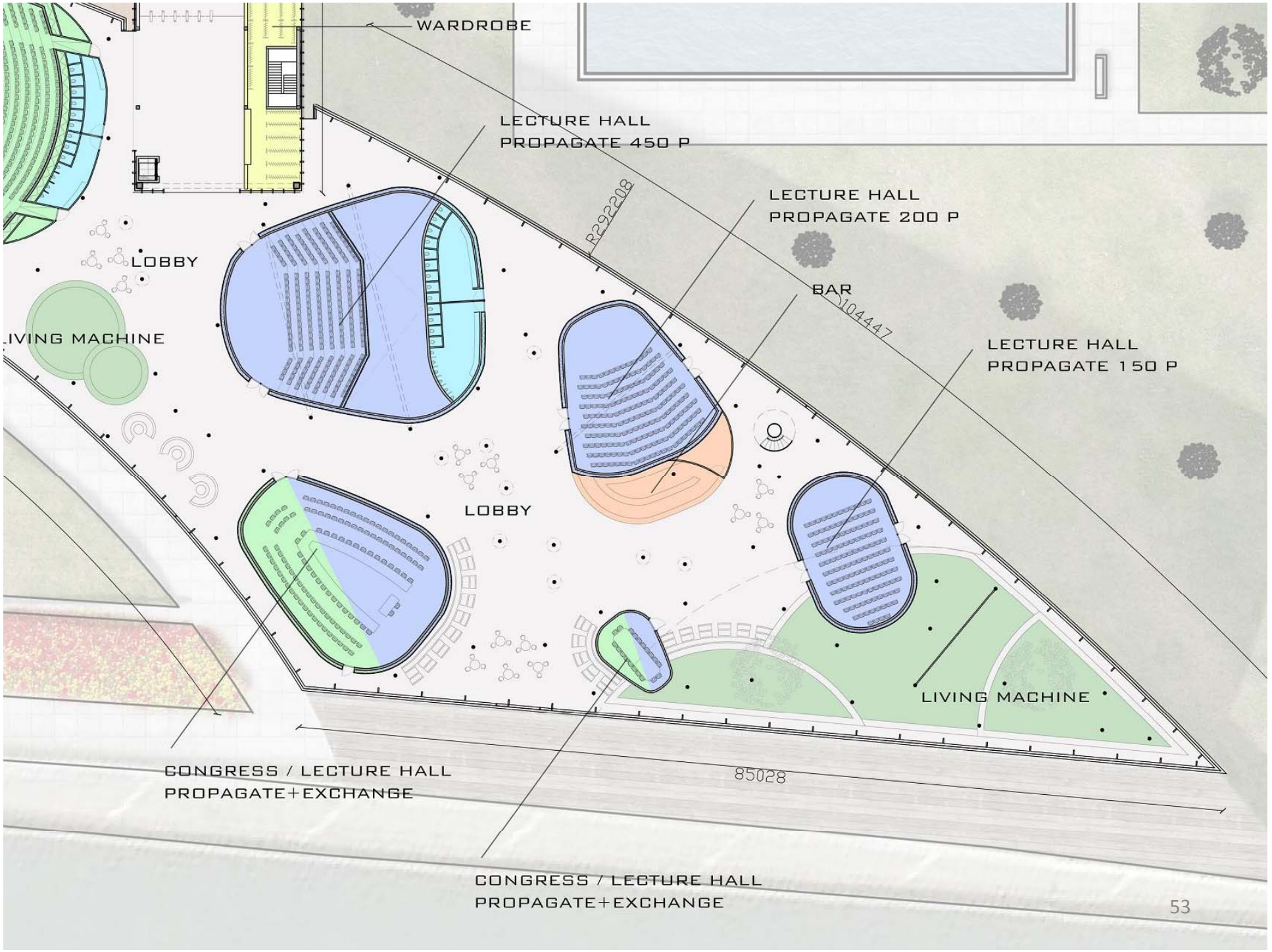
Axel Schultes

Junya Ishigami

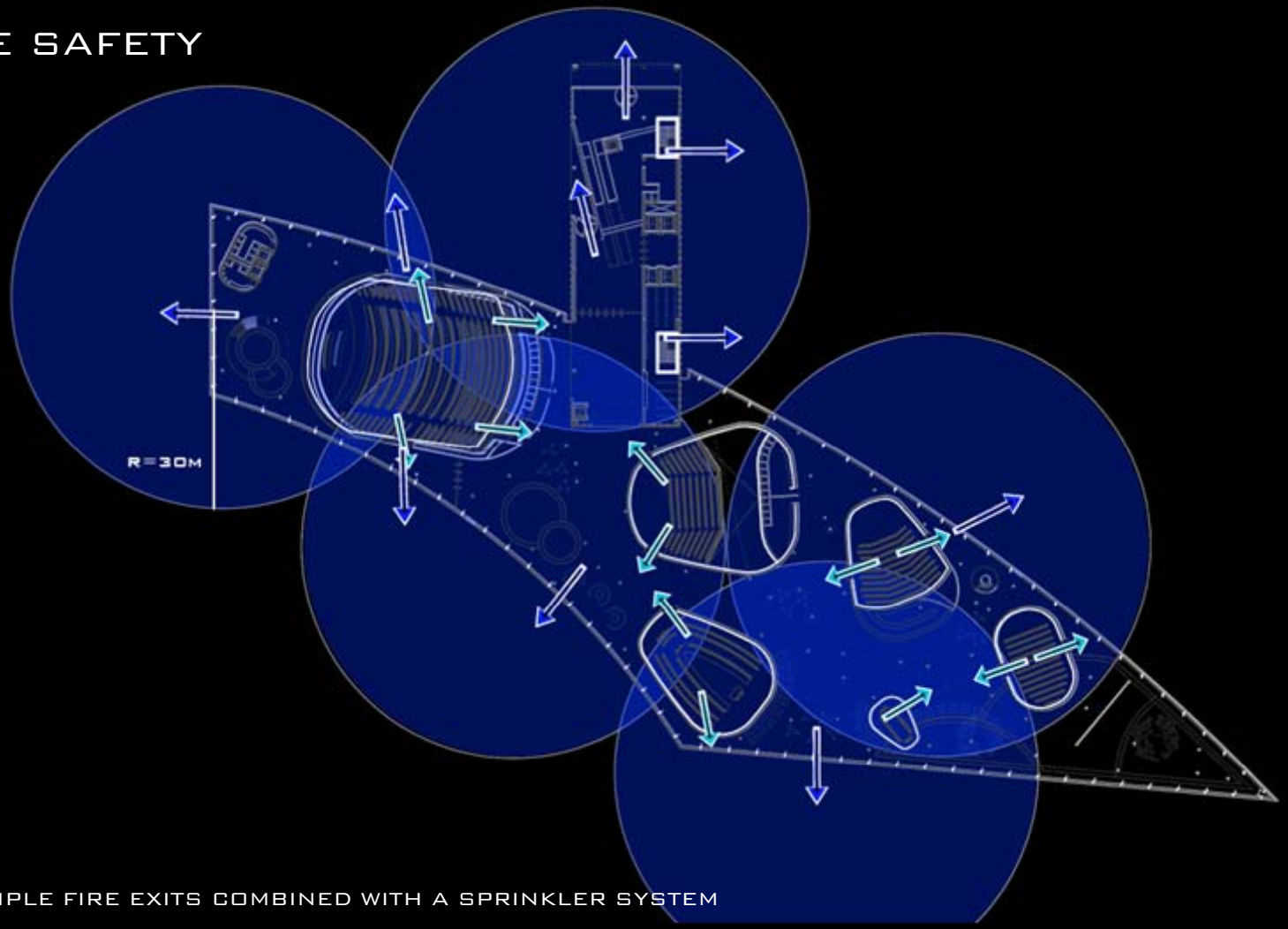
FLOORPLAN


15700
ENTRANCE PUBLIC
INFO DESKS
51705
ENTRANCE GUESTS
AND EMPLOYEES
WARDROBE
52949
27215
DELEGATE
AREA
LIVING MACHINE
LECTURE HALL
PROPAGATE 450 P
R292208
LECTURE HALL
PROPAGATE 200 P
LOBBY
BAR
104447
LIVING MACHINE
LECTURE HALL
PROPAGATE 150 P
EXCHANGE CONGRESS HALL
R24196
85235
LOBBY
LIVING MACHINE
CONGRESS / LECTURE HALL
PROPAGATE+EXCHANGE
85028
CONGRESS / LECTURE HALL
PROPAGATE+EXCHANGE

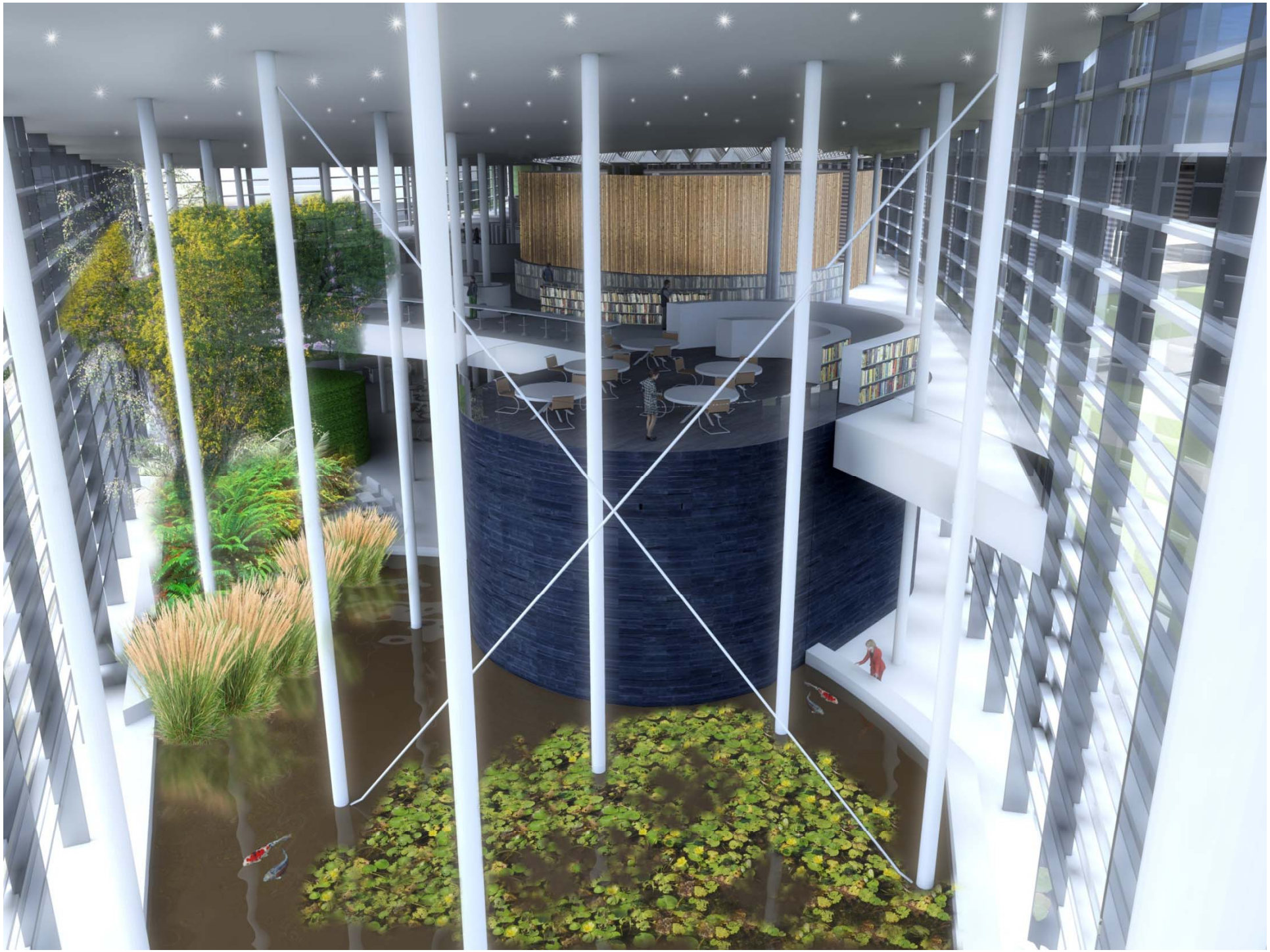

15700
ENTRANCE PUBLIC
INFO DESKS
51705
ENTRANCE GUESTS
AND EMPLOYEES
WARDROBE
52949
27215
DELEGATE
AREA
LIVING MACHINE
LECTURE HALL
PROPAGATE 450 P
R29208
LOBBY
LIVING MACHINE
R11496
EXCHANGE CONGRESS HALL
85233
LOBBY


WARDROBE
LECTURE HALL
PROPAGATE 450 P
R292208
LECTURE HALL
PROPAGATE 200 P
LOBBY
BAR
104447
IVING MACHINE
LECTURE HALL
PROPAGATE 150 P
LOBBY
LIVING MACHINE
CONGRESS / LECTURE HALL
PROPAGATE+EXCHANGE
85028
CONGRESS / LECTURE HALL
PROPAGATE+EXCHANGE

