

# PLAN B

**An Emergency Evacuation Plan for A Group Of Hospitals in  
Midtown Manhattan**



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# Content

**01 // Introduction**

**02 // Research**

**03// Strategy in Urban scale**

**04 // Architectural design**

**Element A: Evacuation tower**

**Element B: Bridge**

**Element C: Hotel B**

**05 // Conclusion**



**01 //**

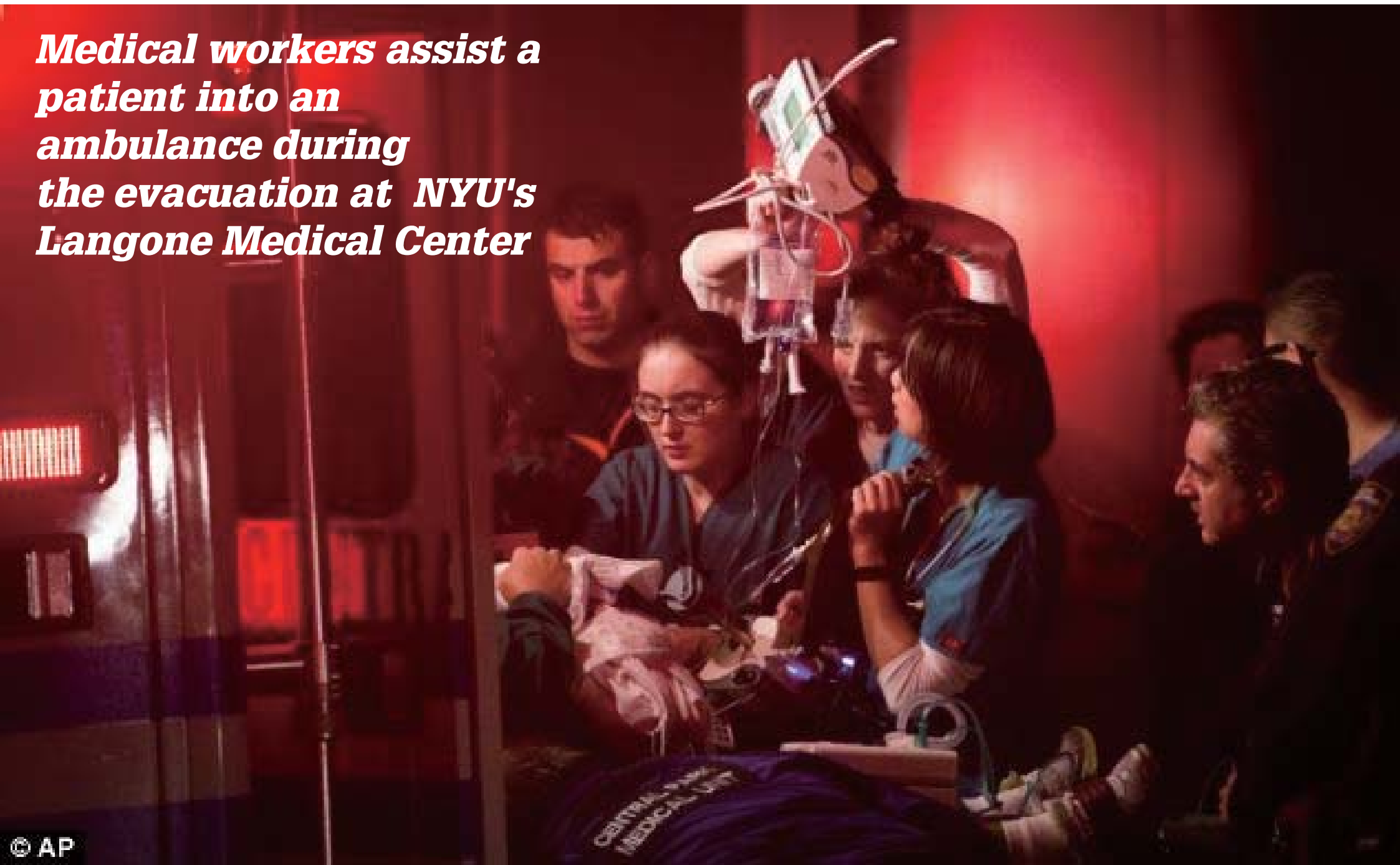
# **Introduction**

***Hospital workers evacuate a patient from NYU's Langone Medical Center during Hurricane Sandy the evening of October 29, 2012 in New York City.***



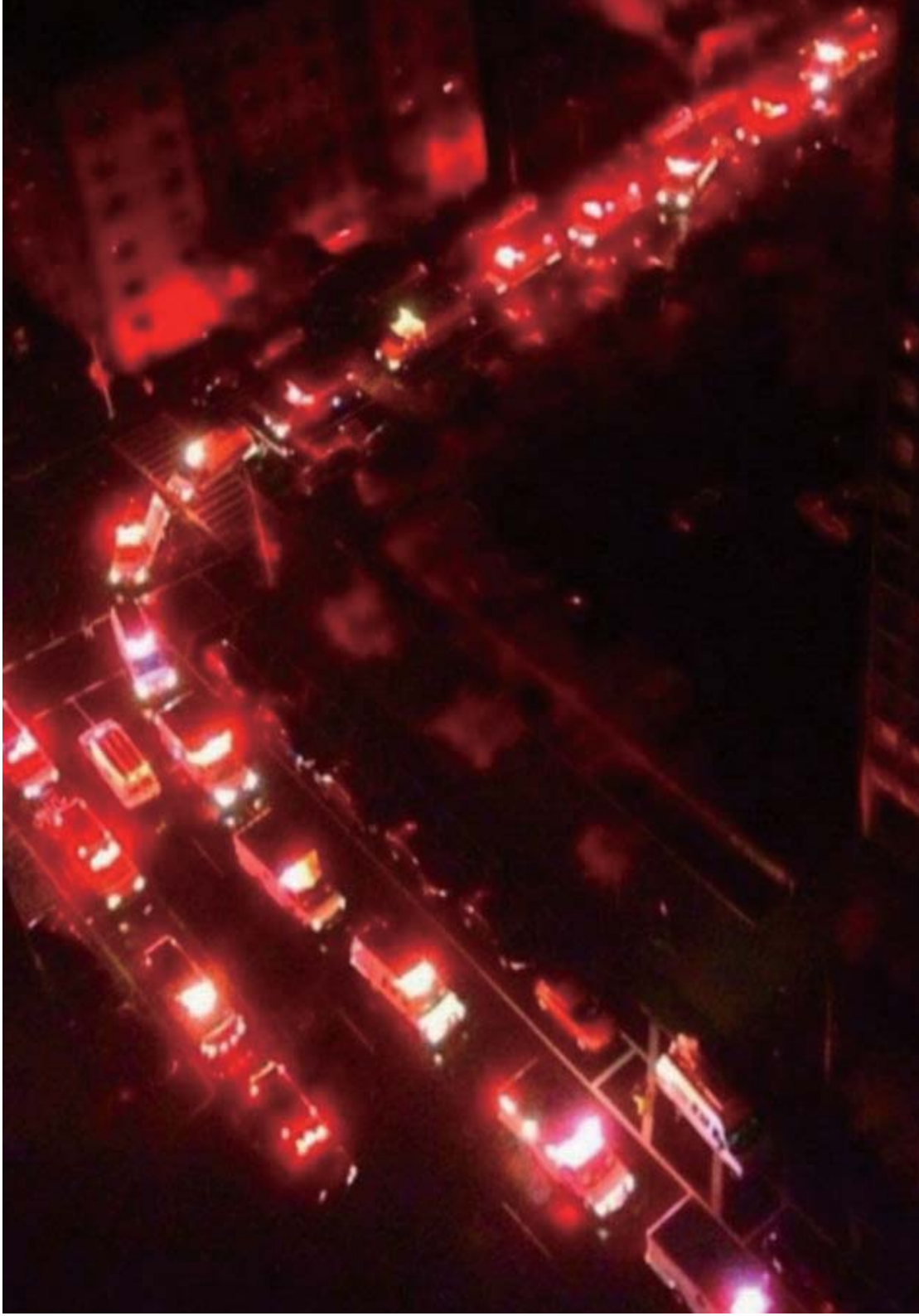
Source: Photographer: Michael Heiman/Getty Images

***Medical workers assist a patient into an ambulance during the evacuation at NYU's Langone Medical Center***



© AP

Source: <http://www.businessweek.com/> Mail online



***Emergency ambulance  
snake around a corner out-  
side the NYU Medical  
Center***

Source: <http://www.businessweek.com/> Mail online





Flood:  
inundated the **basement**  
with **5** feet high water

**No patient** in the building  
during the flooding

Flood:  
fill the entire **basement** of  
182,000 Square feet

**Evacuated 300 patients**

**VA Harbor  
Hospital**

**Bellevue  
Hospital  
828 beds**

**NYU Langone  
Medical Center  
705 beds**

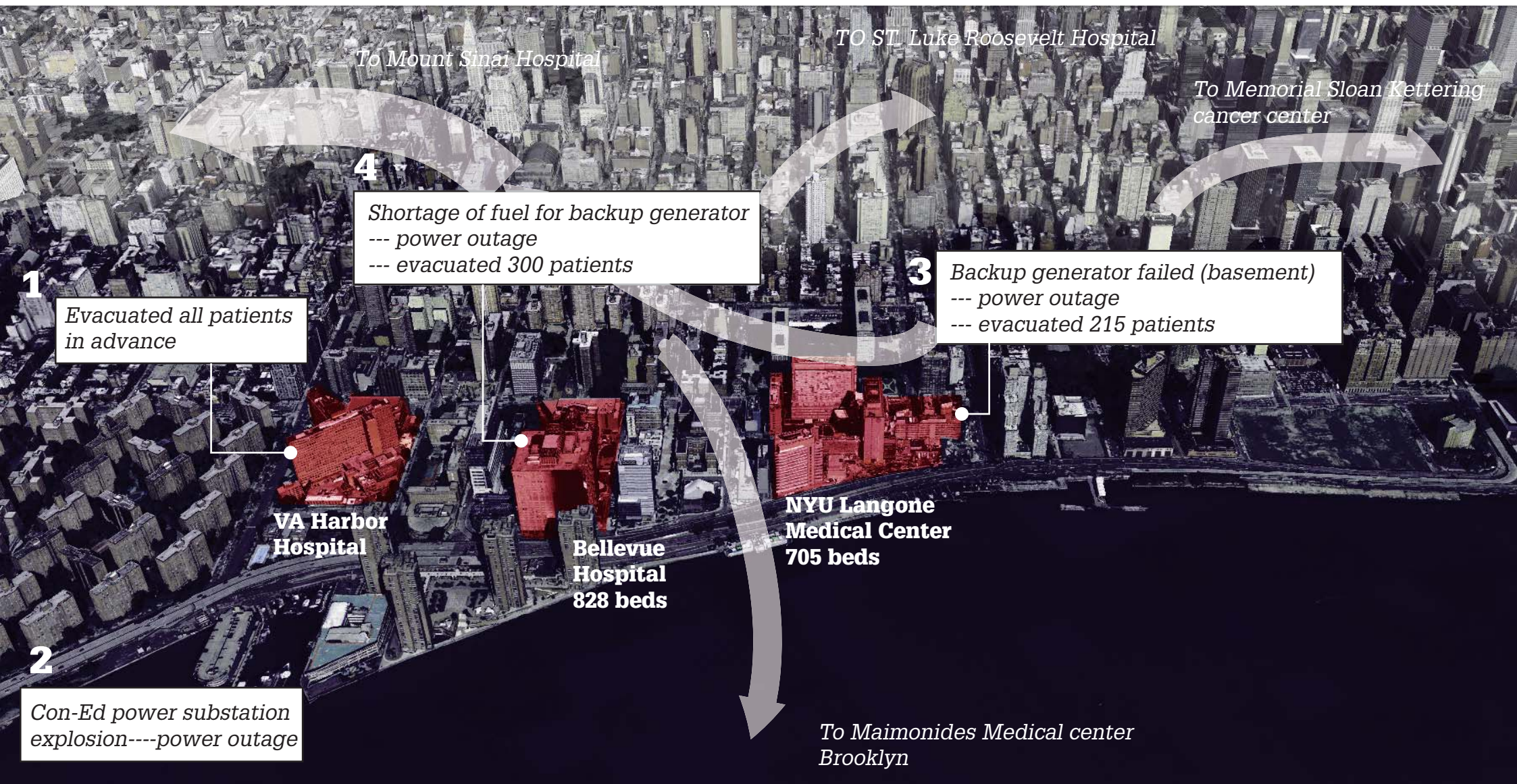
**Failed:**  
Pumps // Blower // Elevators // Running water // Steam //  
Medical oxygen // Freezers // Generator

**Damage:**  
X ray machine // Patient record // MRI scanners

Flood:  
**basement** and backup  
generator

**Evacuated 215 patients**





***For hospitals, one of the biggest issues is figuring out whether to stay or to go.***

***"Evacuating a hospital, at any time, even in the best of conditions in perfect weather, is a difficult proposition,"***

***Ian Michaels***

A spokesman for the New York City Health and Hospitals Corp.,  
which manages Bellevue and Coney Island hospitals

Research question:

How to build a system which can make the evacuation safer and easier?  
And also reduce the damage from flooding.