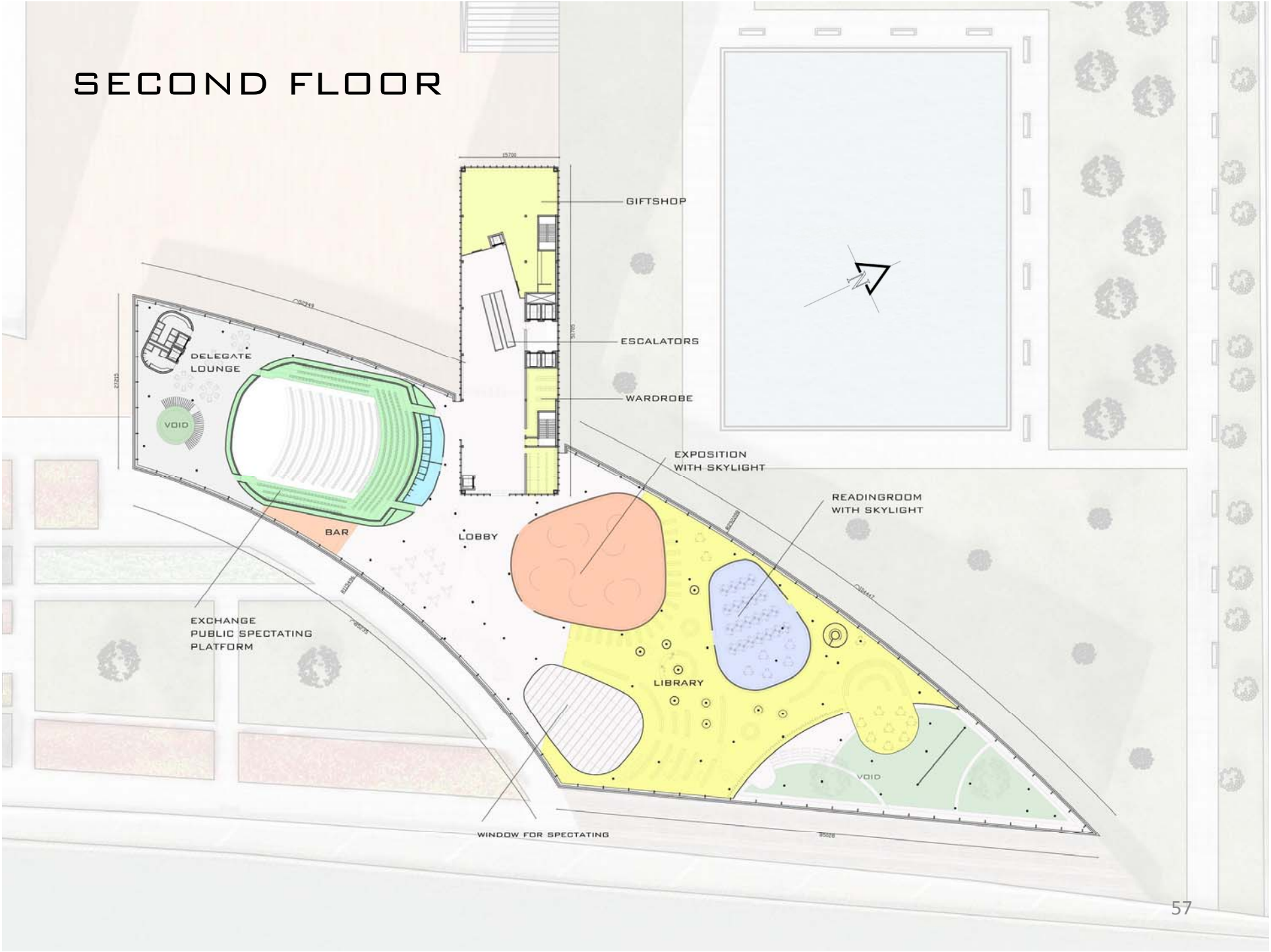
FIRE SAFETY

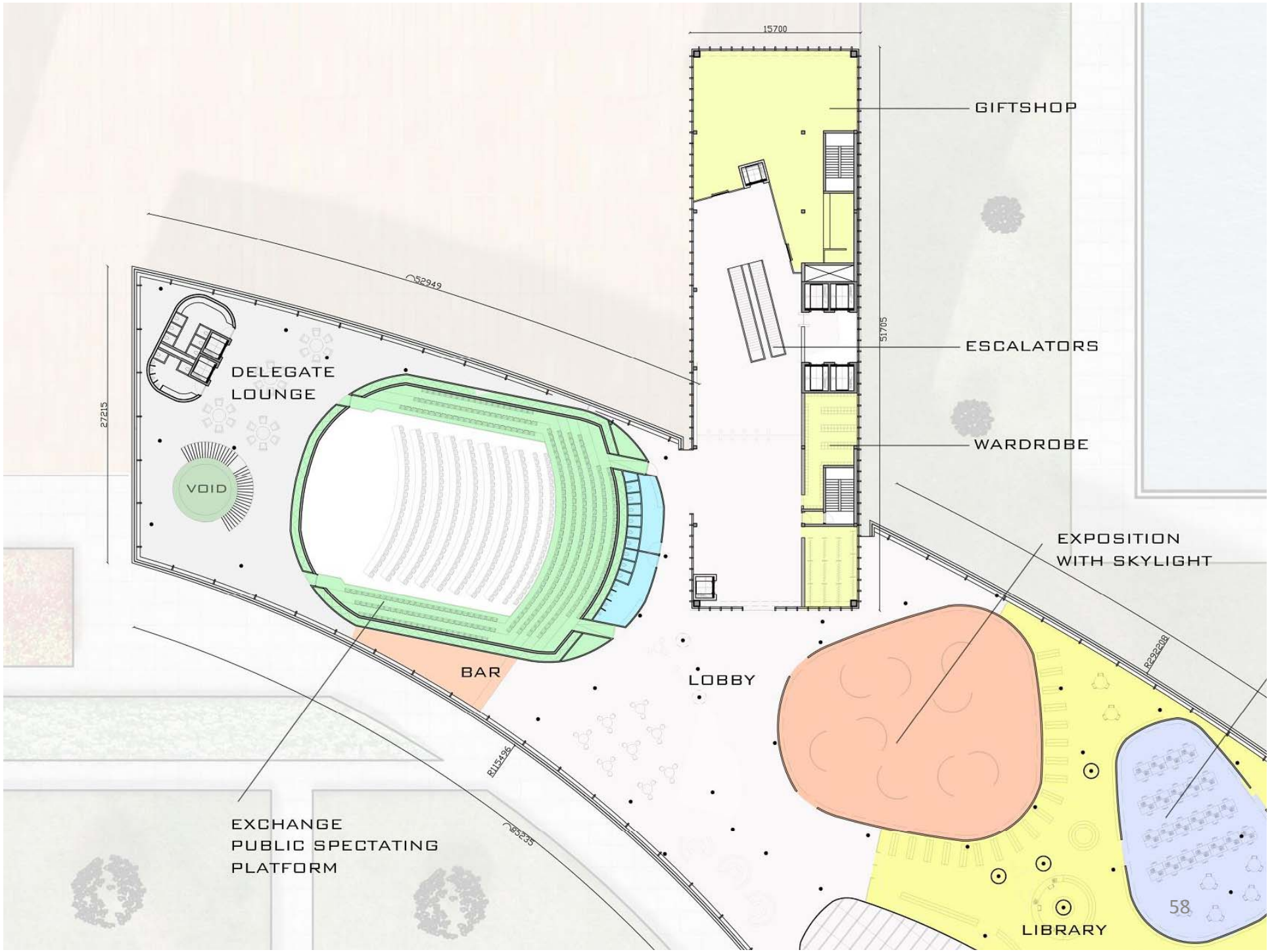


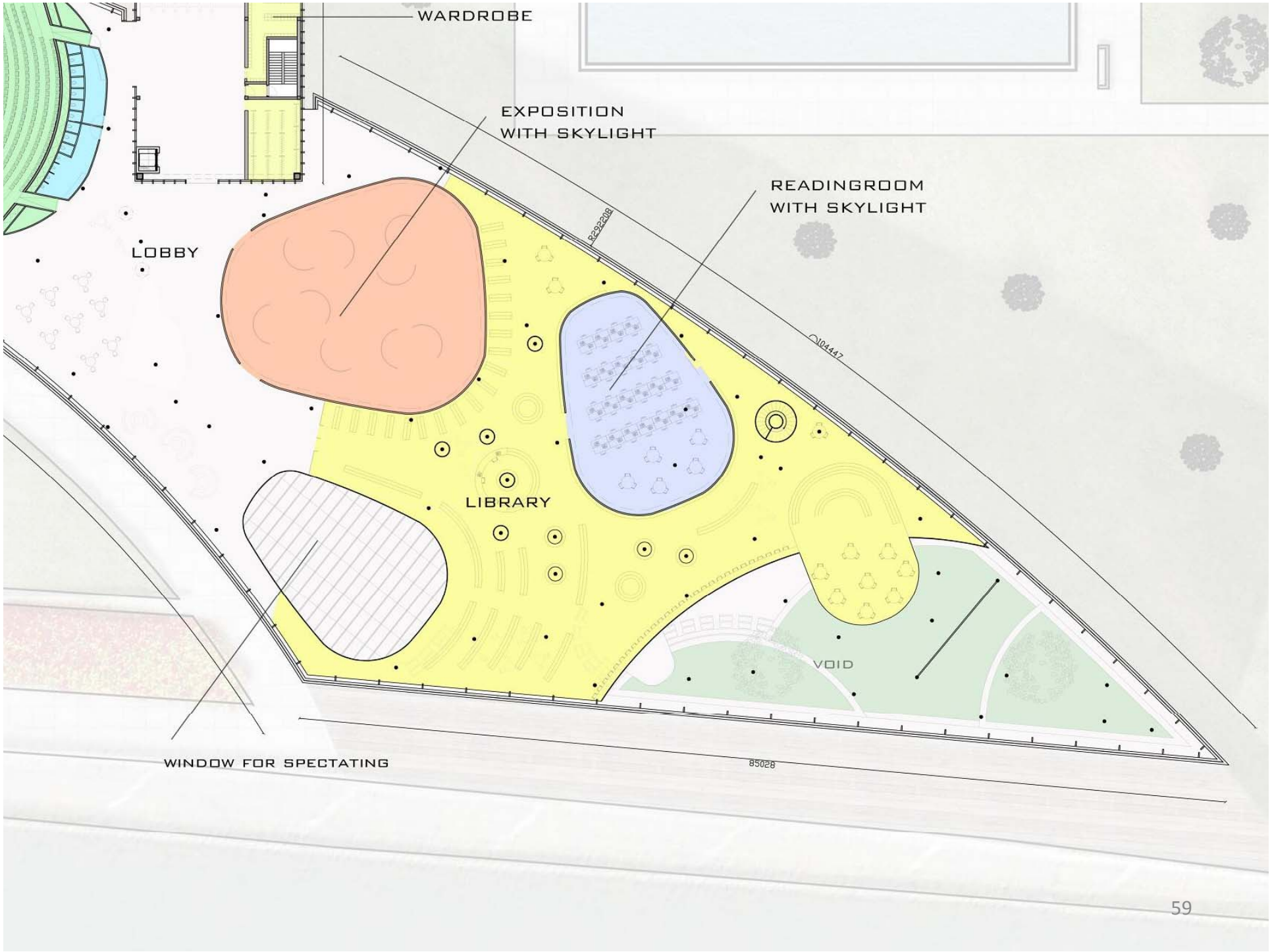
MILTIPLE FIRE EXITS COMBINED WITH A SPRINKLER SYSTEM



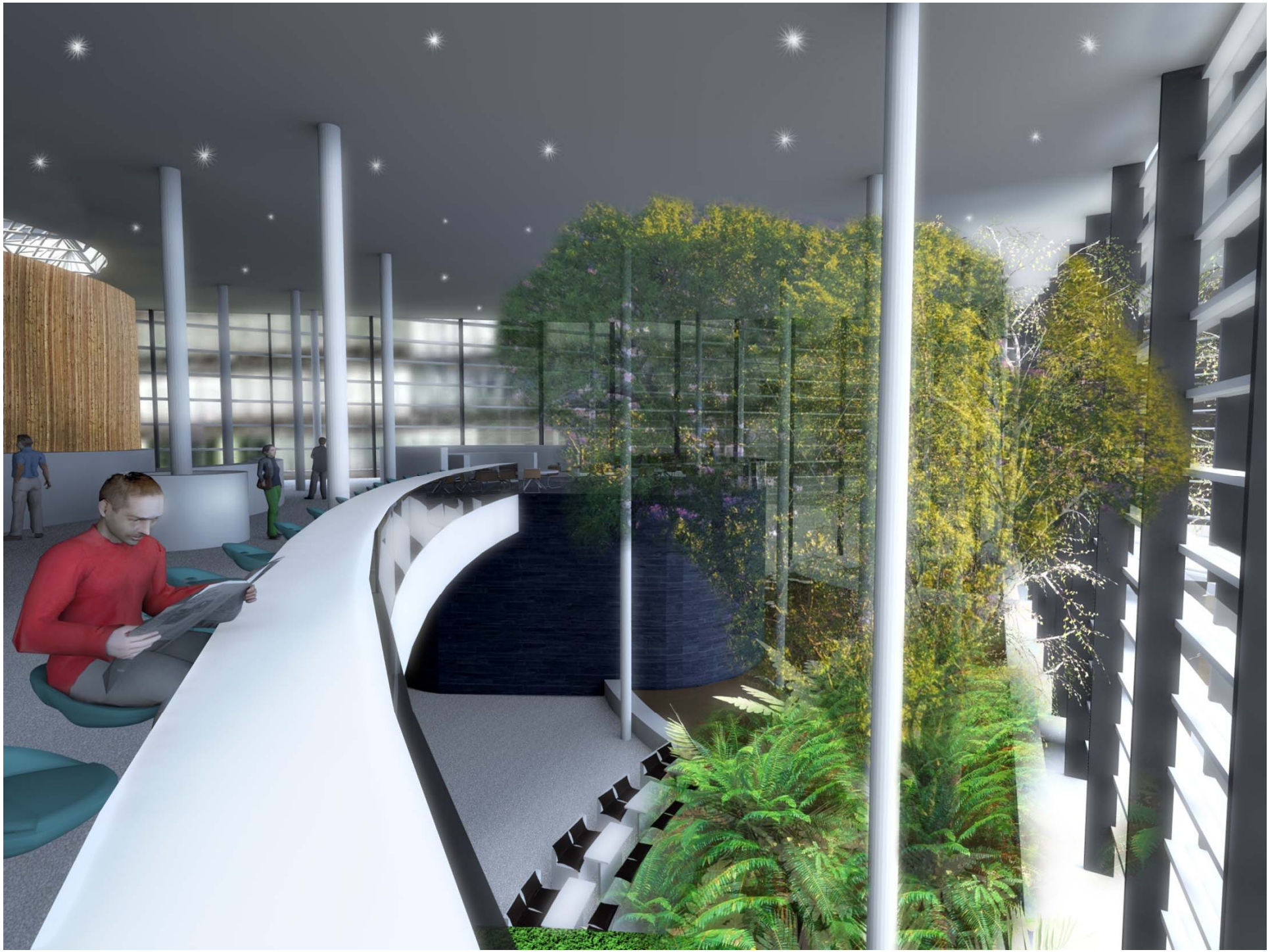
SECOND FLOOR

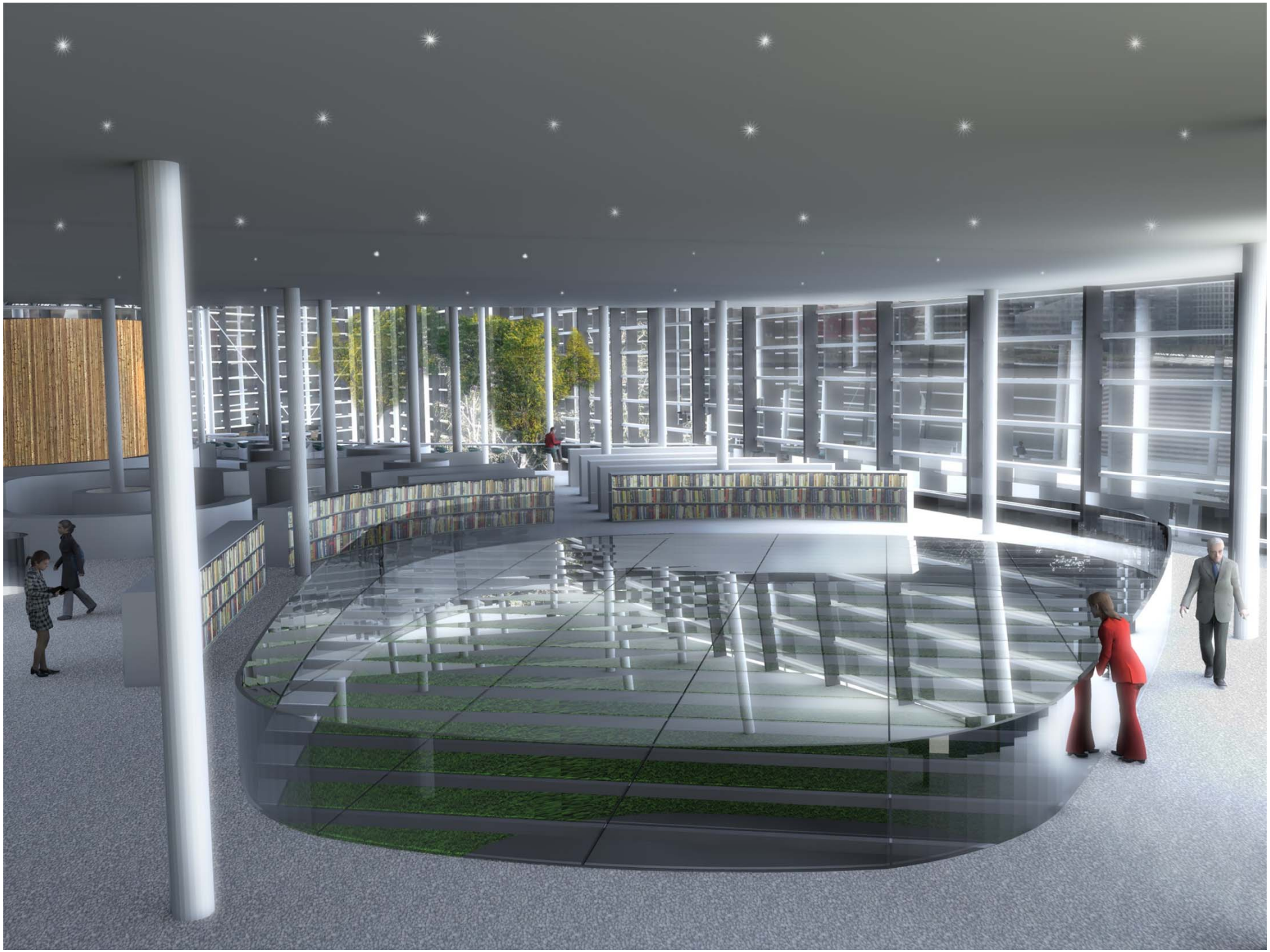


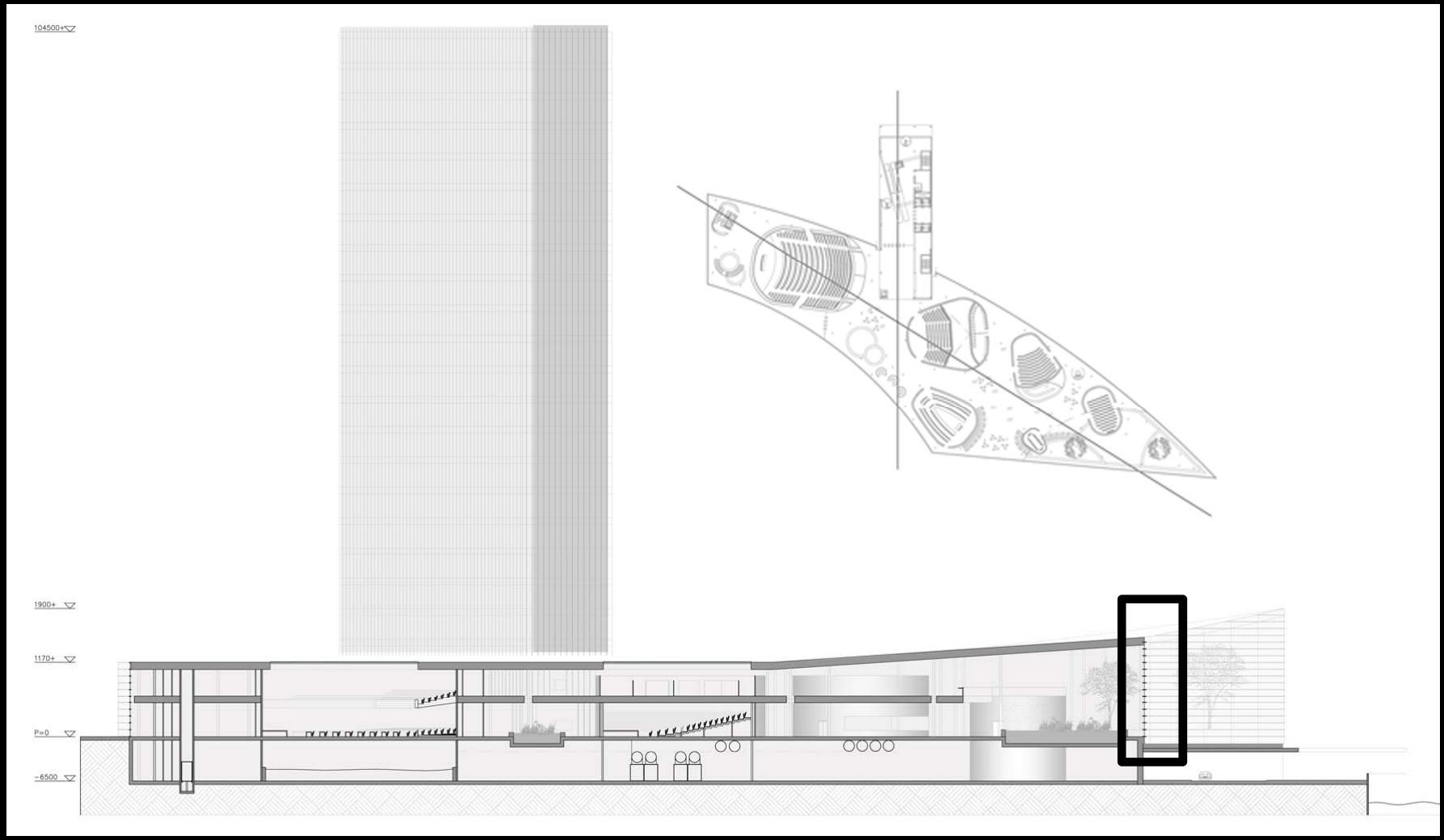

15700
GIFTSHOP
ESCALATORS
WARDROBE
51705
52949
27215
DELEGATE
LOUNGE
VOID
BAR
LOBBY
EXPOSITION
WITH SKYLIGHT
R292208
R115496
53235
EXCHANGE
PUBLIC SPECTATING
PLATFORM
LIBRARY


WARDROBE
EXPOSITION
WITH SKYLIGHT
READINGROOM
WITH SKYLIGHT
LOBBY
LIBRARY
VOID
WINDOW FOR SPECTATING
8292208
104447
85028

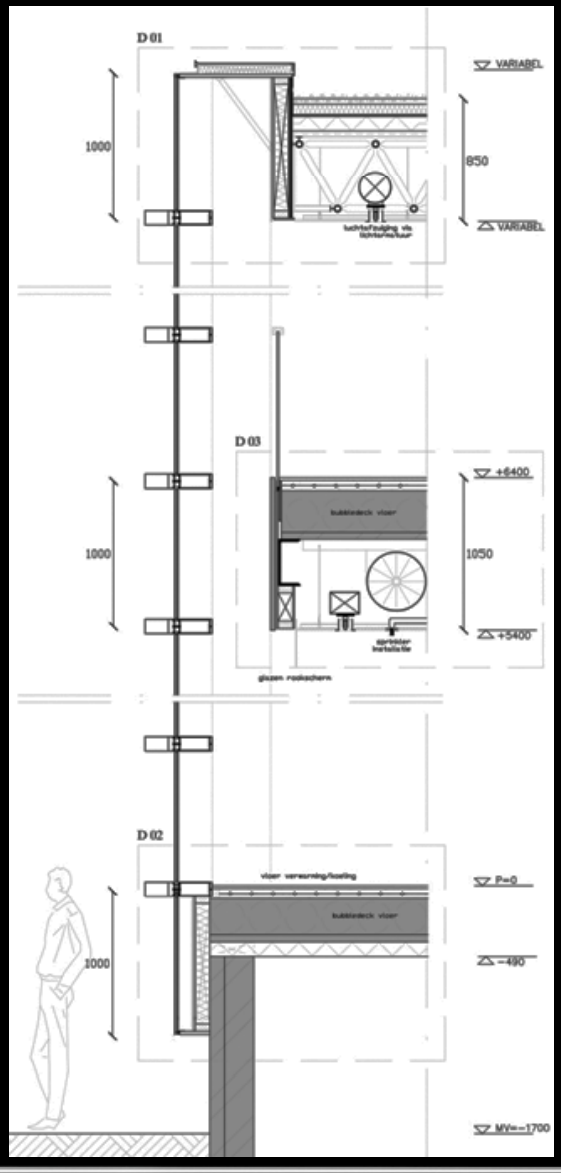
FIRE SAFETY






104500+
1900+
1170+
P=0
-6500

DETAILING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VARIABEL
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VARIABEL
D 03
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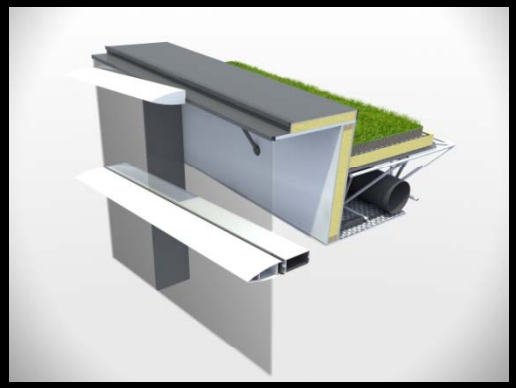
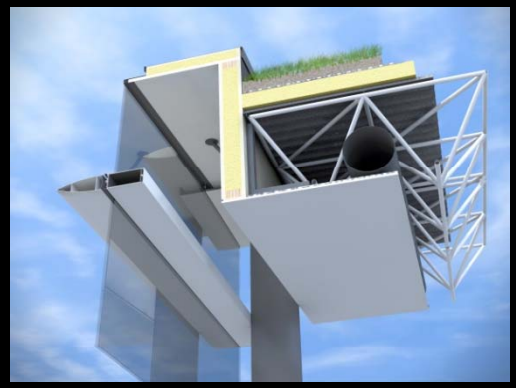
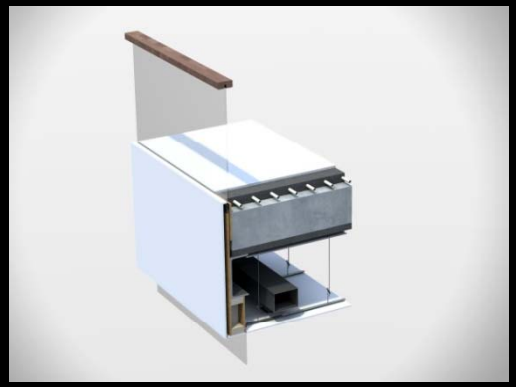
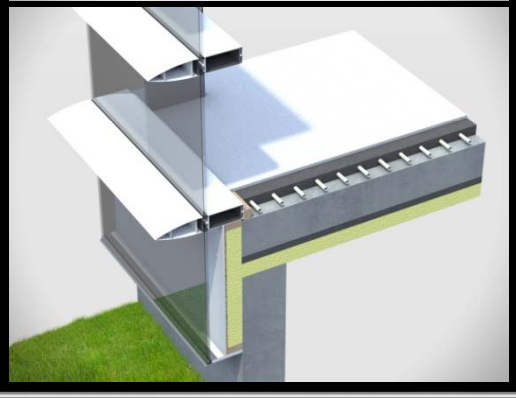
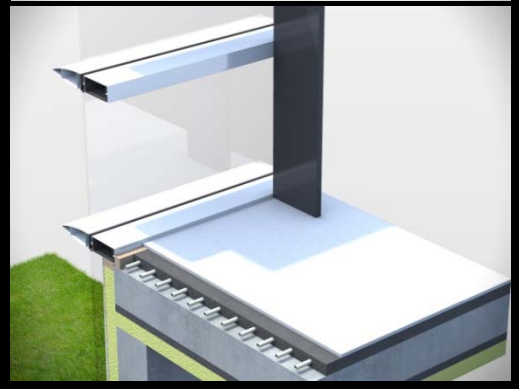
D 02
P=0
1000
-490
MV=-1700