# **02 //**

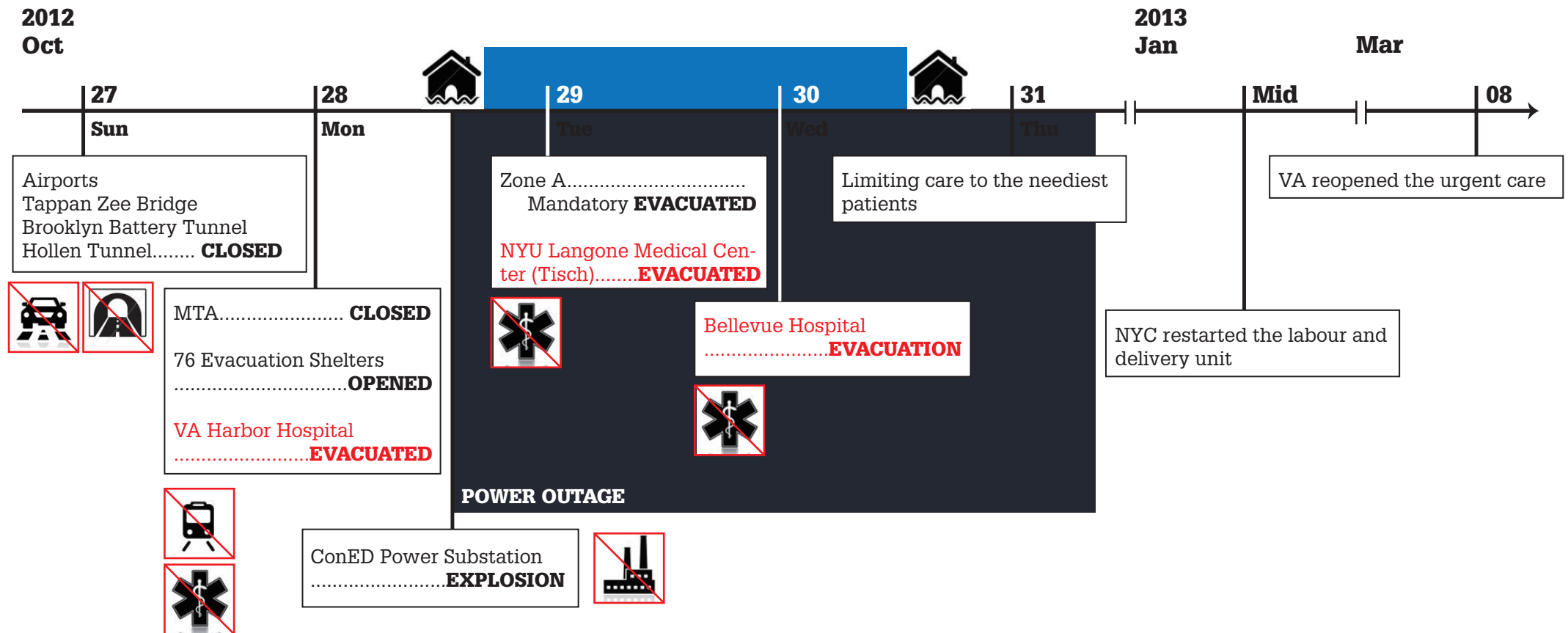
# **Research**

001 \_ The lesson learn for Hurricane Sandy

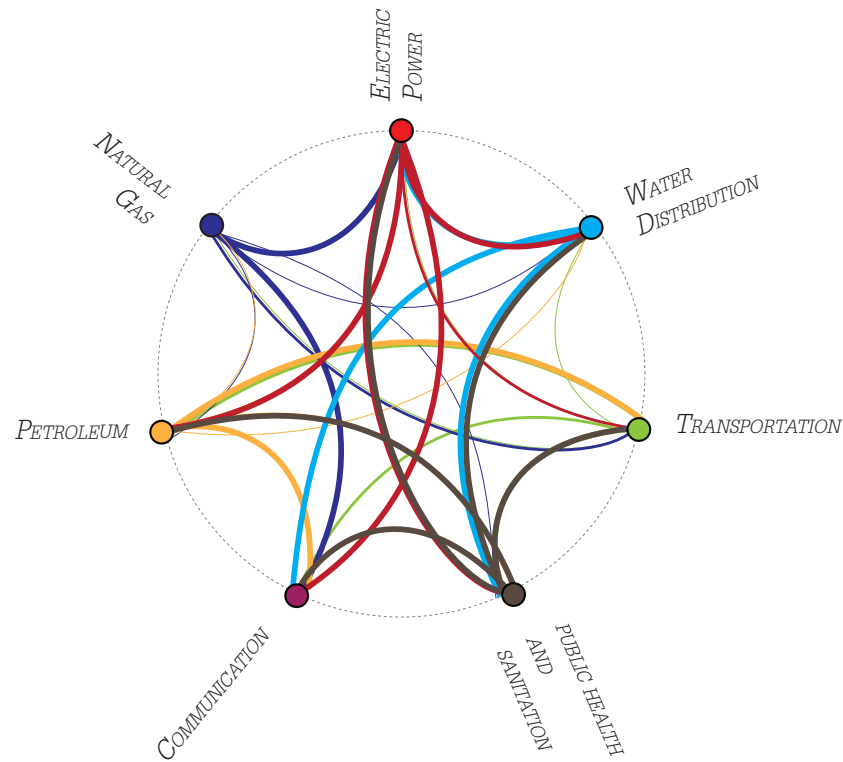
002\_ Flooding risk

003\_ Typology of hosptial

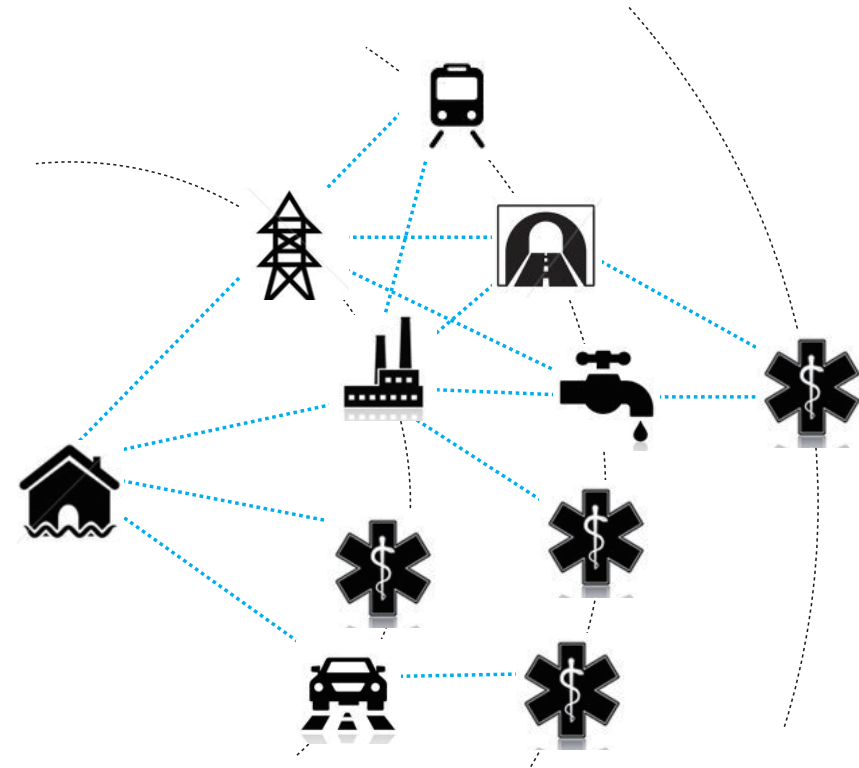




***The Interdependencies  
Between Infrastructures***



***Chain Reaction***



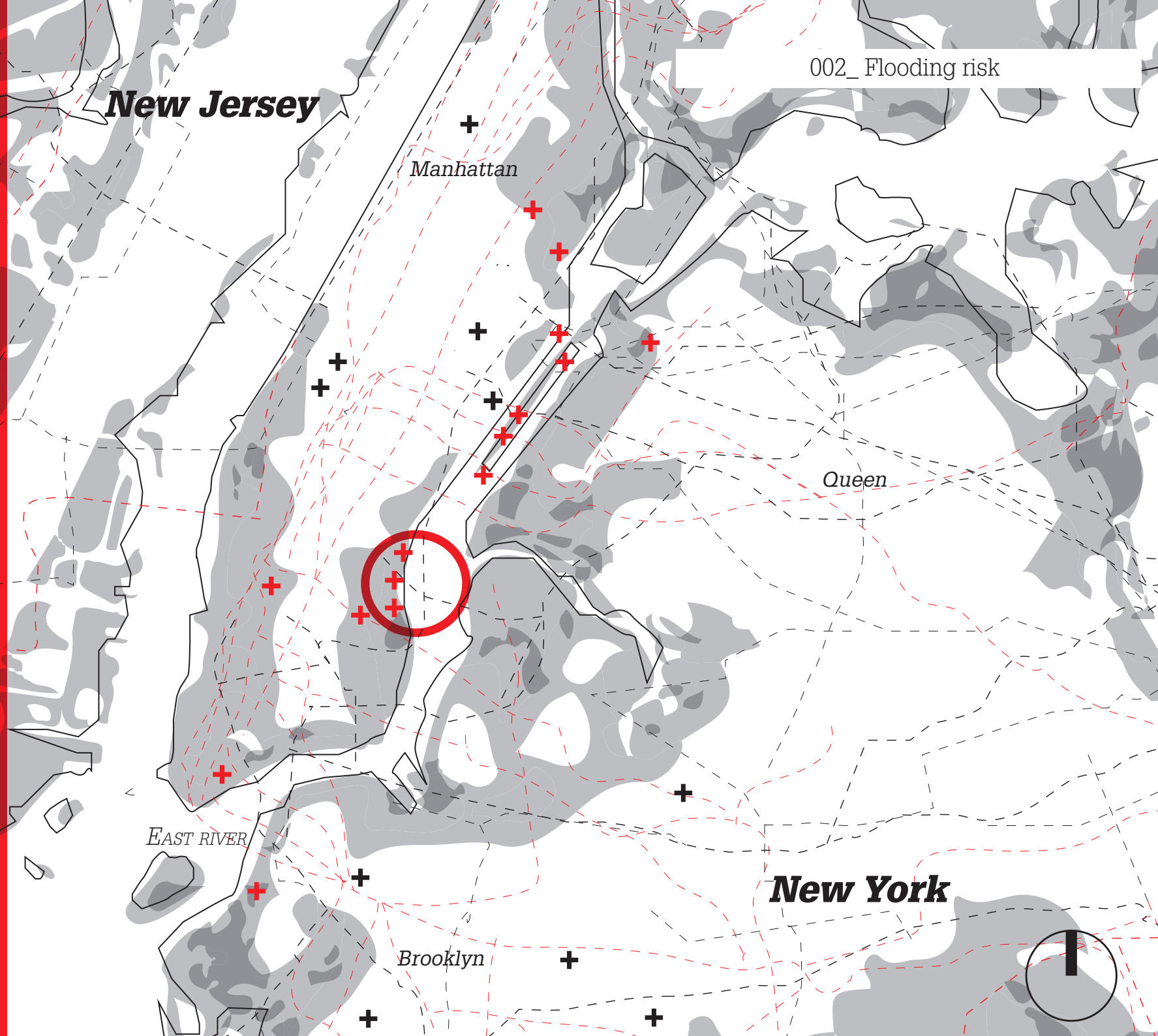
**Conclusion:**

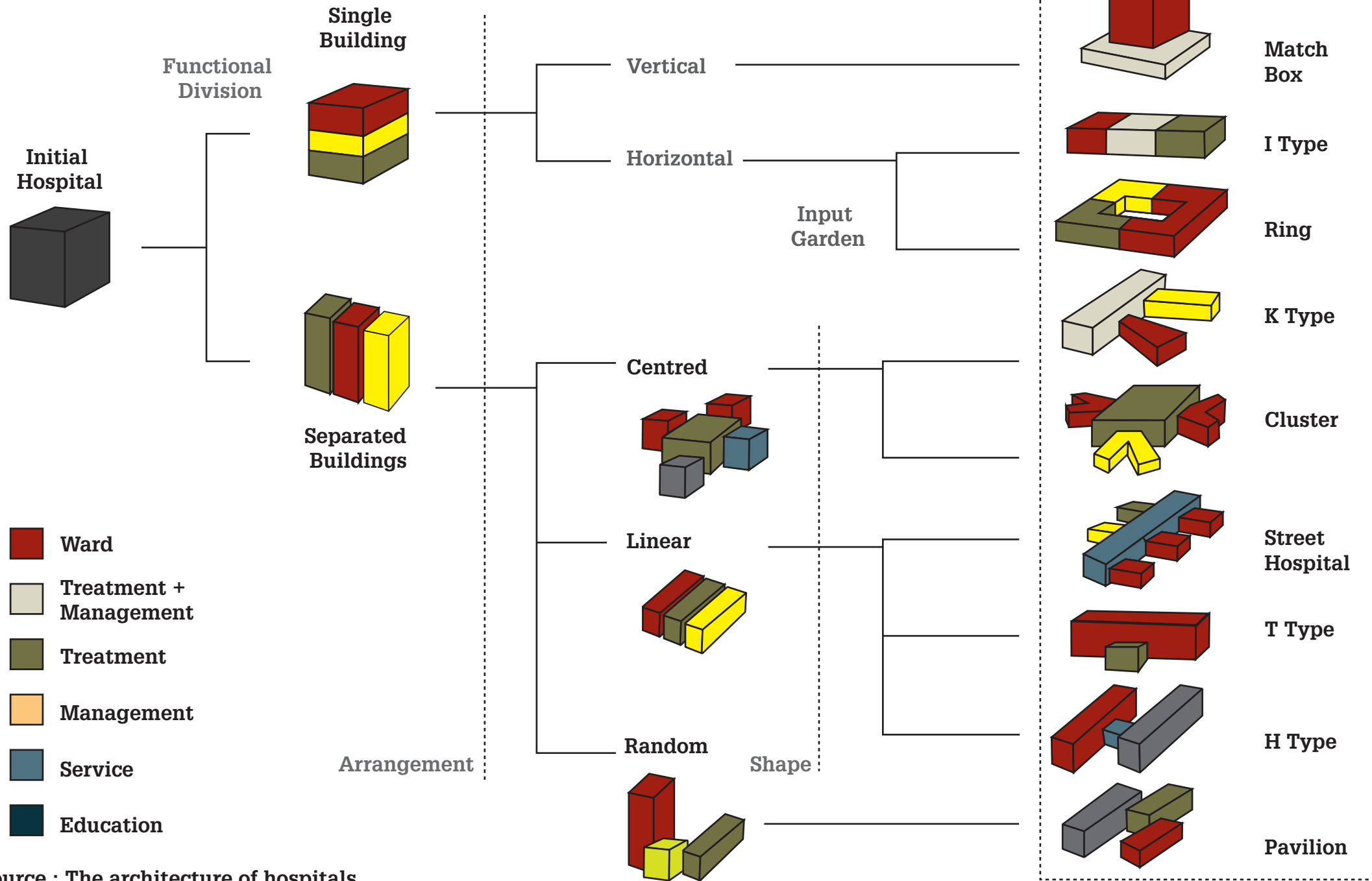
For the buildings in metropolis, the water defending system is not only involved with