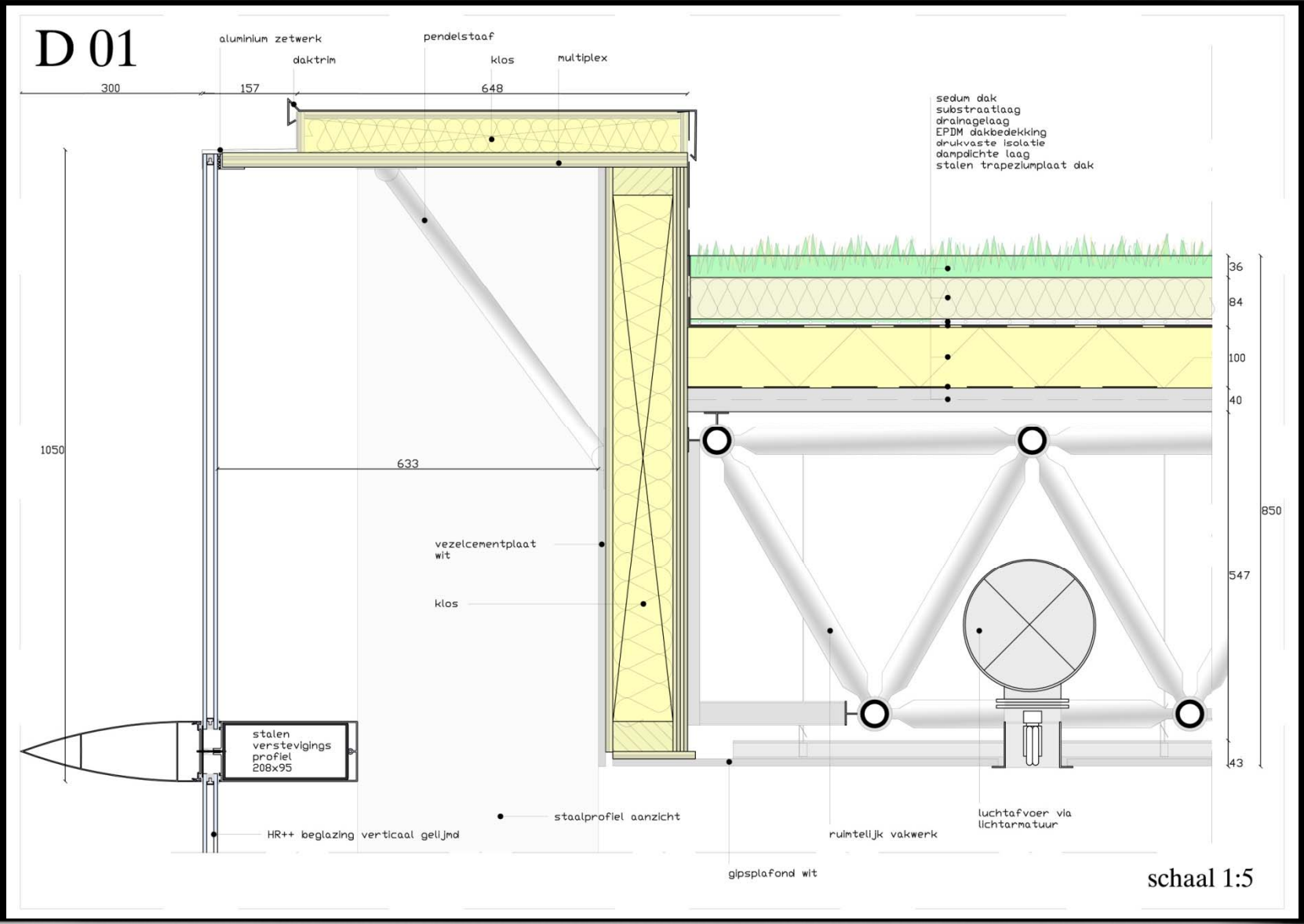


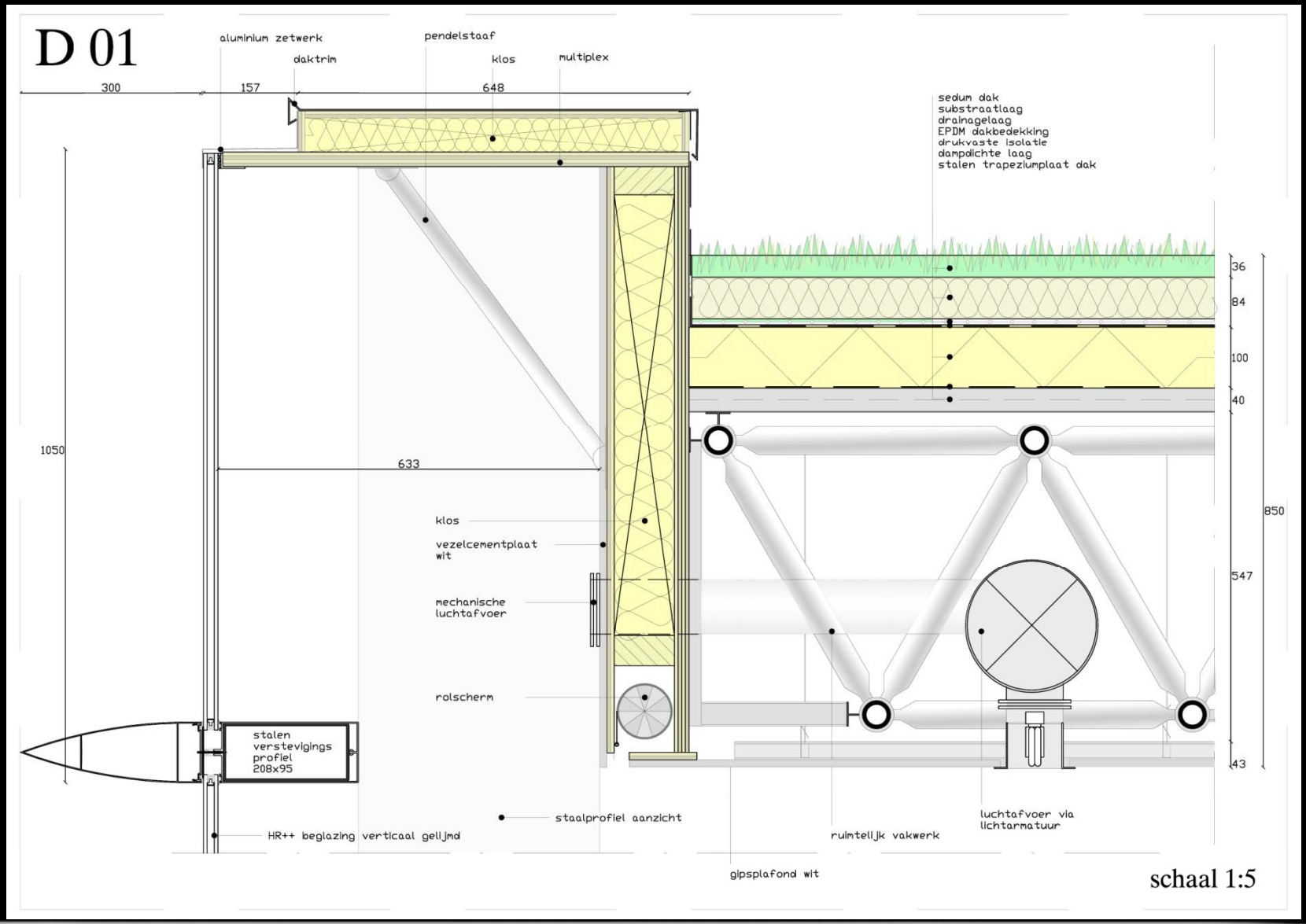









D 01
aluminium zetwerk
daktrim
pendelstaaf
klos
multiplex
300
157
648
sedum dak
substraatlaag
drainagelaag
EPDM dakbedekking
drukvaste isolatie
dampdichte laag
stalen trapeziumplaat dak
36
84
100
40
547
43
850
1050
633
vezelcementplaat
wit
klos
stalen
verstevigings
profiel
208x95
staalprofiel aanzicht
HR++ beglazing verticaal gelijmd
ruimtelijk vakwerk
luchtafvoer via
lichtarmatuur
gipsplafond wit
schaal 1:5


D 01
aluminium zetwerk
daktrim
pendelstaaf
klos
multiplex
300
157
648
sedum dak
substraatlaag
drainagelaag
EPDM dakbedekking
drukvaste isolatie
dampdichte laag
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36
84
100
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547
43
850
1050
633
klos
vezelcementplaat
wit
mechanische
luchtafvoer
rolscherm
stalen
verstevigings
profiel
208x95
staalprofiel aanzicht
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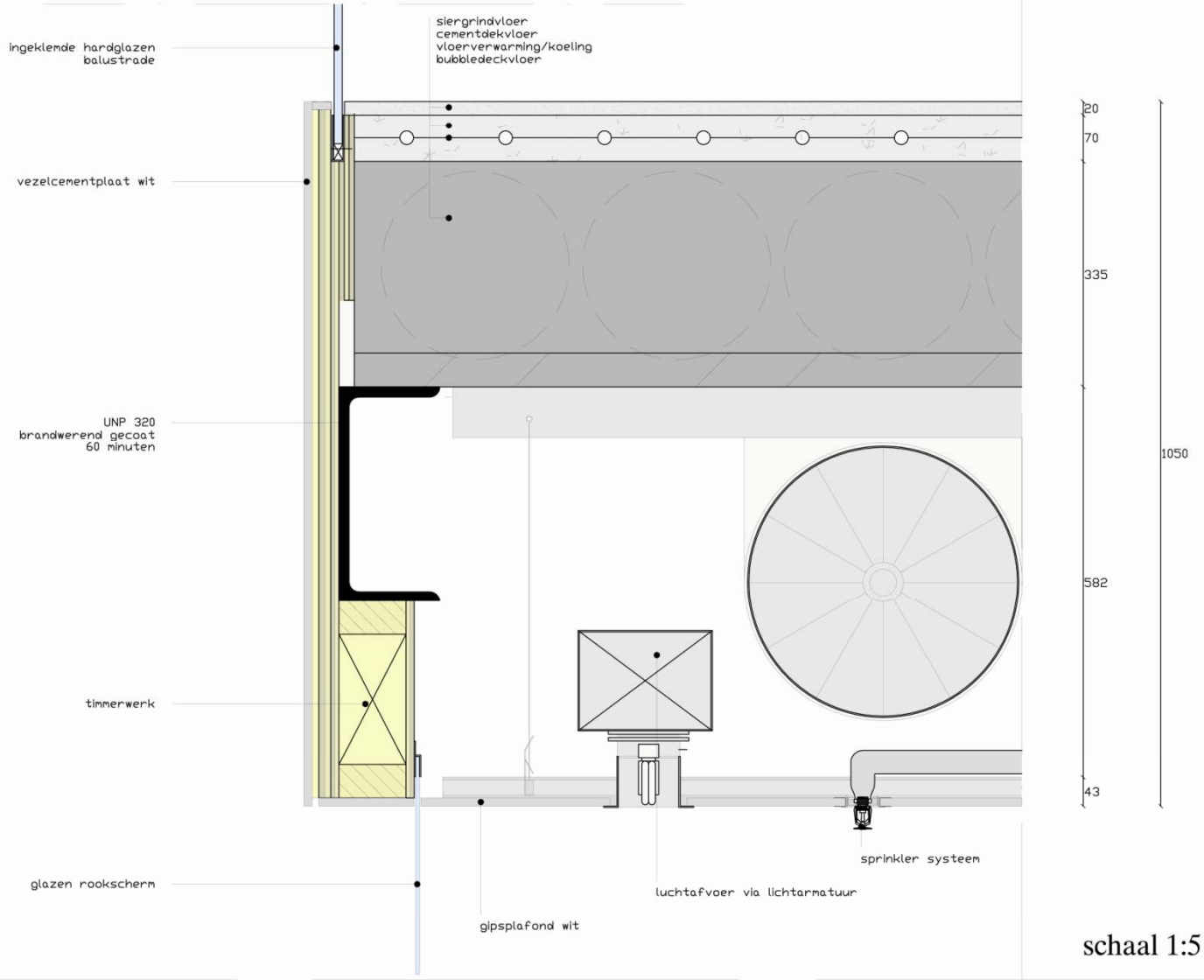
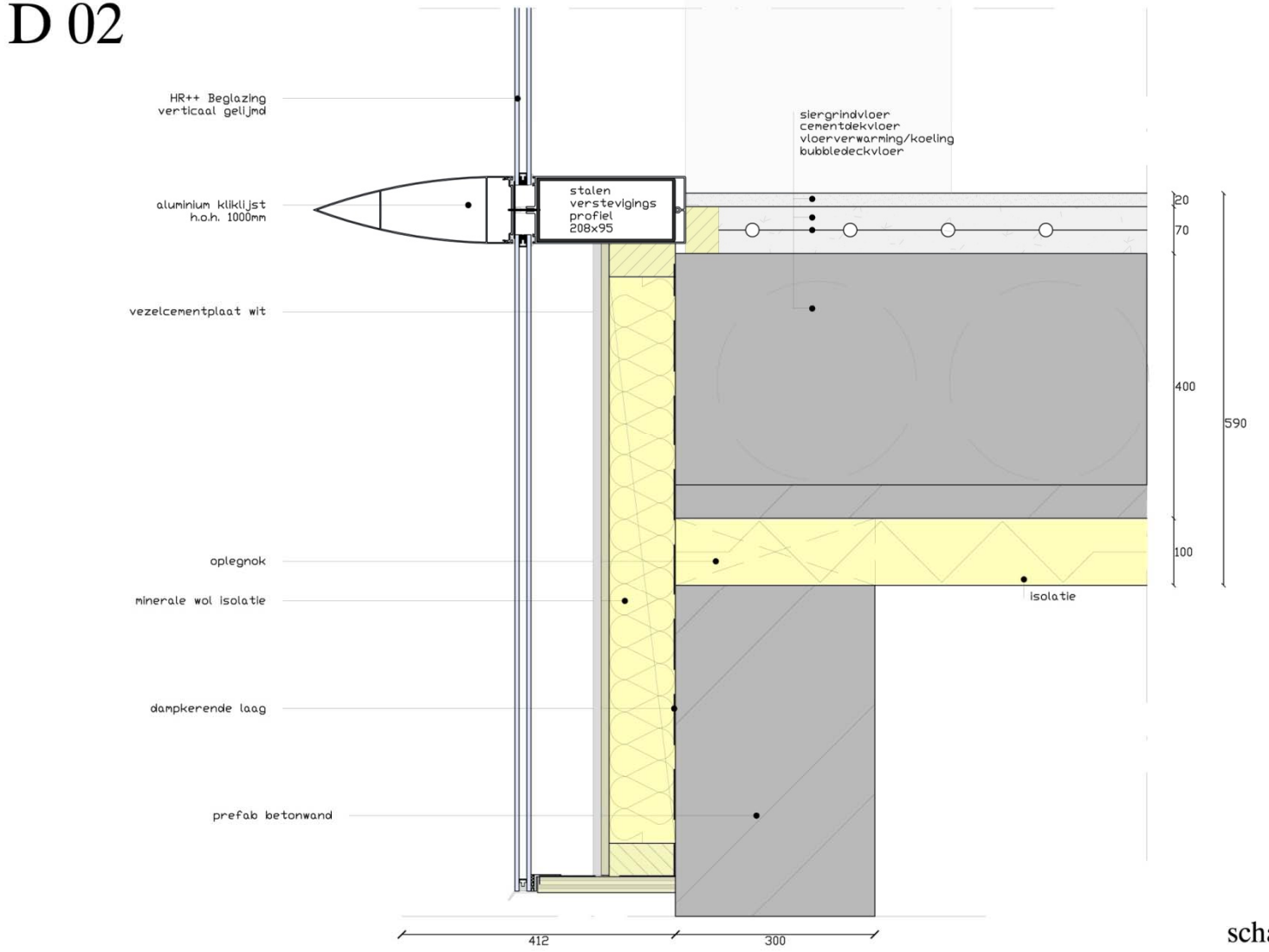
ruimtelijk vakwerk
luchtafvoer via
lichtarmatuur
gipsplafond wit
schaal 1:5

D 03

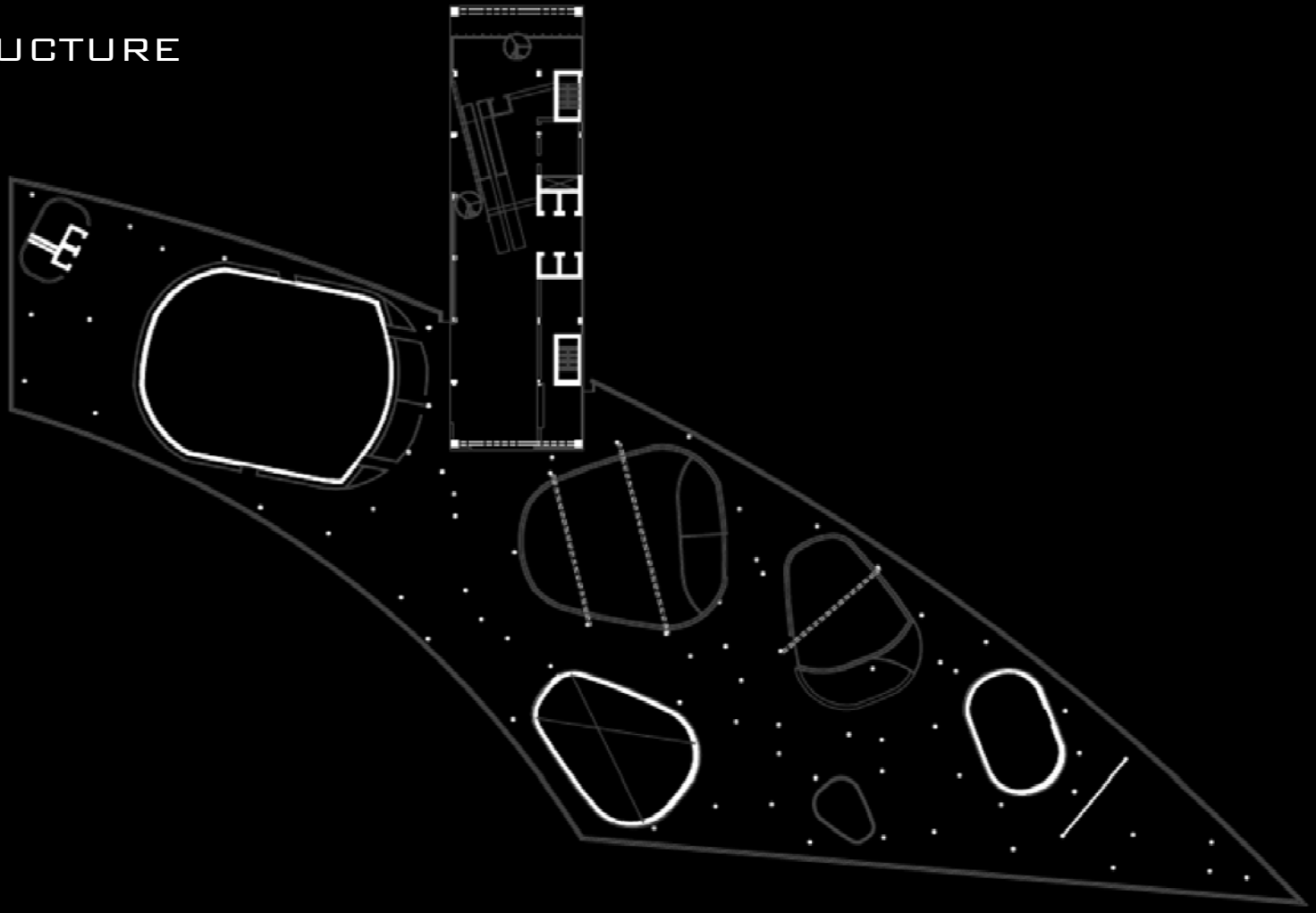

ingeklemde hardglazen balustrade
siergrindvloer
cementdekvloer
vloerverwarming/koeling
bubbledeckvloer
vezelcementplaat wit
UNP 320
brandwerend gecoat
60 minuten
timmerwerk
glazen rookscherm
gipsplafond wit
luchtafvoer via lichtarmatuur
sprinkler systeem
20
70
335
582
43
1050
schaal 1:5