water proof, it should be considered as a system with other basic infrastructures

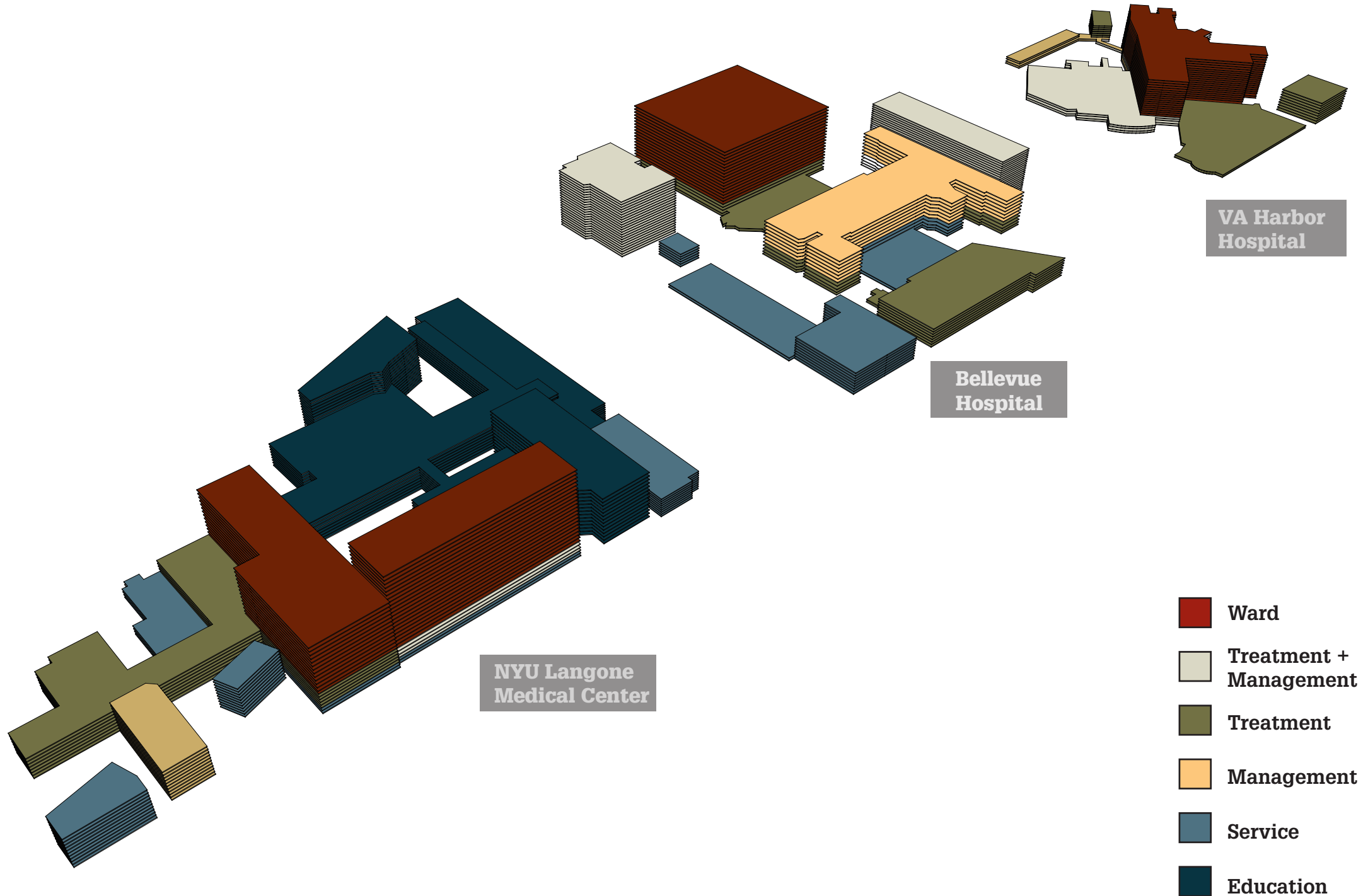
## Conclusion:

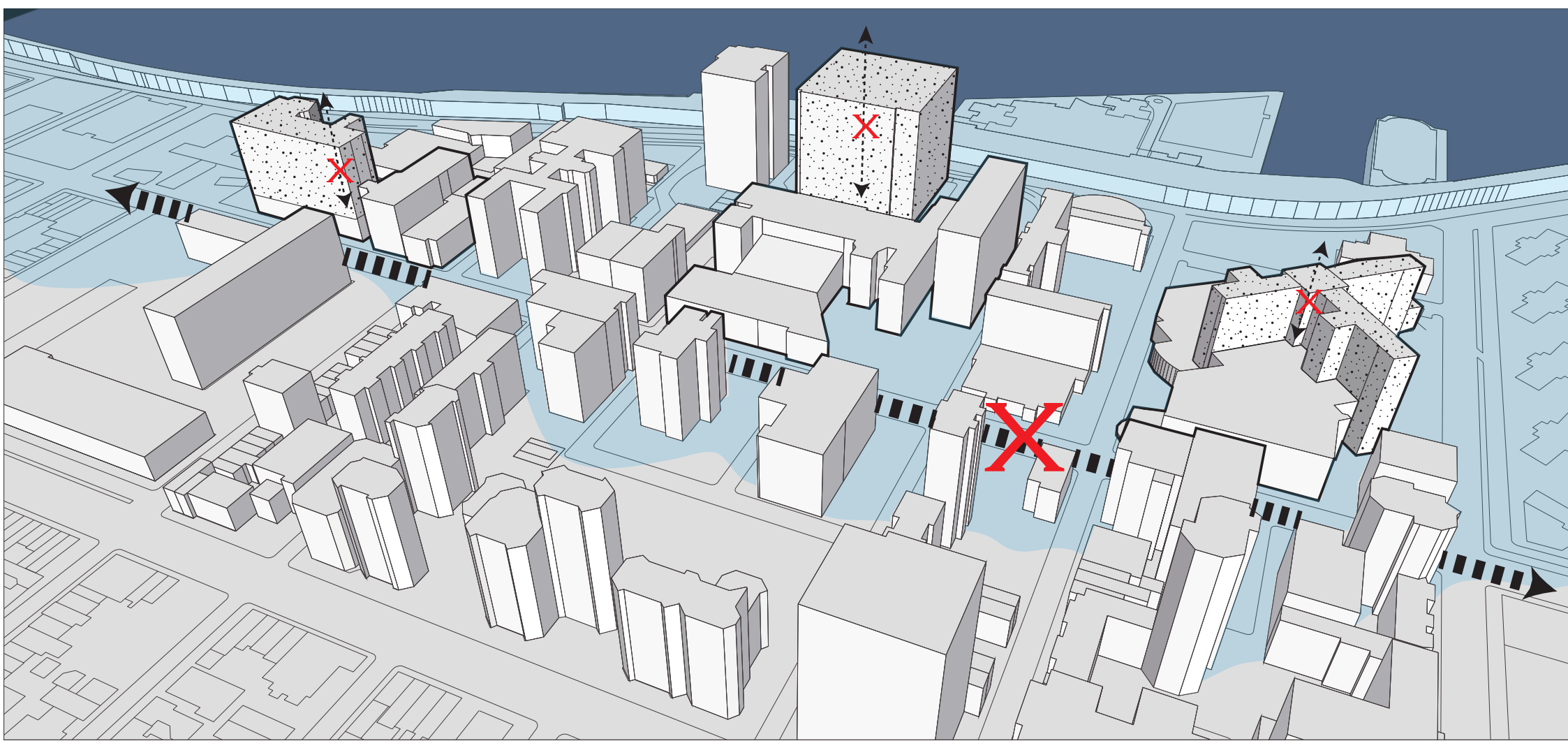
\_ This design proposal should be adaptable to other location which has similar situation.

\_ The design proposal should also consider the daily life not only urgent









## Conclusion:

During a flooding the hospitals have ward in higher level will become a island isolated with urban fabric in vertical and horizontal way.

**03//**

# **Strategy in Urban scale**



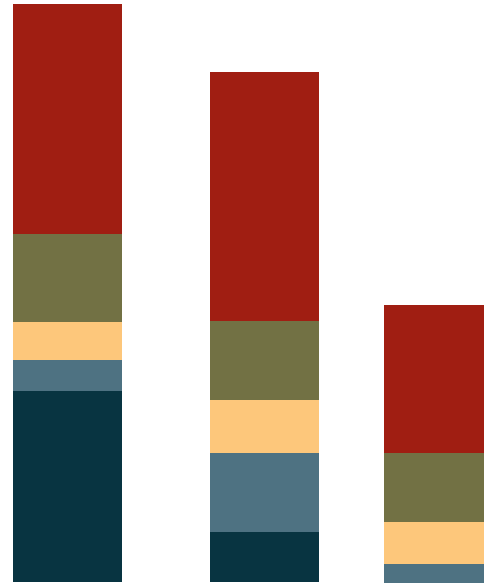
## NORMAL CONDITION

## FLOOD

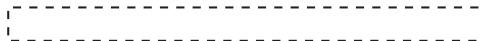
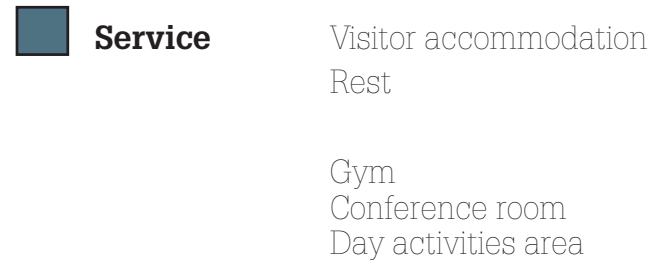
### EXISTING PROGRAM



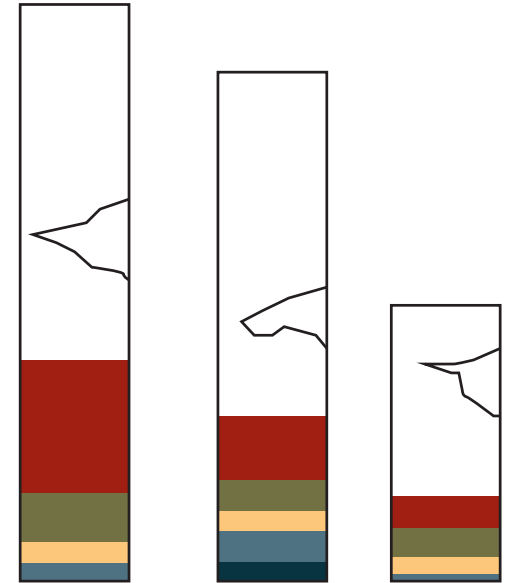
*NYU Tisch Hospital*     *Bellevue Hospital*     *VA Hospital*



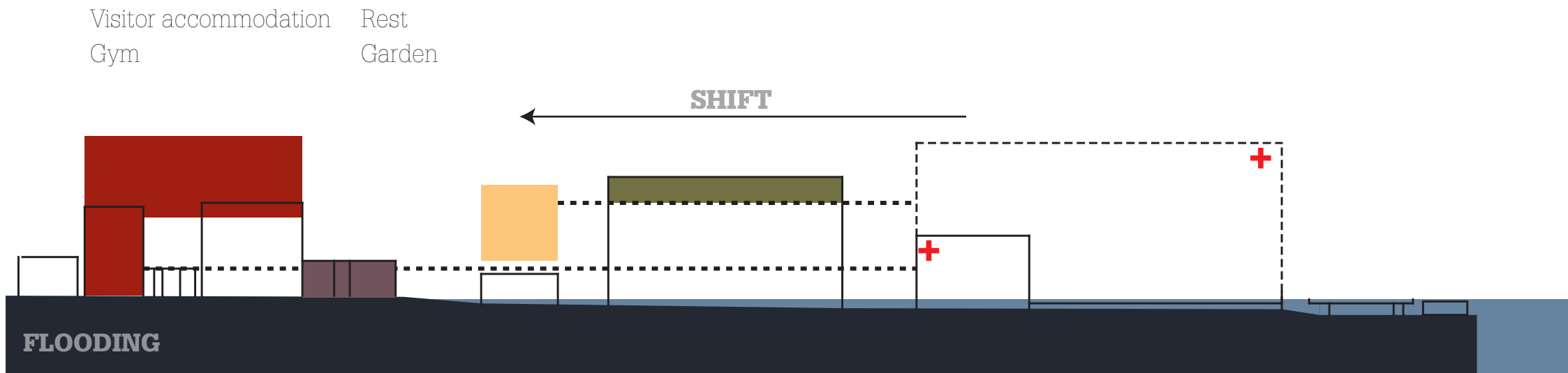
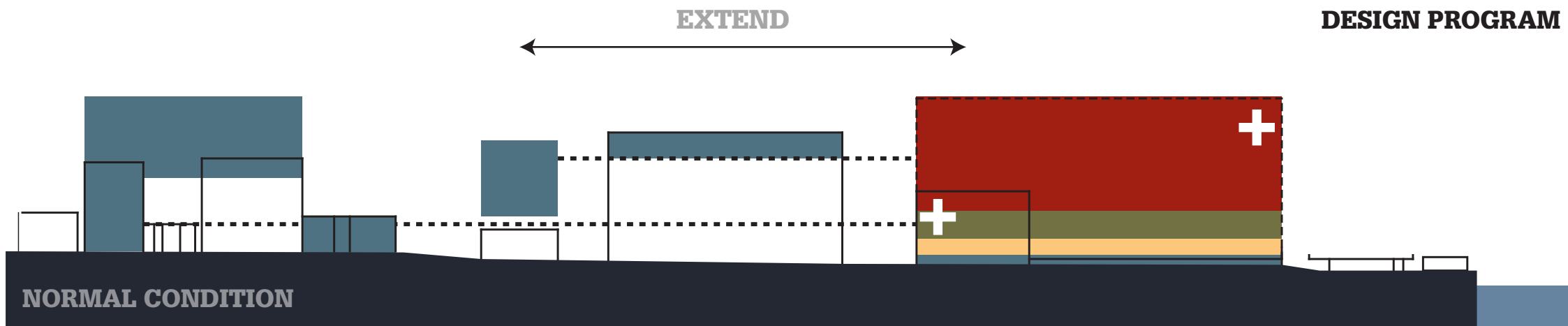
### EXTENSION



*NYU Tisch Hospital*     *Bellevue Hospital*     *VA Hospital*







## Paul Baran 'decentralized networks

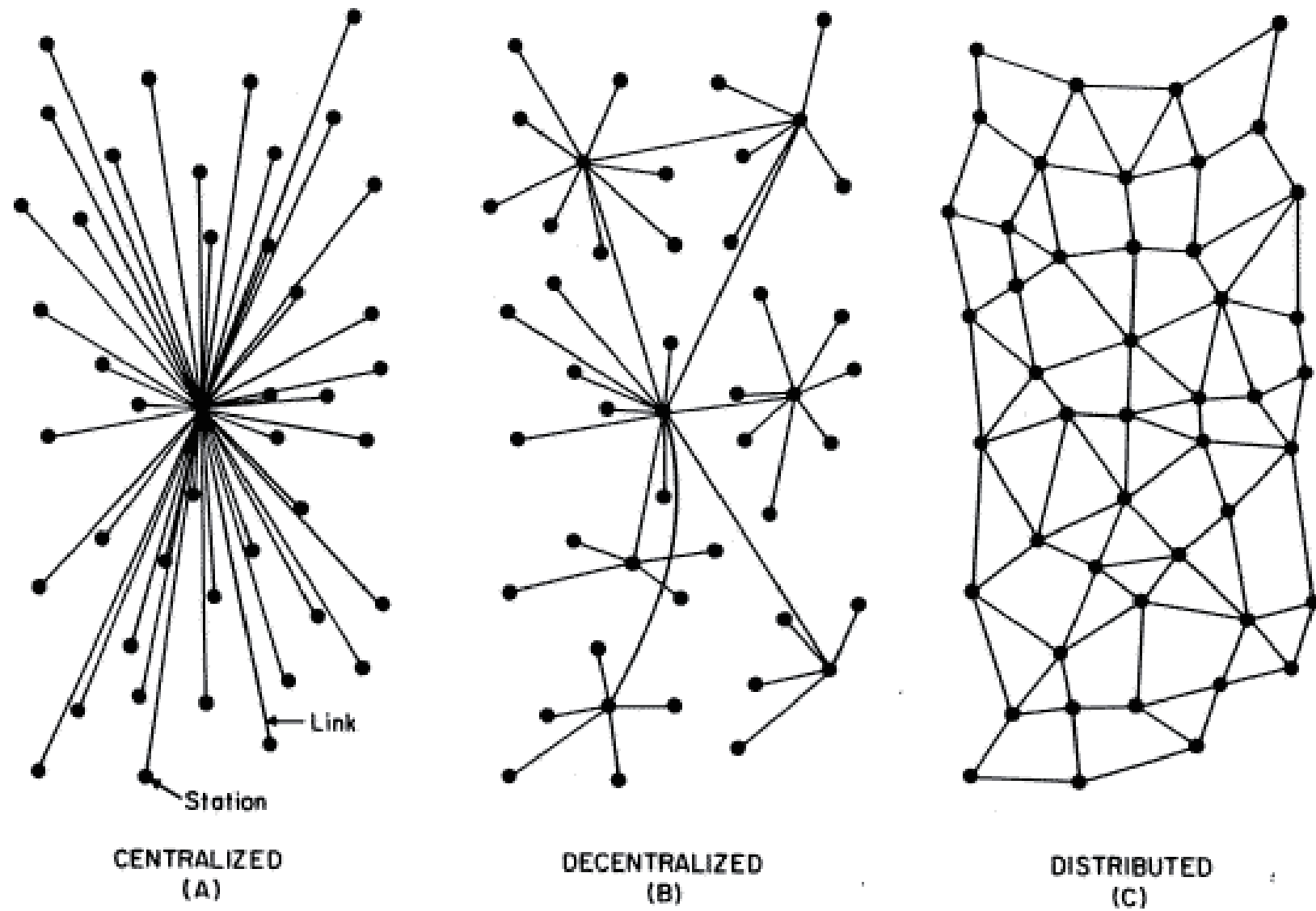
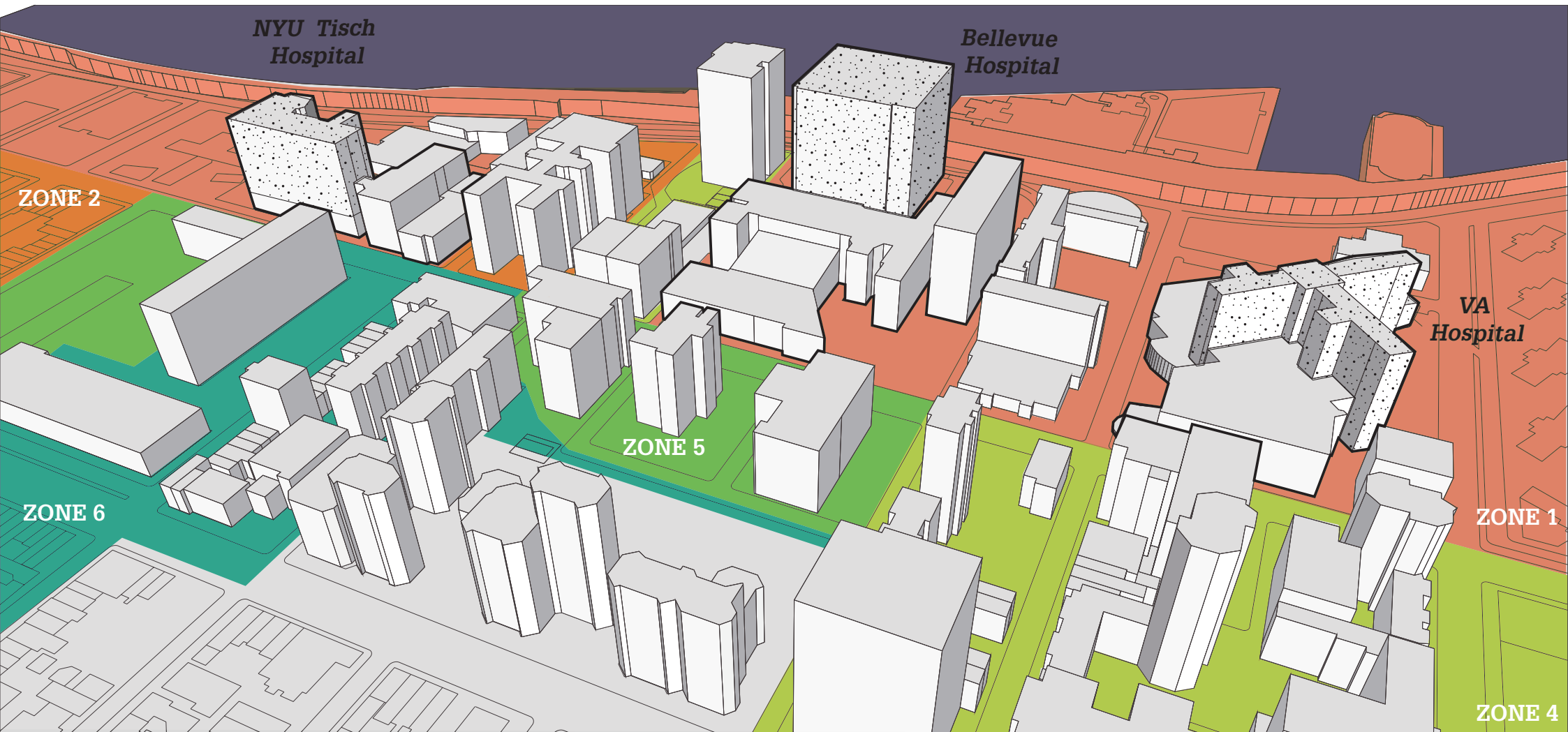
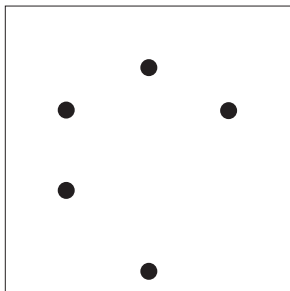


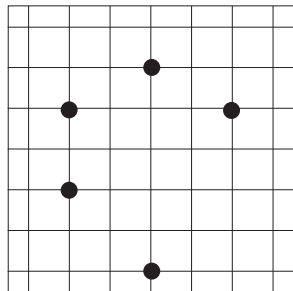
FIG. 1 – Centralized, Decentralized and Distributed Networks