D 02

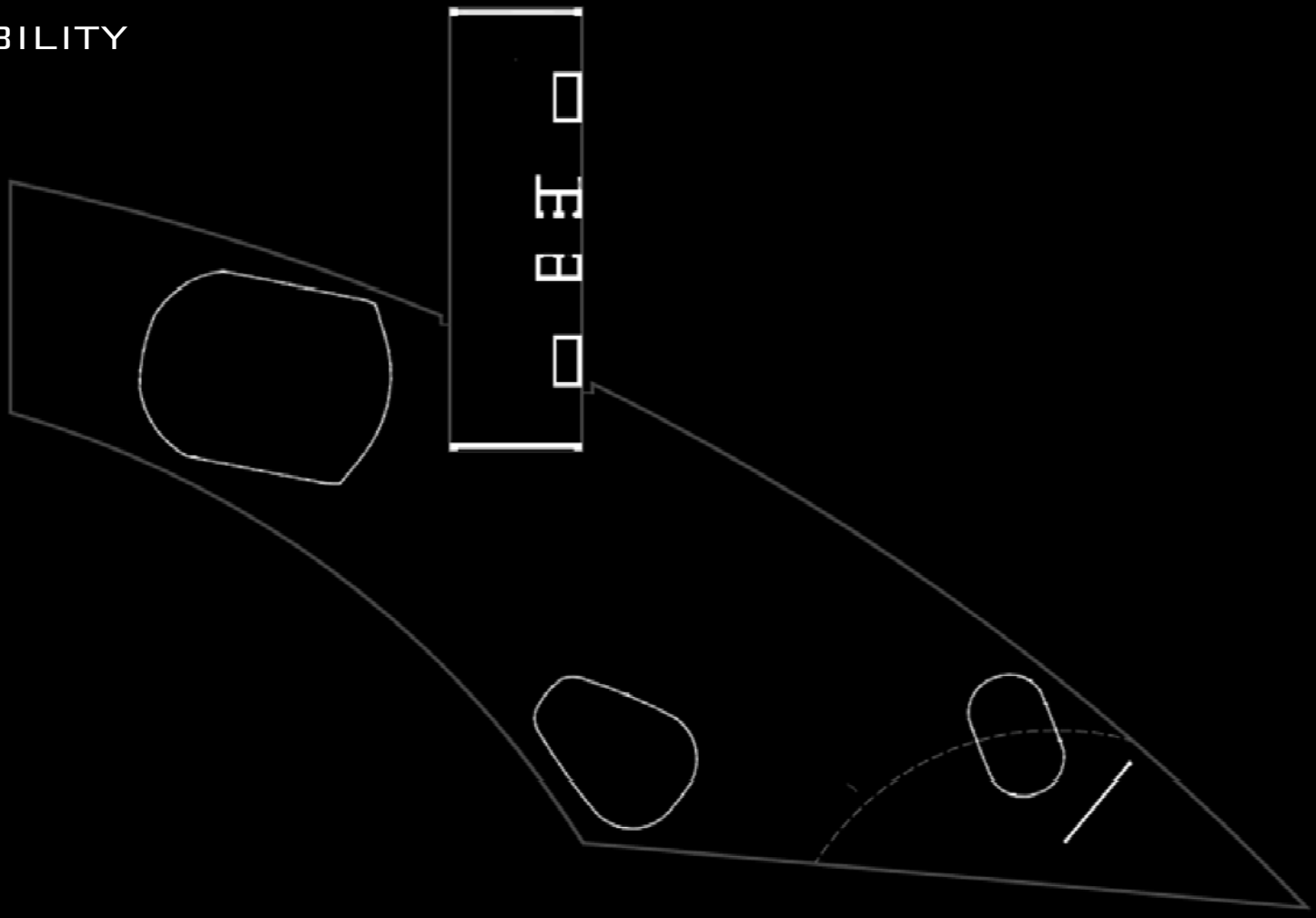


schaal 1:5

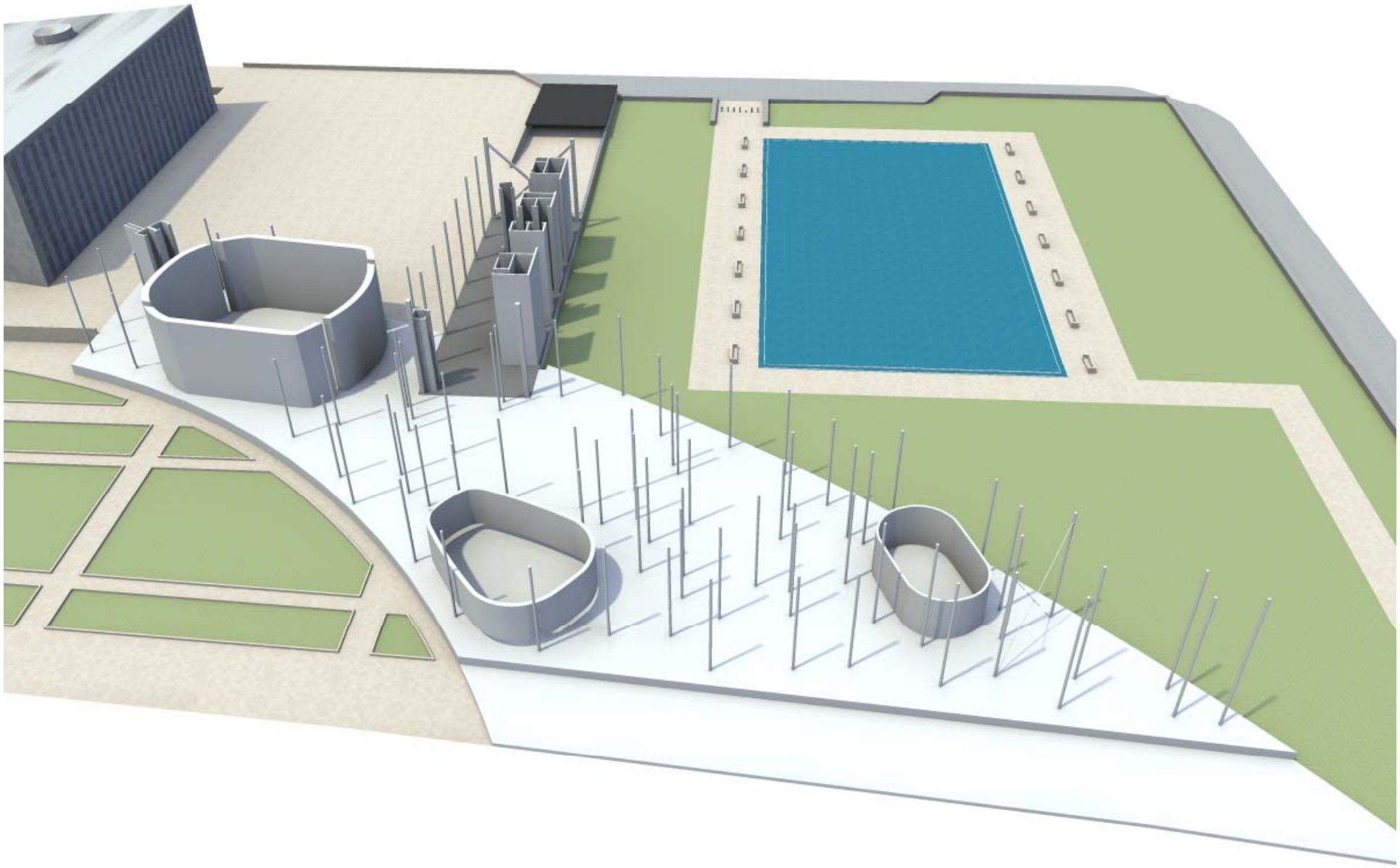
STRUCTURE

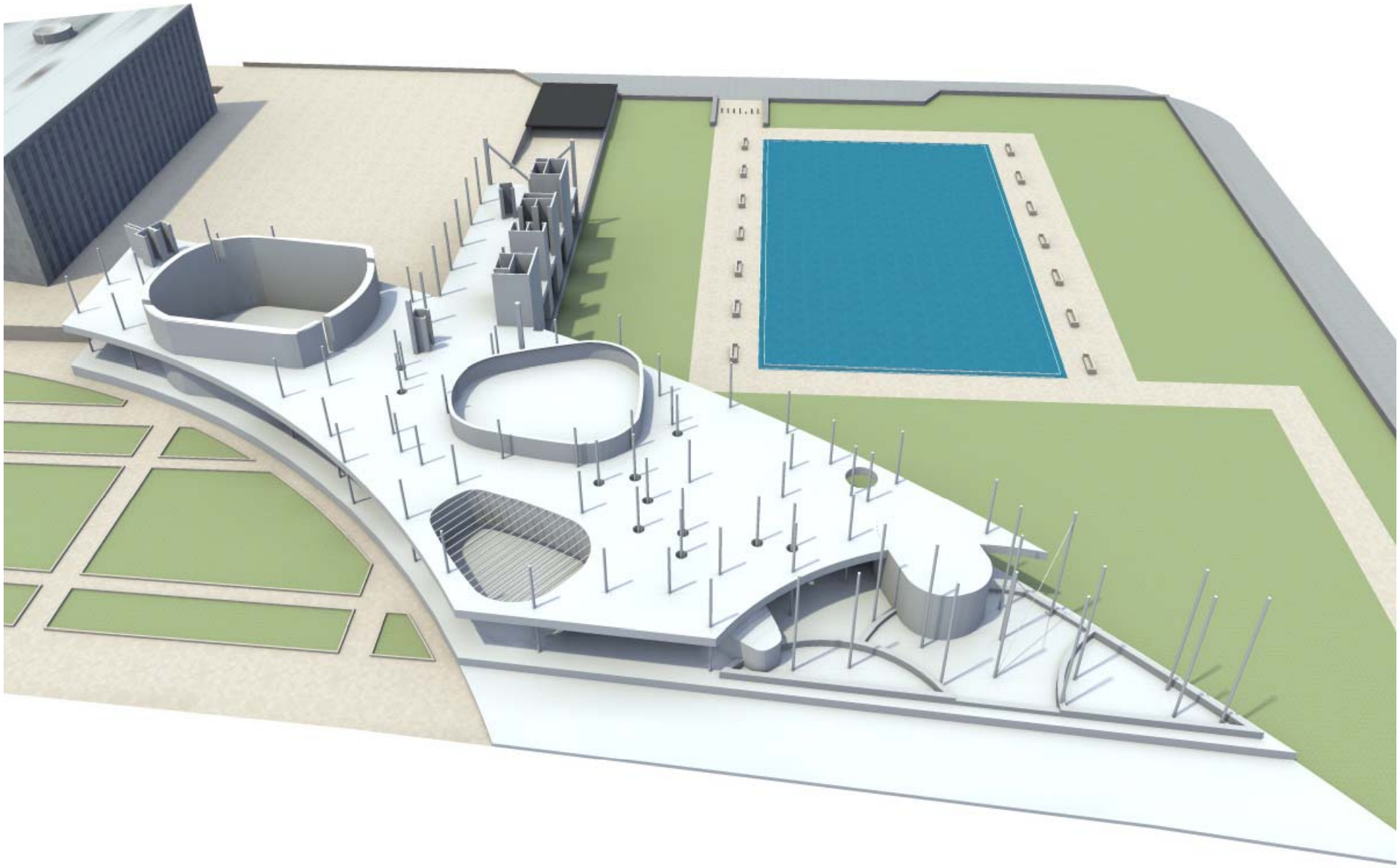


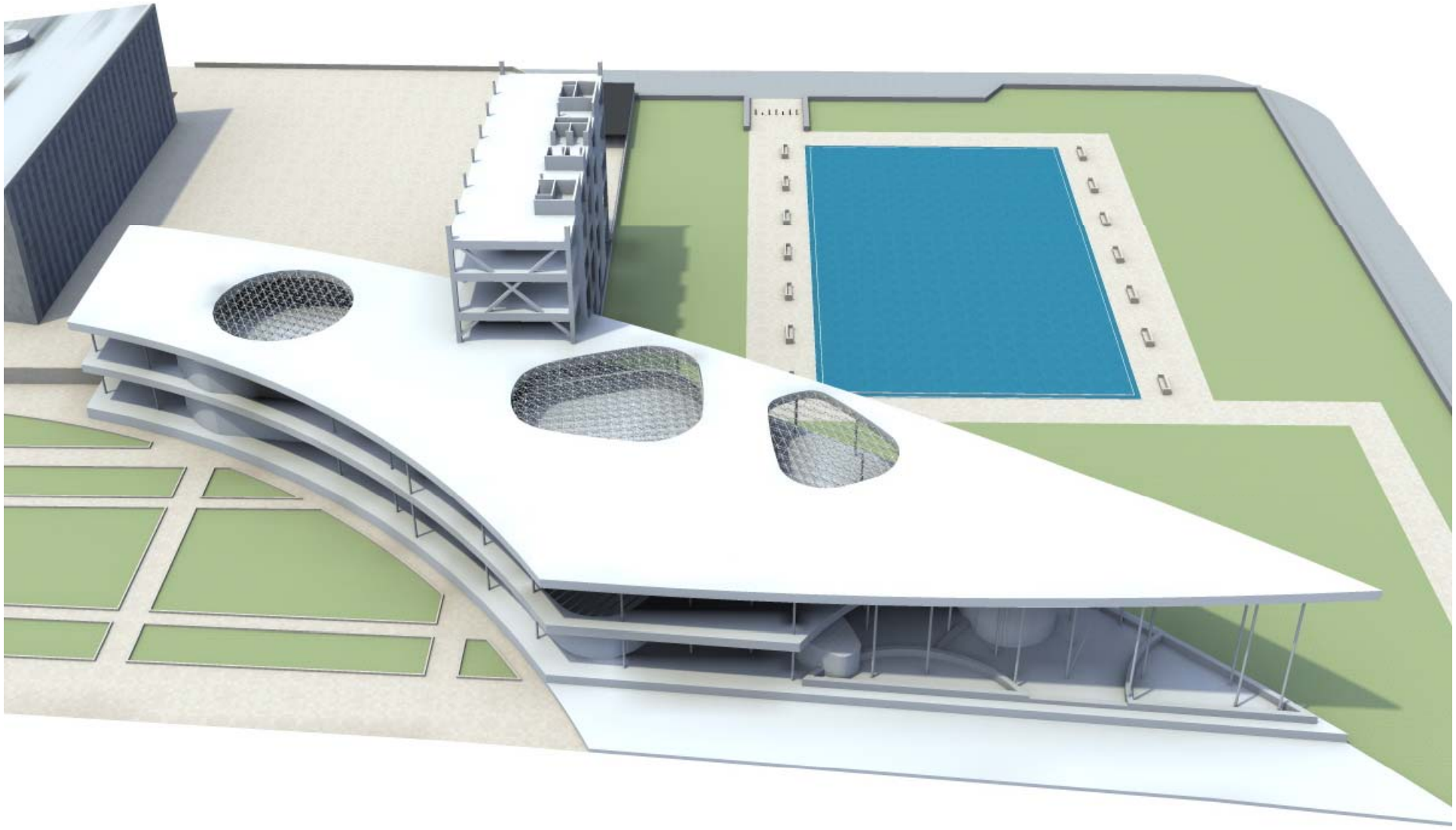
STABILITY

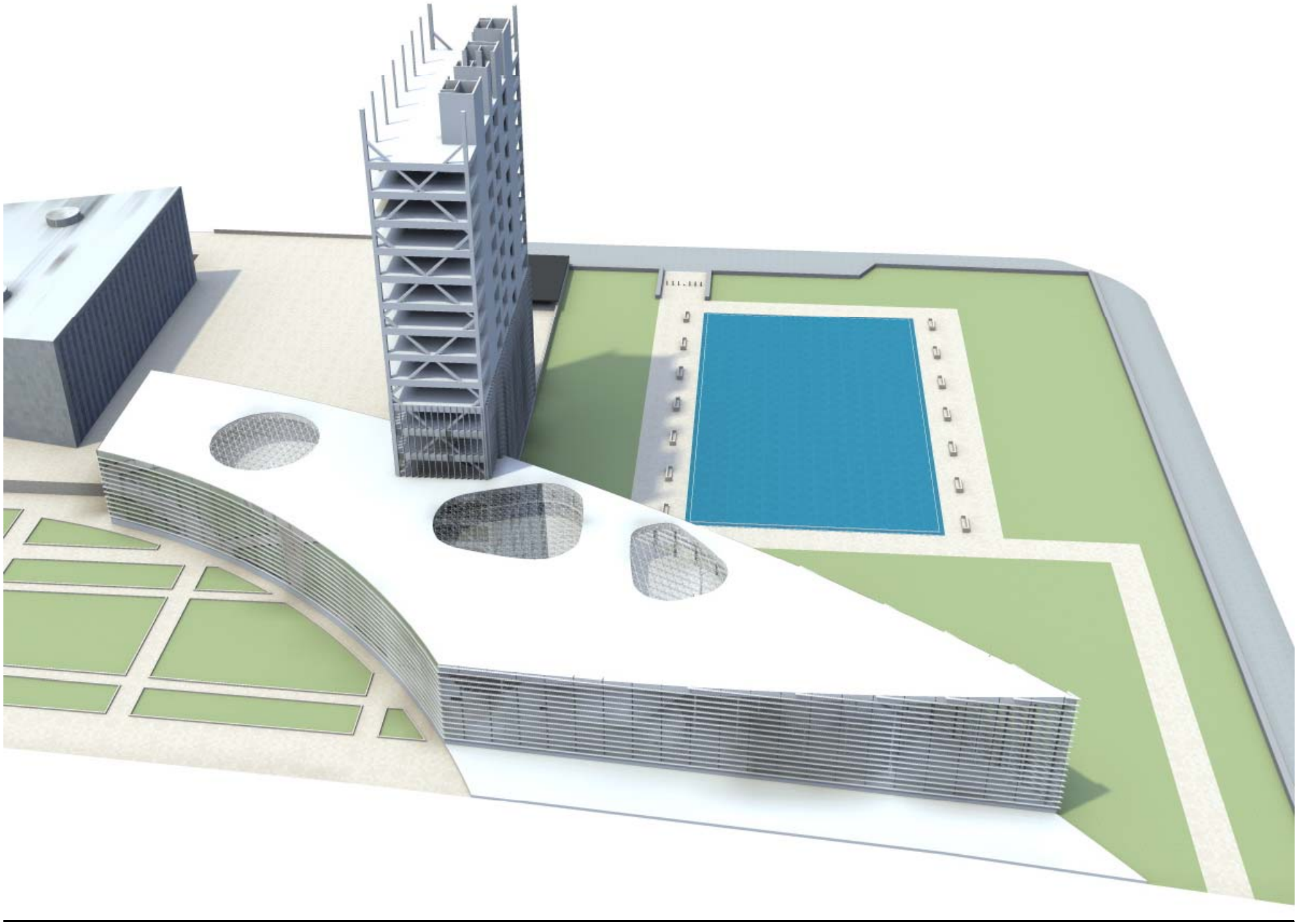


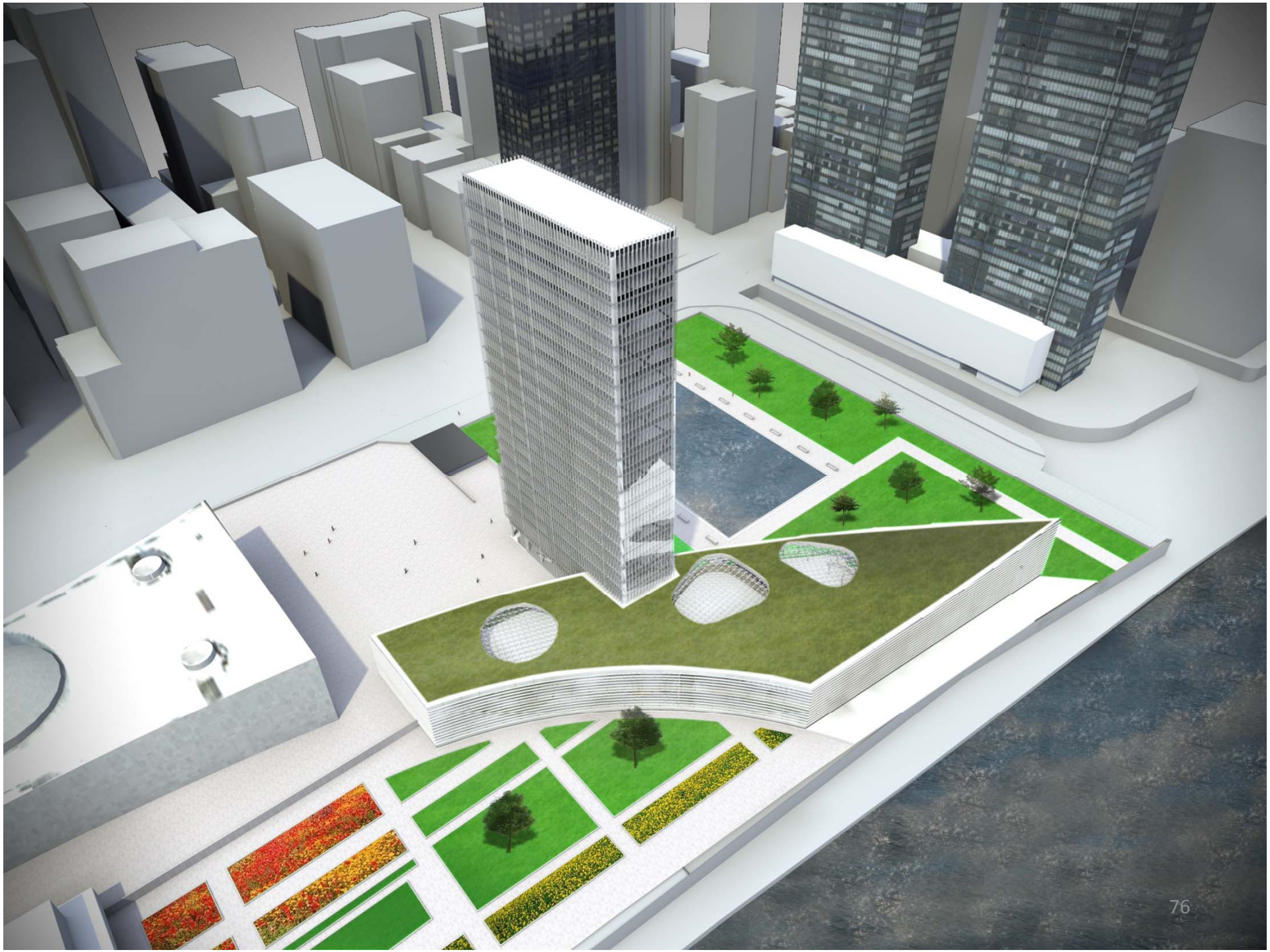
BUILDING ORDER



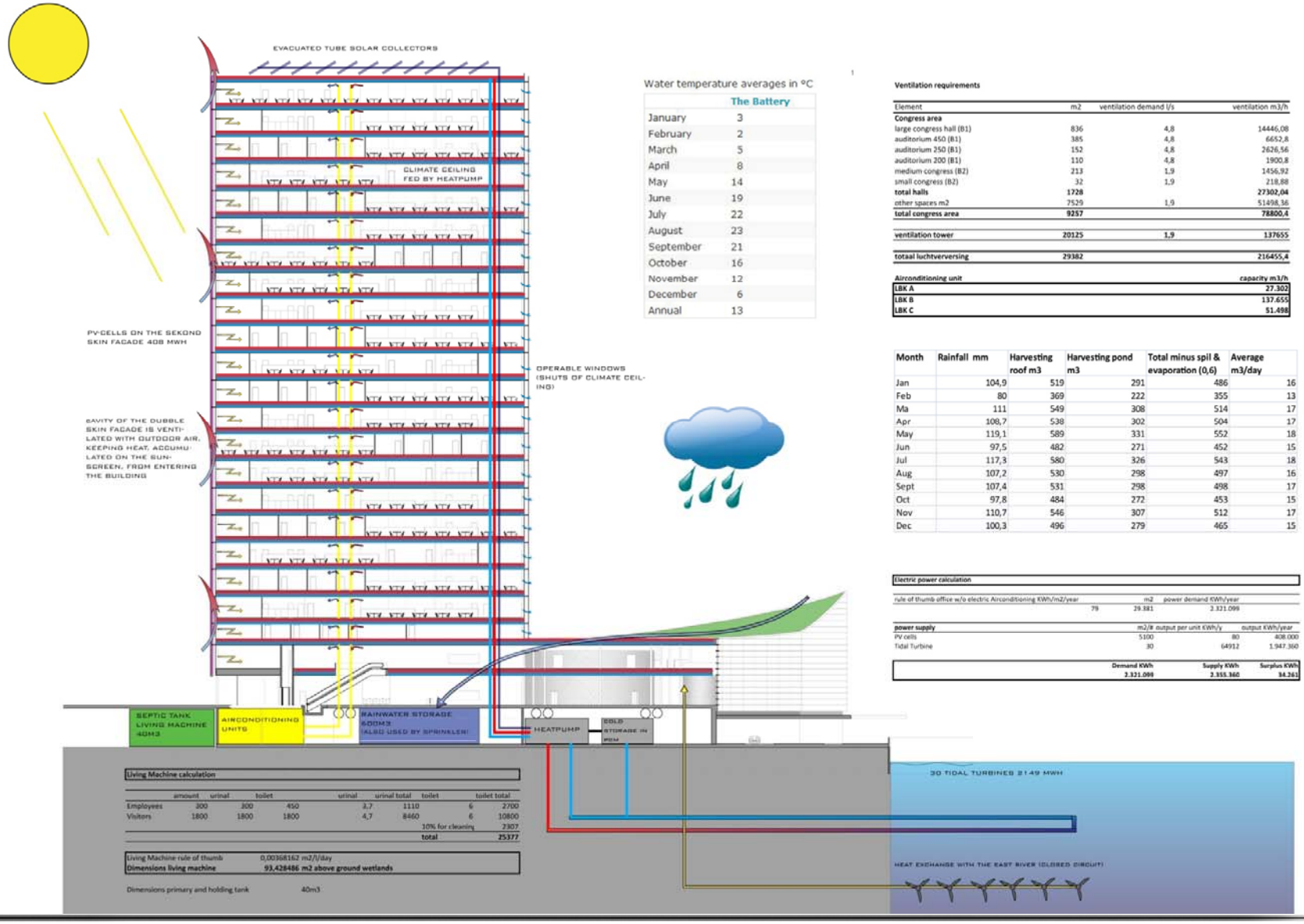








INSTALLATION CONCEPT



Water temperature averages in °C

	The Battery
January	3
February	2
March	5
April	8
May	14
June	19
July	22
August	23
September	21
October	16
November	12
December	6
Annual	13

Ventilation requirements

Element	m2	ventilation demand l/s	ventilation m3/h
Congress area			
large congress hall (B1)	836	4,8	14446,08
auditorium 450 (B1)	385	4,8	6652,8
auditorium 250 (B1)	152	4,8	2626,56
auditorium 200 (B1)	110	4,8	1900,8
medium congress (B2)	213	1,9	1456,92
small congress (B2)	32	1,9	218,88
total halls	**1728**		**27302,04**
other spaces m2	7529	1,9	51498,36
total congress area	**9257**		**78800,4**
ventilation tower	**20125**	**1,9**	**137655**
totaal luchtverversing	**29382**		**216455,4**

Airconditioning unit	capacity m3/h
LBK A	27.302
LBK B	137.655
LBK C	51.498

Month	Rainfall mm	Harvesting roof m3	Harvesting pond m3	Total minus spil & evaporation (0,6)	Average m3/day
Jan	104,9	519	291	486	16
Feb	80	369	222	355	13
Ma	111	549	308	514	17
Apr	108,7	538	302	504	17
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Jul	117,3	580	326	543	18
Aug	107,2	530	298	497	16
Sept	107,4	531	298	498	17
Oct	97,8	484	272	453	15
Nov	110,7	546	307	512	17
Dec	100,3	496	279	465	15

Electric power calculation

rule of thumb office w/o electric Airconditioning KWh/m2/year		m2	power demand KWh/year
	79	29.381	2.321.099

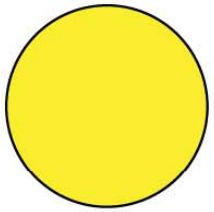
power supply	m2/#	output per unit KWh/y	output KWh/year
PV cells	5100	80	408.000
Tidal Turbine	30	64912	1.947.360

	Demand KWh	Supply KWh	Surplus KWh
	2.321.099	2.355.360	34.261

Living Machine calculation

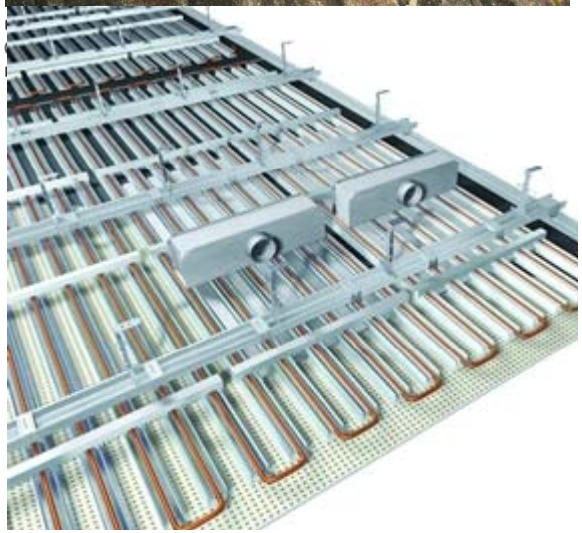
	amount	urinal	toilet	urinal	urinal total	toilet	toilet total
Employees	300	300	450	3,7	1110	6	2700
Visitors	1800	1800	1800	4,7	8460	6	10800
					10% for cleaning		2307
					total		25377

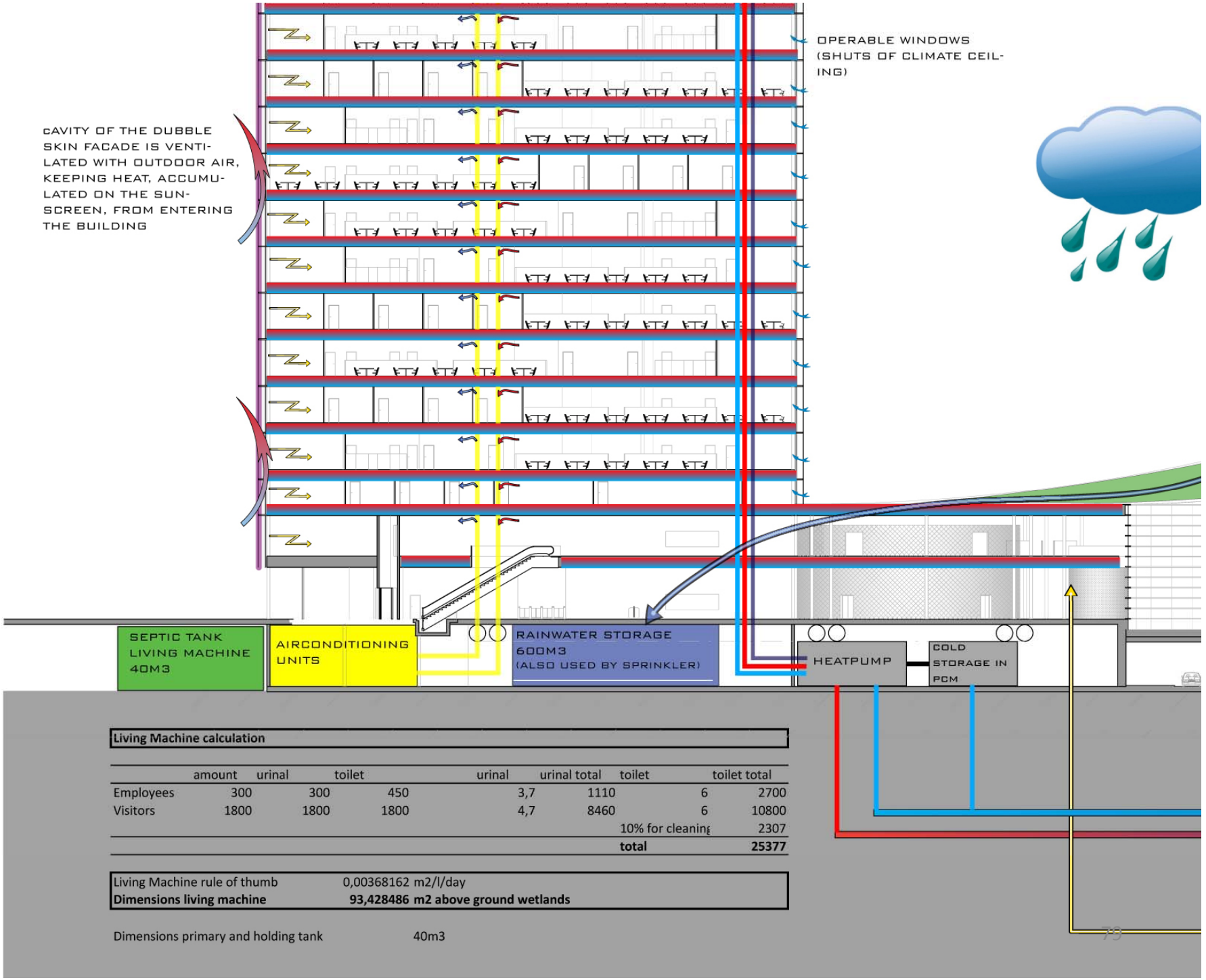
Living Machine rule of thumb	0,00368162 m2/l/day
Dimensions living machine	**93,428486 m2 above ground wetlands**
Dimensions primary and holding tank	40m3



PV-CELLS ON THE SEOND SKIN FACADE 374 MWH

CAVITY OF THE DUBBLE SKIN FACADE IS VENTILATED WITH OUTDOOR AIR, KEEPING HEAT, ACCUMULATED ON THE SUNSCREEN, FROM ENTERING THE BUILDING





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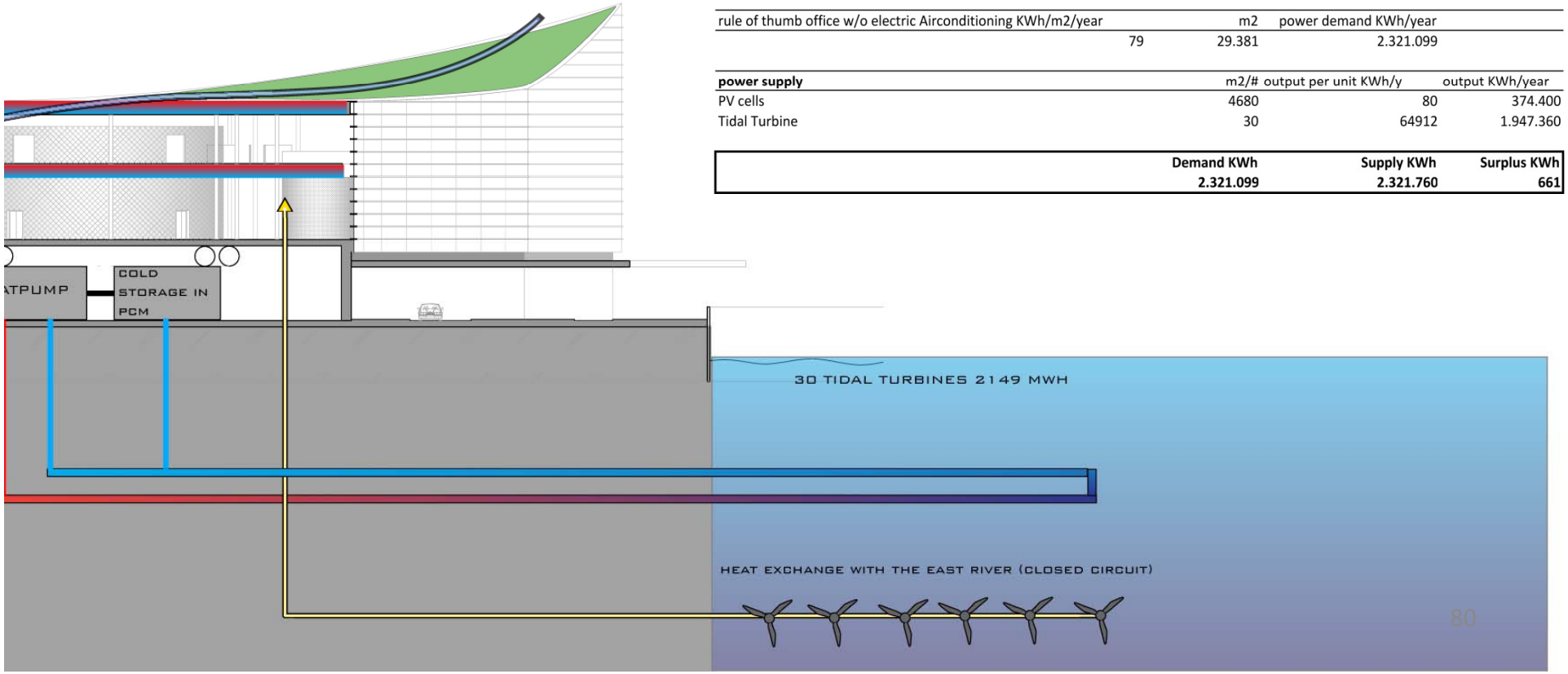
Electric power calculation

rule of thumb office w/o electric Airconditioning KWh/m2/year		m2	power demand KWh/year
	79	29.381	2.321.099

power supply	m2/#	output per unit KWh/y	output KWh/year
PV cells	4680	80	374.400
Tidal Turbine	30	64912	1.947.360

	Demand KWh	Supply KWh	Surplus KWh
	2.321.099	**2.321.760**	**661**



Water temperature averages in °C

	The Battery	av.air temp
January	3	3,3 / -3,2
February	2	5 / -2,2
March	5	9,9 / 1,7
April	8	15,9 / 6,8
May	14	21,6 / 12,3
June	19	26,1 / 12,3
July	22	29 / 20,4
August	23	28 / 19,8
September	21	23,7 / 15,7
October	16	17,5 / 9,8
November	12	11,7 / 5
December	6	6,1 / -0,2
Annual	13	16,5 / 8,6