*Evacuation plan*  
*By NYC government*

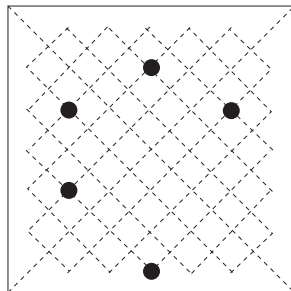




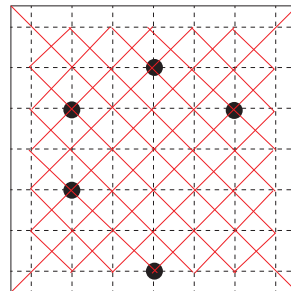
SPOTS



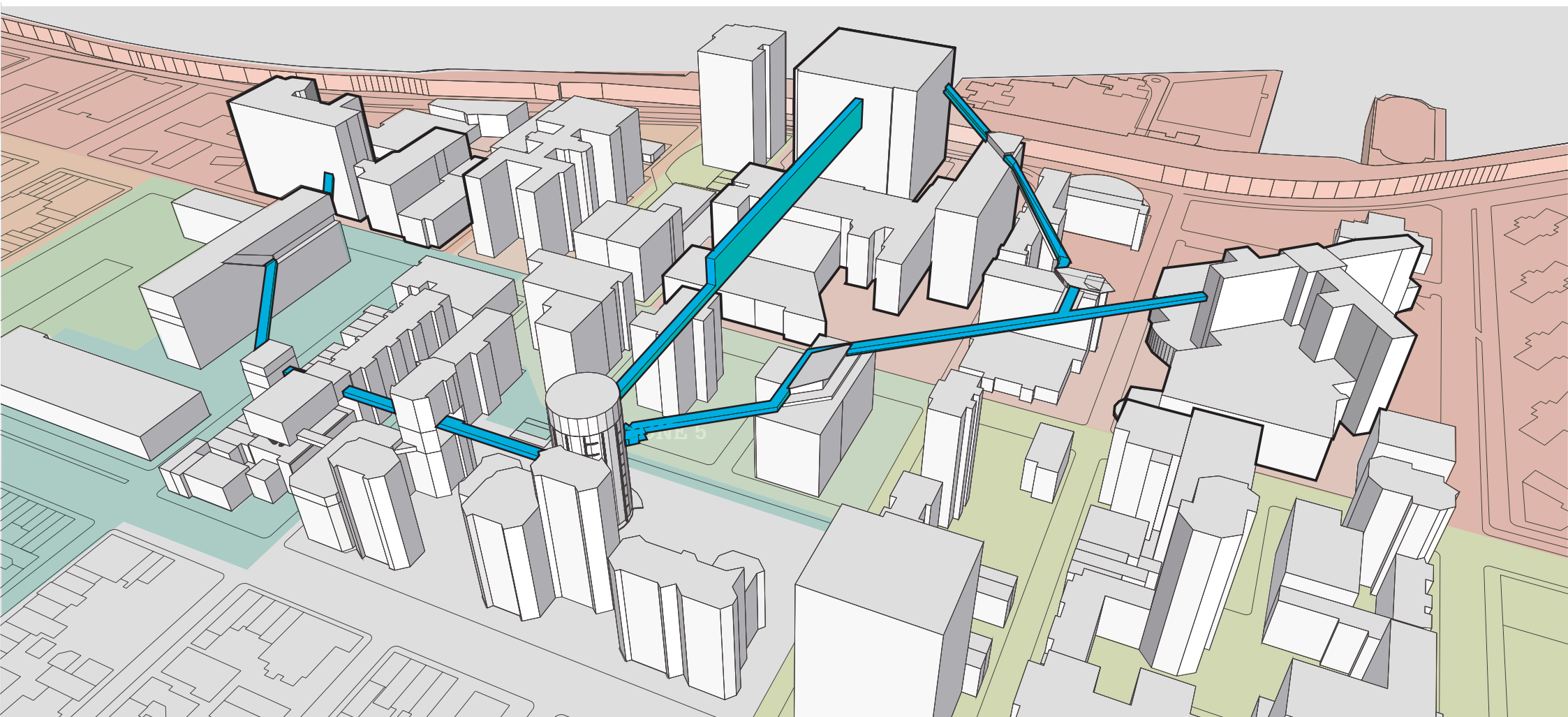
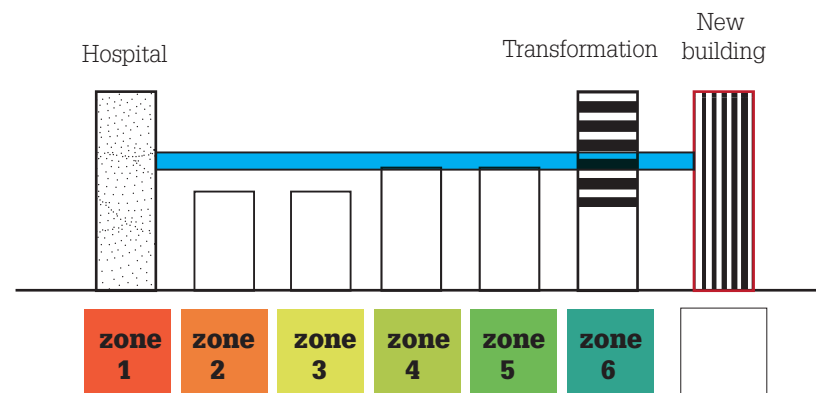
FIRST GRID



SECOND GRID

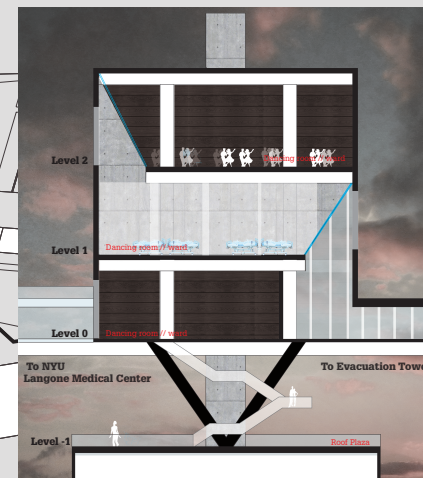
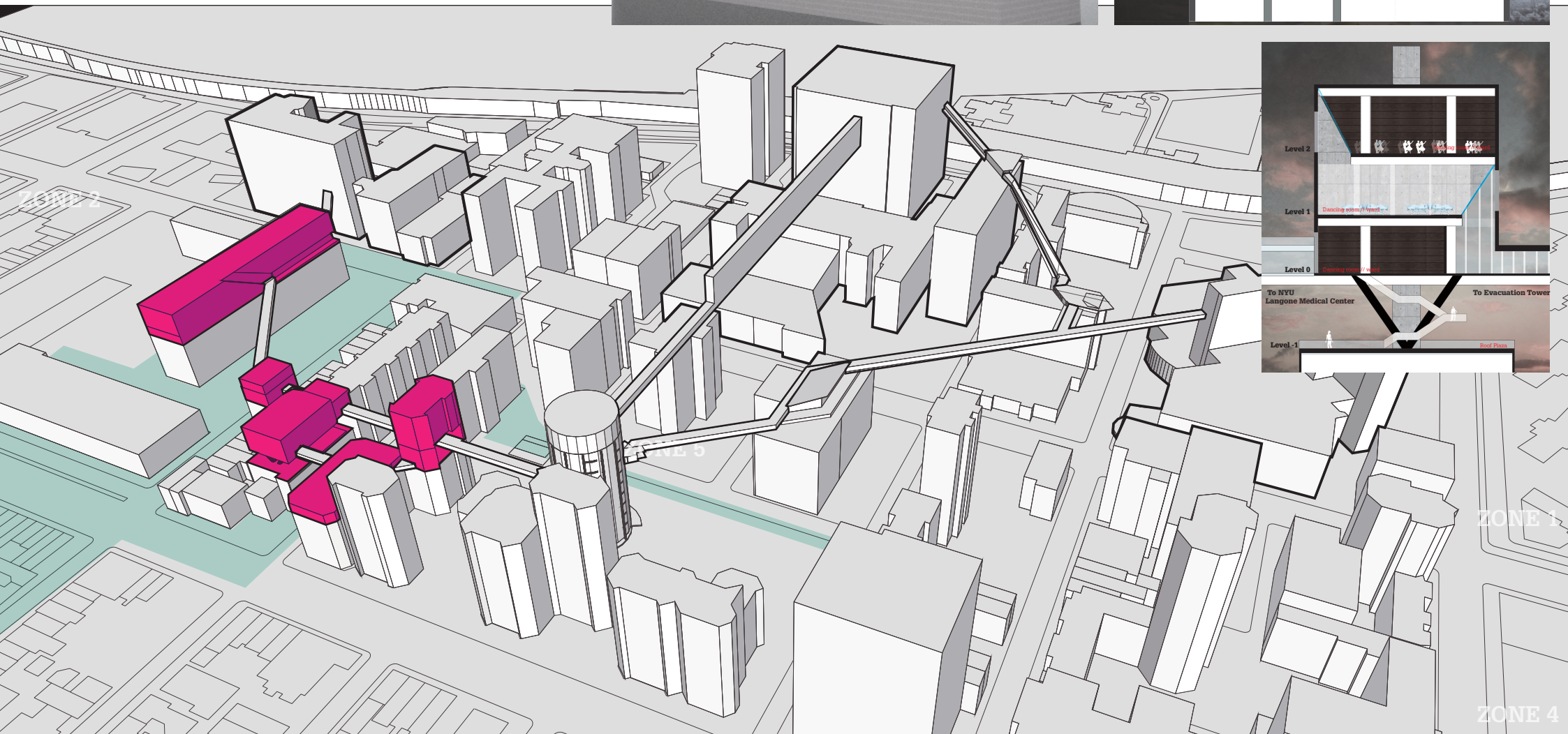
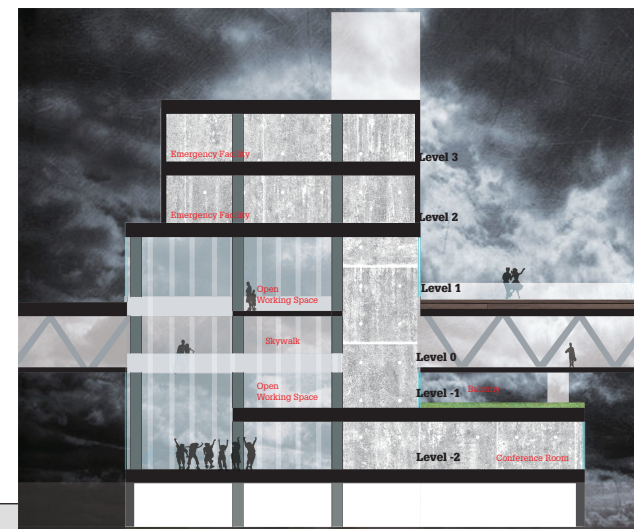
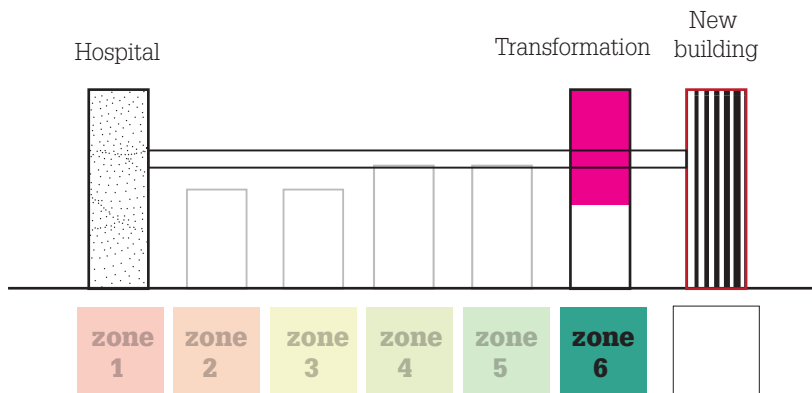