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Congress area			
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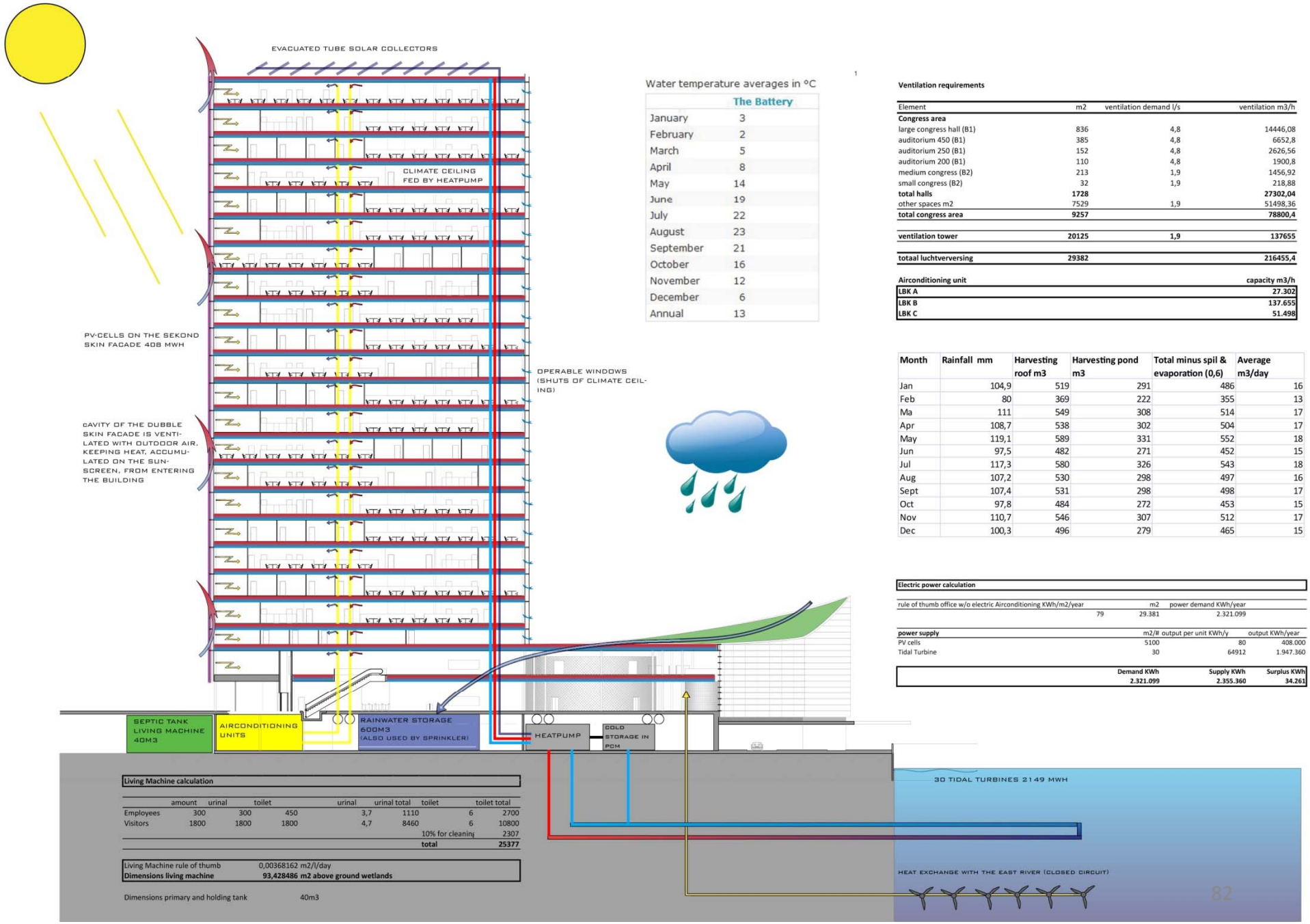

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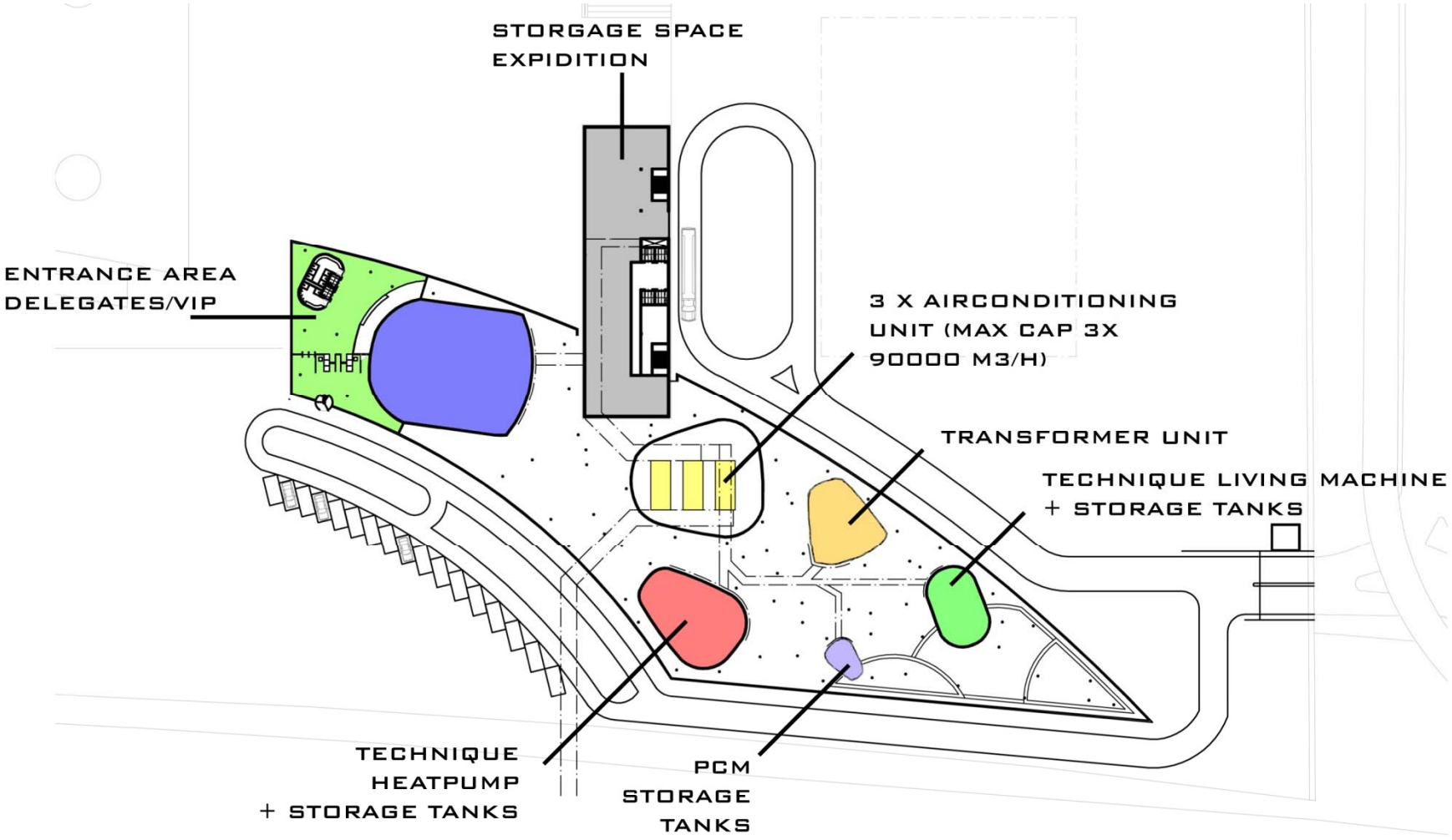
STORGAGE SPACE
EXPIDITION
ENTRANCE AREA
DELEGATES/VIP
3 X AIRCONDITIONING
UNIT (MAX CAP 3X
90000 M3/H)
TRANSFORMER UNIT
TECHNIQUE LIVING MACHINE
+ STORAGE TANKS
TECHNIQUE
HEATPUMP
+ STORAGE TANKS
PCM
STORAGE
TANKS

REFERENCES

Projects

Muziekgebouw aan 't IJ , 3 X Nielsen
Treptow crematorium, Axel Schultes
Seagram building, Mies van der Rohe
ING hoofdkantoor, Meyer en van Schooten

references internet

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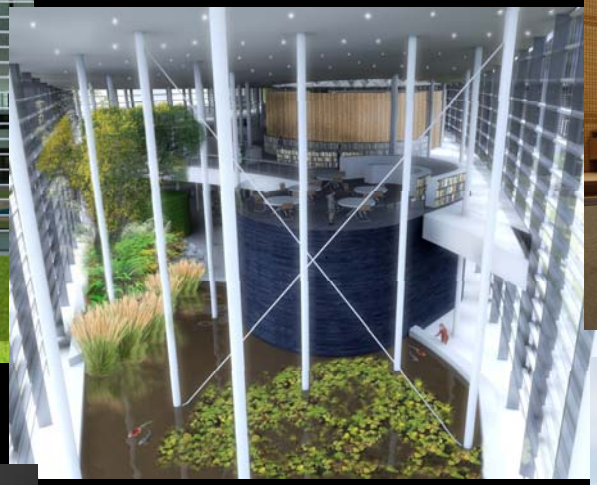
Hofkes, K et al. (2001) *Jellema 4b, Omhulling*, Thiememeulenhoff, Utrecht/zutphen
Kamerling, M.W. et al. (2004) *Jellema 9, Utiliteitsbouw*, Thiememeulenhoff, Utrecht/Zutphen



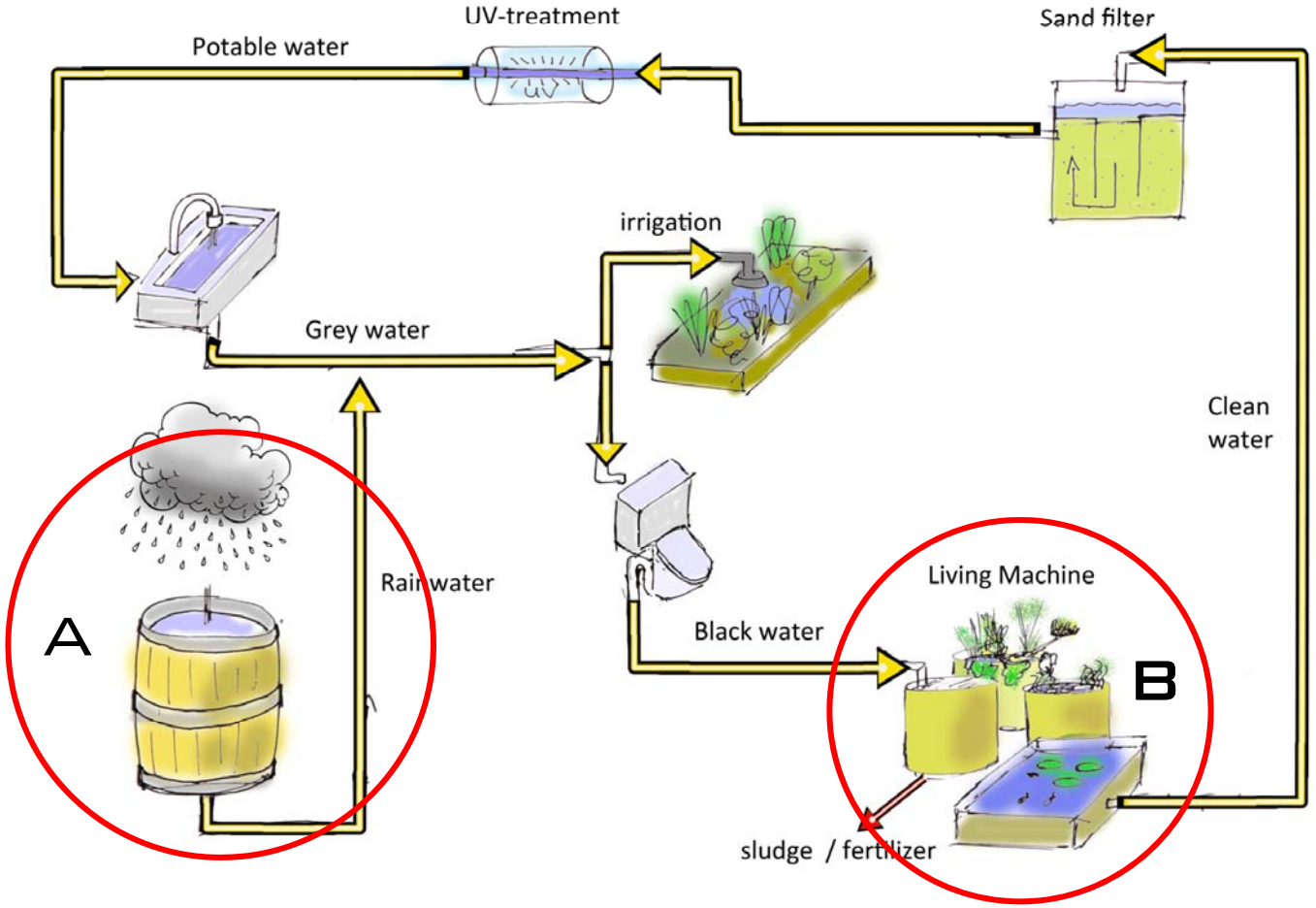
REFLECTIE / RELEVANTIE

Het oppakken van stedenbouwkundige lijnen om die vervolgens te gebruiken in de vormgeving van het gebouw werkte voor mij zeer goed. Het gebouw is hierdoor verankerd in de locatie en daardoor geen los object in de ruimte. Ook de restruimten die zijn ontstaan binnen de locatie hebben een toegevoegde waarde gekregen voor zowel het gebouw als de omgeving. Door de beveiliging buiten het gebouw te plaatsen en deze als ingang tot het entree plein te maken wordt ook de huidige situatie, waarbij er gebruik wordt gemaakt van een tent voor de beveiliging, sterk verbeterd.

Het verdelen van het programma in verschillende gebouwonderdelen maakt het dat deze makkelijk beveiligbaar zijn. Ook leende de toren zich uitstekend voor het realiseren van kantoorruimten. Het horizontale element was een veel grotere uitdaging en heeft ook veel tijd gekost. Omdat het gebouw een gebogen vorm heeft met twee verschillende curven was het lastig om een structuur te introduceren voor zowel de constructie als het programma. De oplossing lag voor mij in het loslaten van de structuur en het introduceren van vrije vormen. De kolommen van de constructie zijn hierdoor ook onderdeel geworden van de ruimtelijke beleving en zijn meer als de bomen in het bos geworden dan alleen de noodzakelijke constructie. Het loslaten van de structuur was voor mij een nieuwe tool voor het ontwerpen van een plattegrond en een nuttig leermoment.

Het ontwerpen van een zelfvoorzienend gebouw is zeker mogelijk maar wel een uitdaging. Een punt in het duurzame ontwerp, is het ontwerp van de tweede huid gevel. Aan de ene kant wil ik dat de gevel volledig transparant is, terwijl ik aan de andere kant wil dat hij zon tegenhoudt en energie opwerk. Uiteindelijk heb ik er voor gekozen om de PV cellen op strategische plaatsen in te zetten zodat de warmtelast op de eigenlijke gevel verminderd wordt terwijl het zicht toch zeker 70% blijft. Een ander punt is dat er voor het voorzien van de energiebehoefte 30 getijdenturbines geïnstalleerd moeten worden, dit aantal is veel hoger dan ik in eerste instantie had voorgenomen en zal in de uitvoering op dit moment veel kosten met zich meebrengen. Er moet dan wel in acht worden genomen dat veel van de toegepaste systemen nog volop in ontwikkeling zijn en dat deze nog niet op grote schaal worden toegepast. Indien de afname van deze systemen groter wordt, dan zal de ontwikkeling ook in een stroomversnelling komen en zullen de productiekosten dalen. De baten kosten verhouding wordt dan gunstiger. Ook is het zo dat er onderzoek naar eventueel hinder voor ecosystemen en scheepsverkeer zou moeten komen wanneer zo'n plan echt tot uitvoering komt.

WATER TREATMENT / DRINKINGWATER PRODUCTING



A: NEEDS LARGE (ROOF) SURFACE TO COLLECT WATER

B: INDOOR AREA FOR WETLANDS AND PONDS