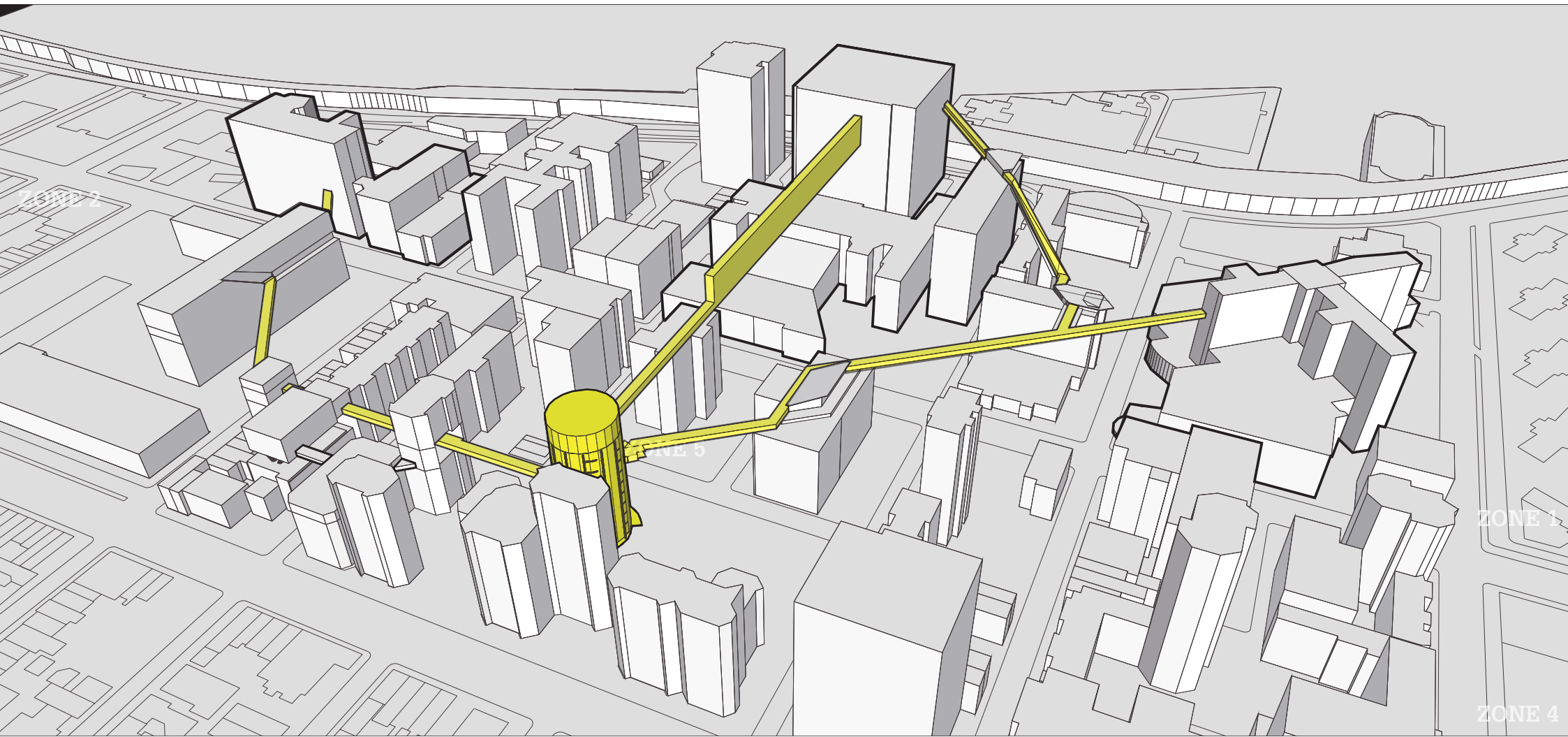
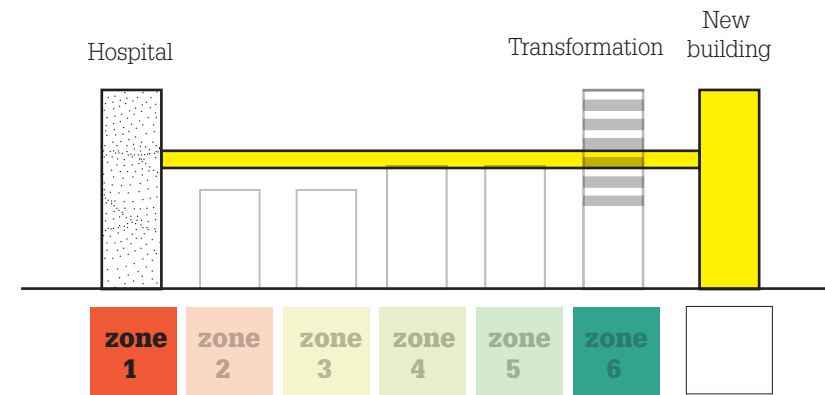
OVERLAPPING  
OF  
TWO LAYERS  
OF GRIDS













# SERVICE

- Hotel A // Alternative ward
- Hotel B // Alternative ward
- Sport Center // Alternative Ward
- Office // Emergency Responding Center

NYU Langone  
Medical Center

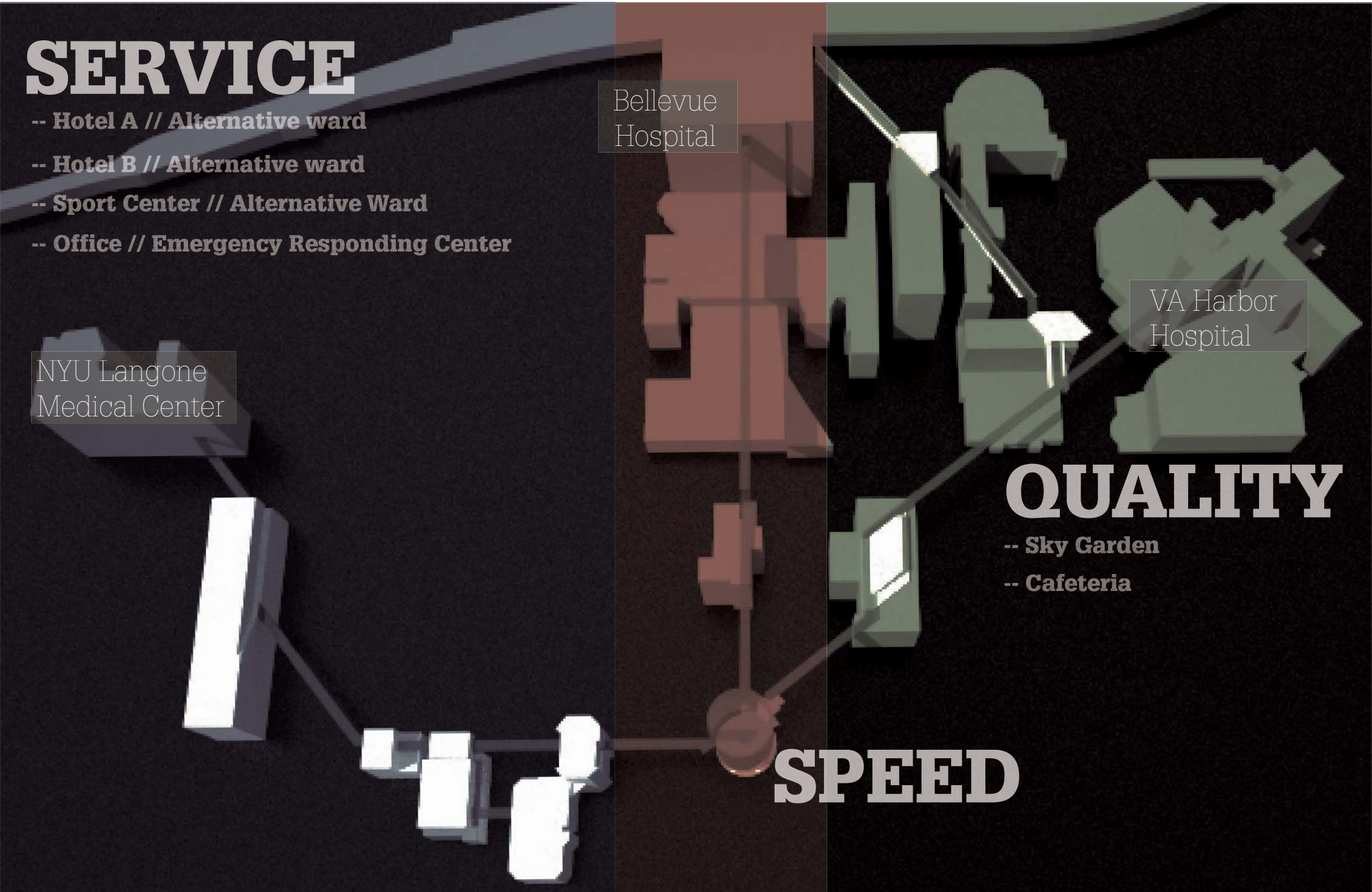
Bellevue  
Hospital

VA Harbor  
Hospital

# QUALITY

- Sky Garden
- Cafeteria

# SPEED





# **04 //**

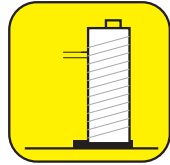
# **Architectural design**

Element A: Evacuation tower

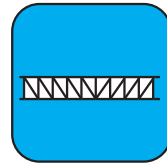
Element B: Bridge

Element C: Hotel B

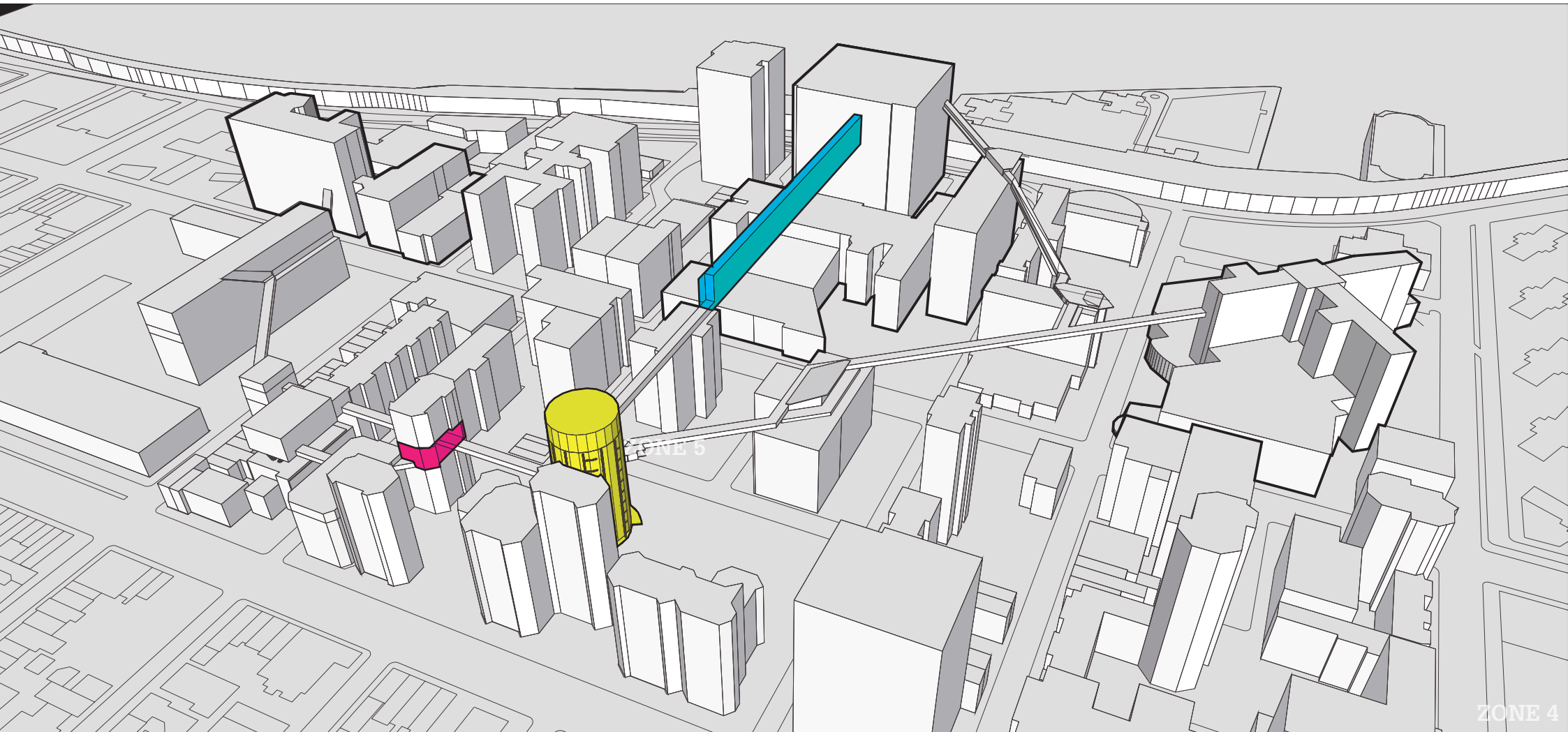
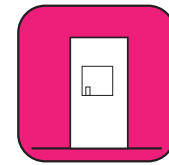
**A**



**B**



**C**



Bellevue  
Hospital

**SPEED**

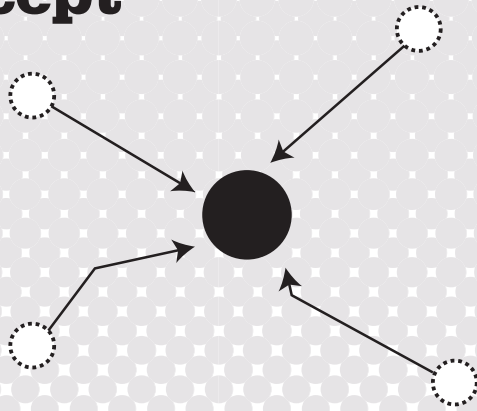


## **Evacuation Tower**

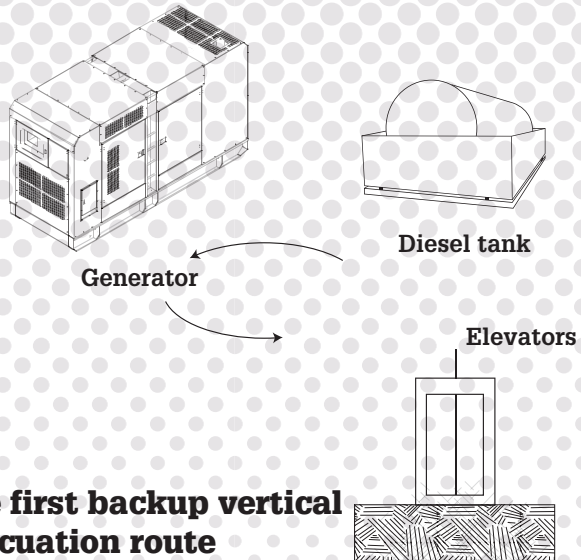
Concept  
Scheme  
Strcuture system  
Detail  
Materialization  
Inter climate design



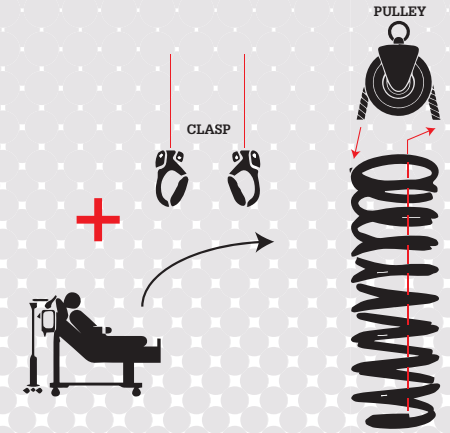
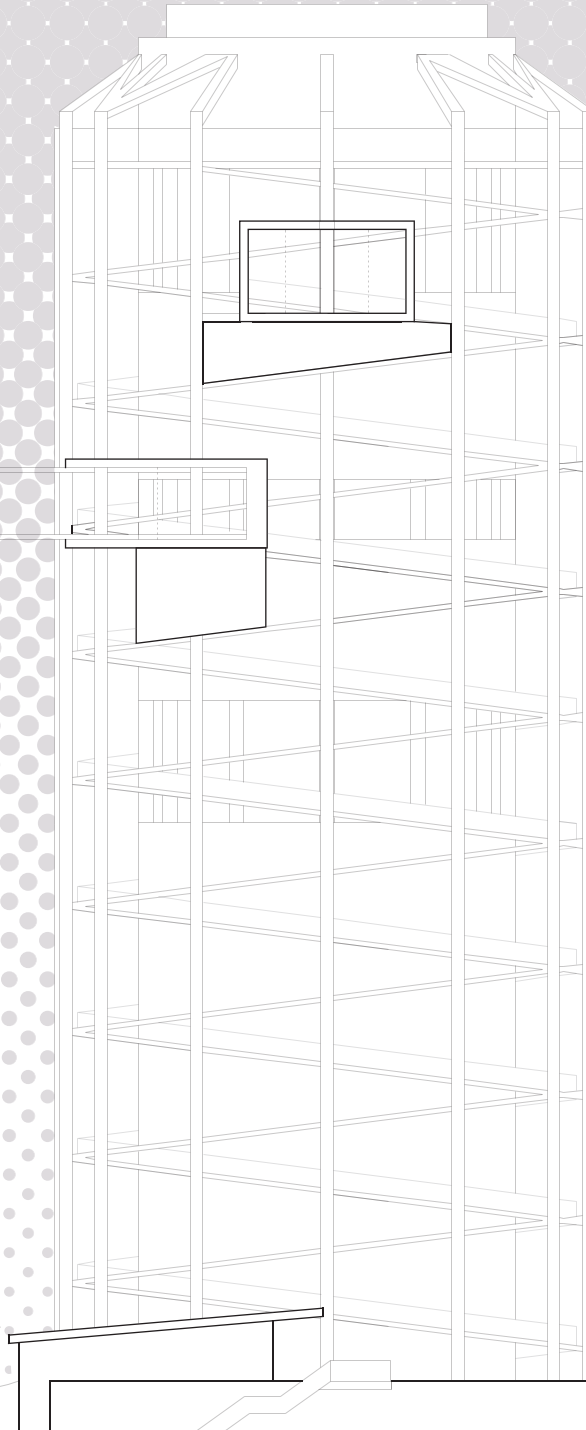
# Concept



**The final backup route of evacuation in urban fabric**

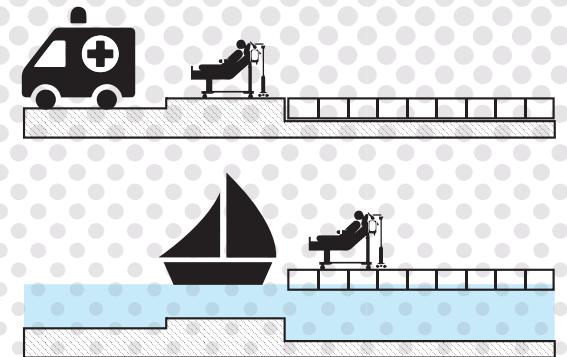


**The first backup vertical evacuation route**

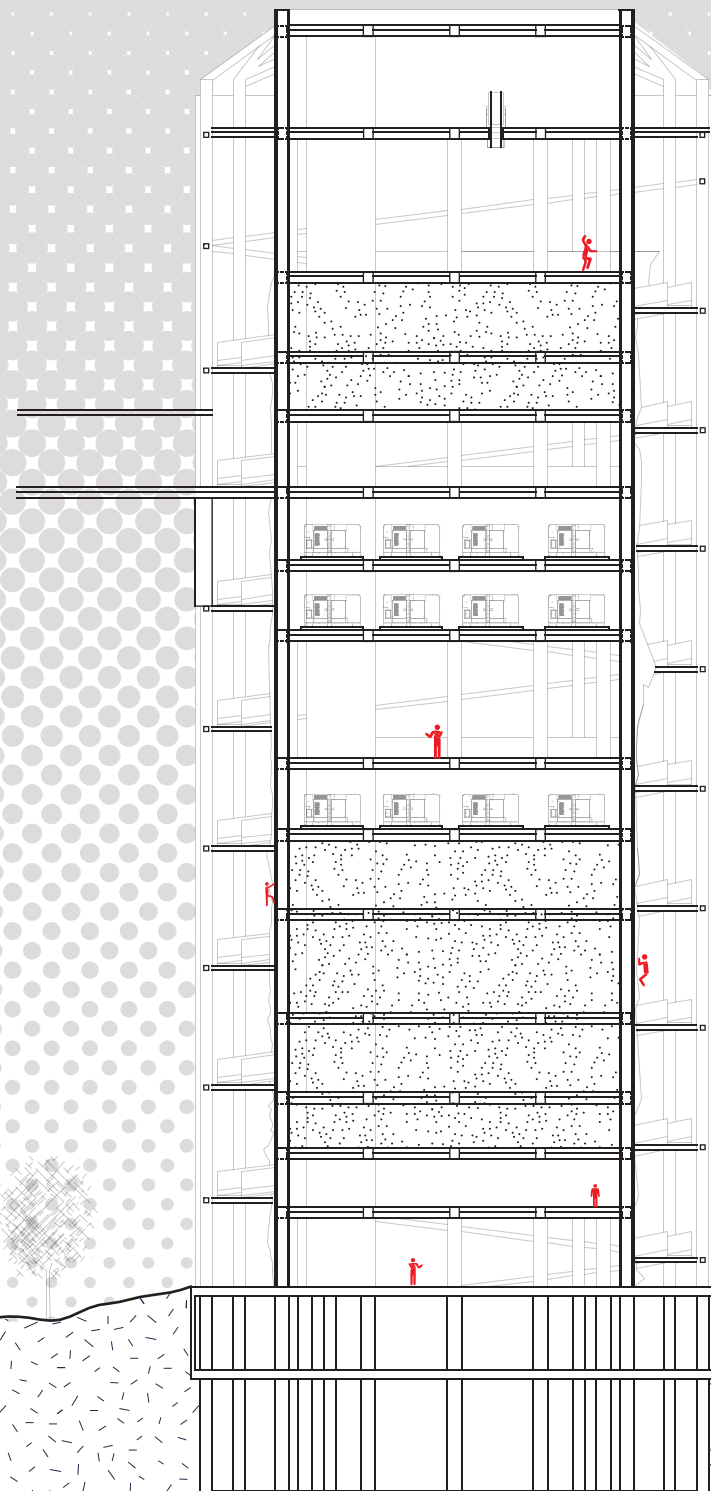


**The second backup vertical evacuation route**

**The backup ground floor evacuation route**



# Scheme



## Level 3

From Bellevue Hospital

Diesel tank

## Level 2

From VA Hospital

Generators

## Level 1

From NYU Medical Centre

Generators

Diesel tank

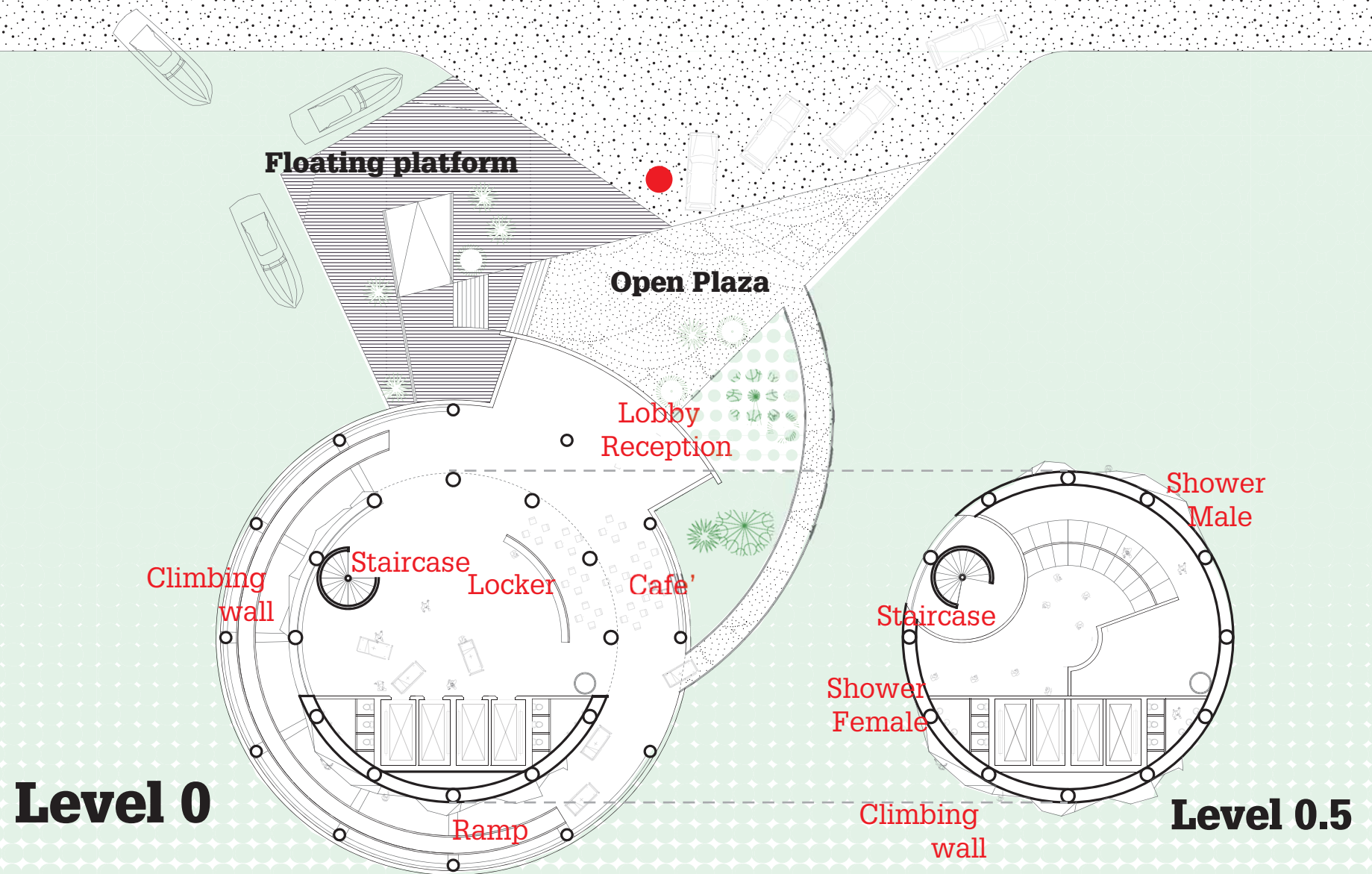
## Level 0.5

Fitting room // Shower

## Level 0

Lobby // Reception

# Scheme

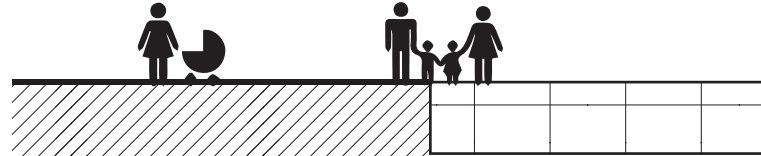




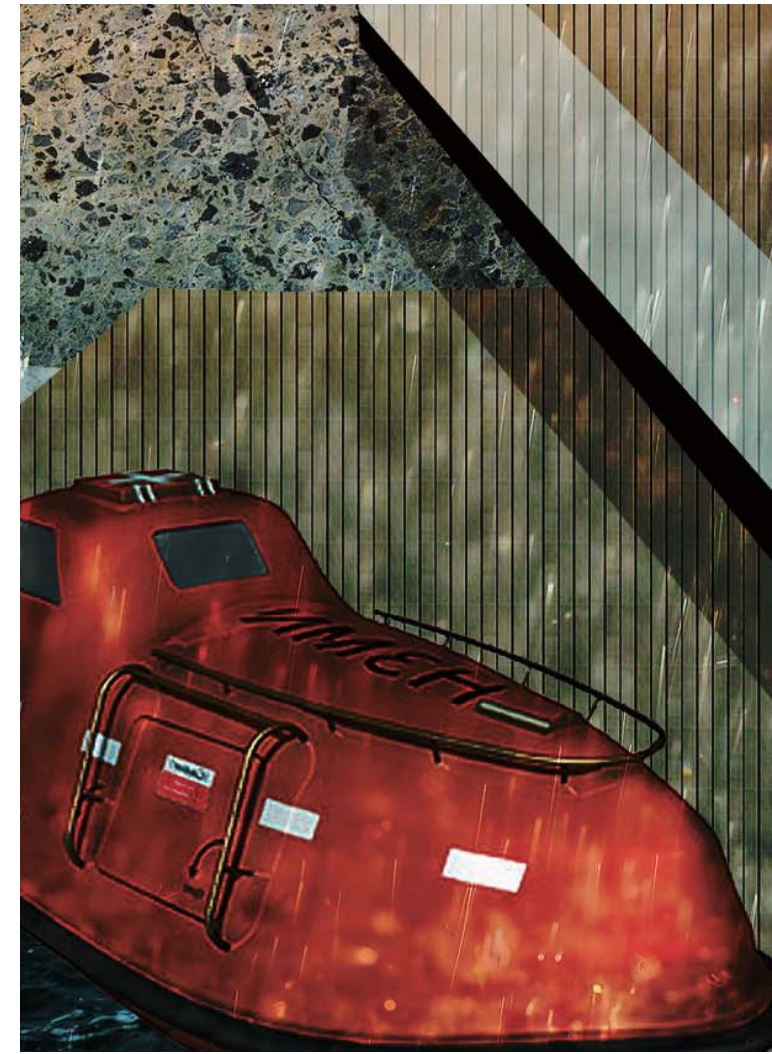
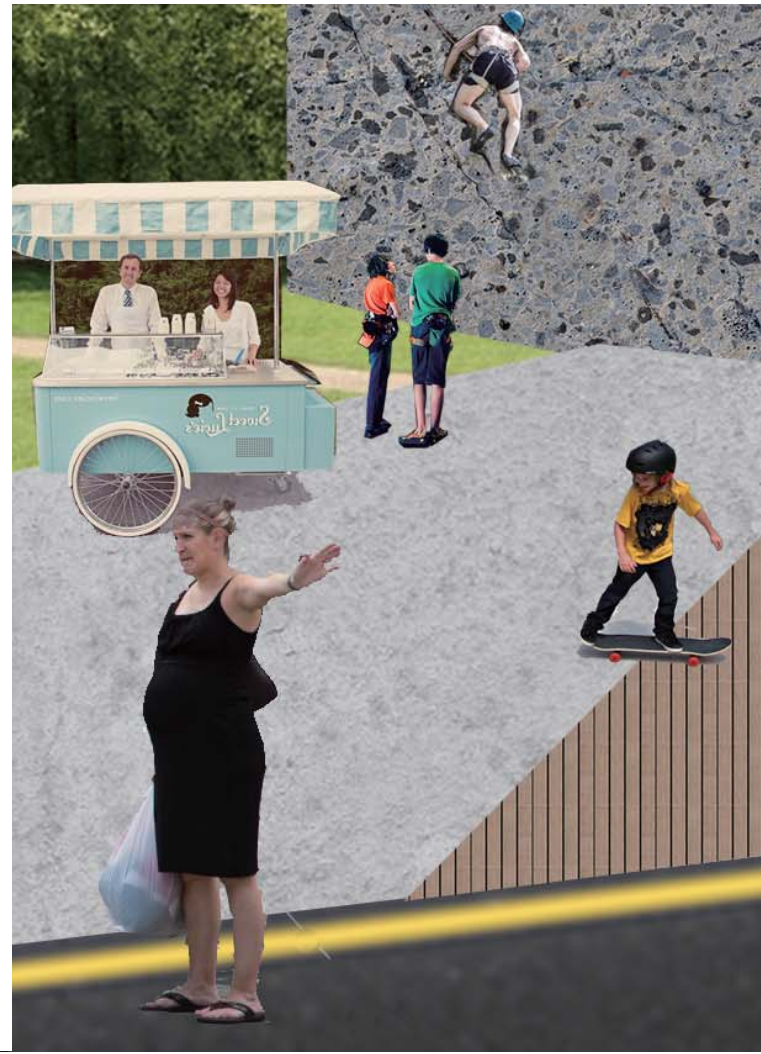
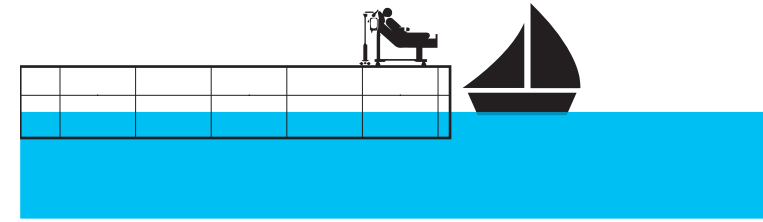
**Urgent situation -- normal**

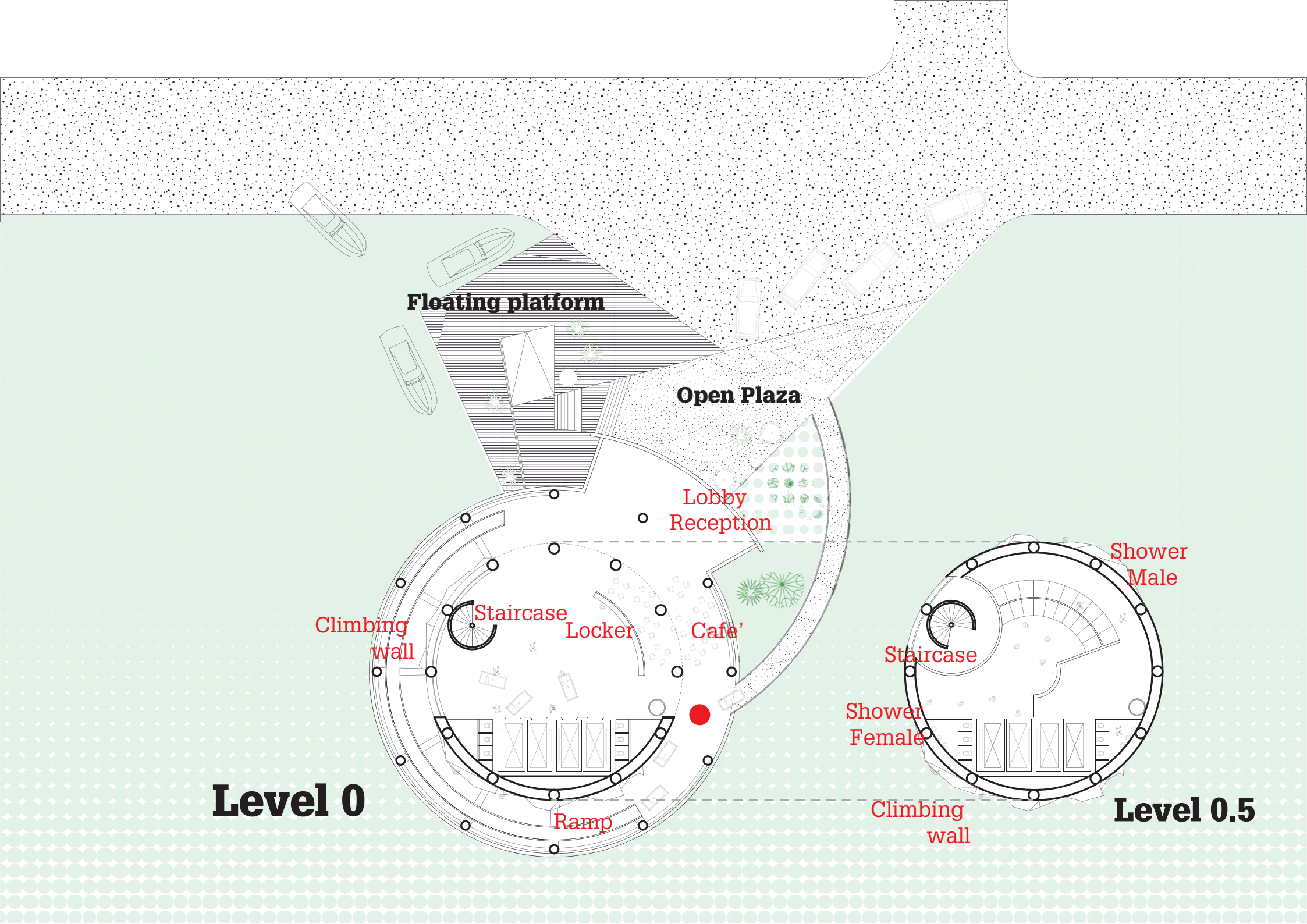


**Daily situation**



**Urgent situation -- flooding**





**Floating platform**

**Open Plaza**

Lobby  
Reception

Climbing  
wall

Staircase

Locker

Cafe'

Ramp

Staircase

Shower  
Female

Shower  
Male

Climbing  
wall

**Level 0**

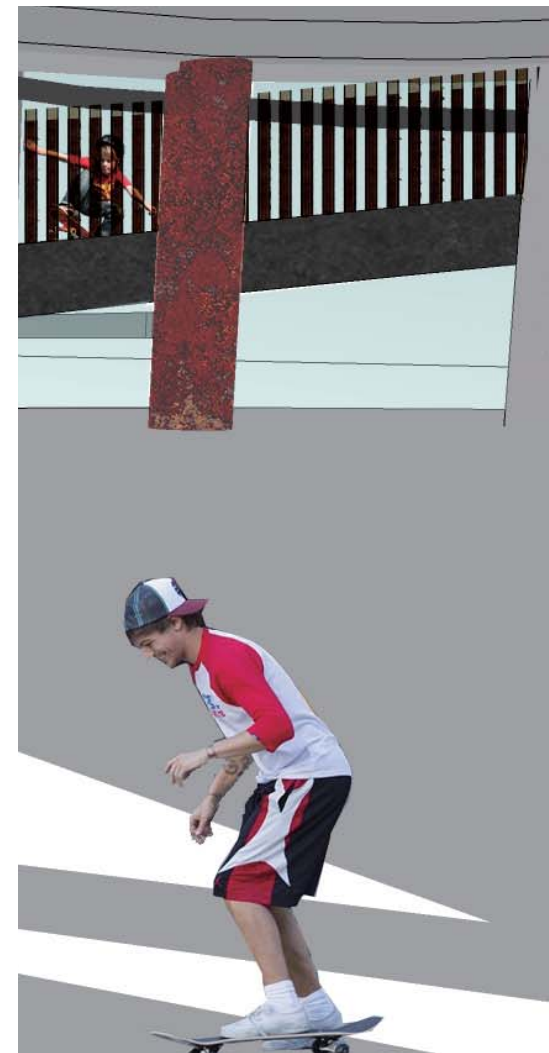
**Level 0.5**



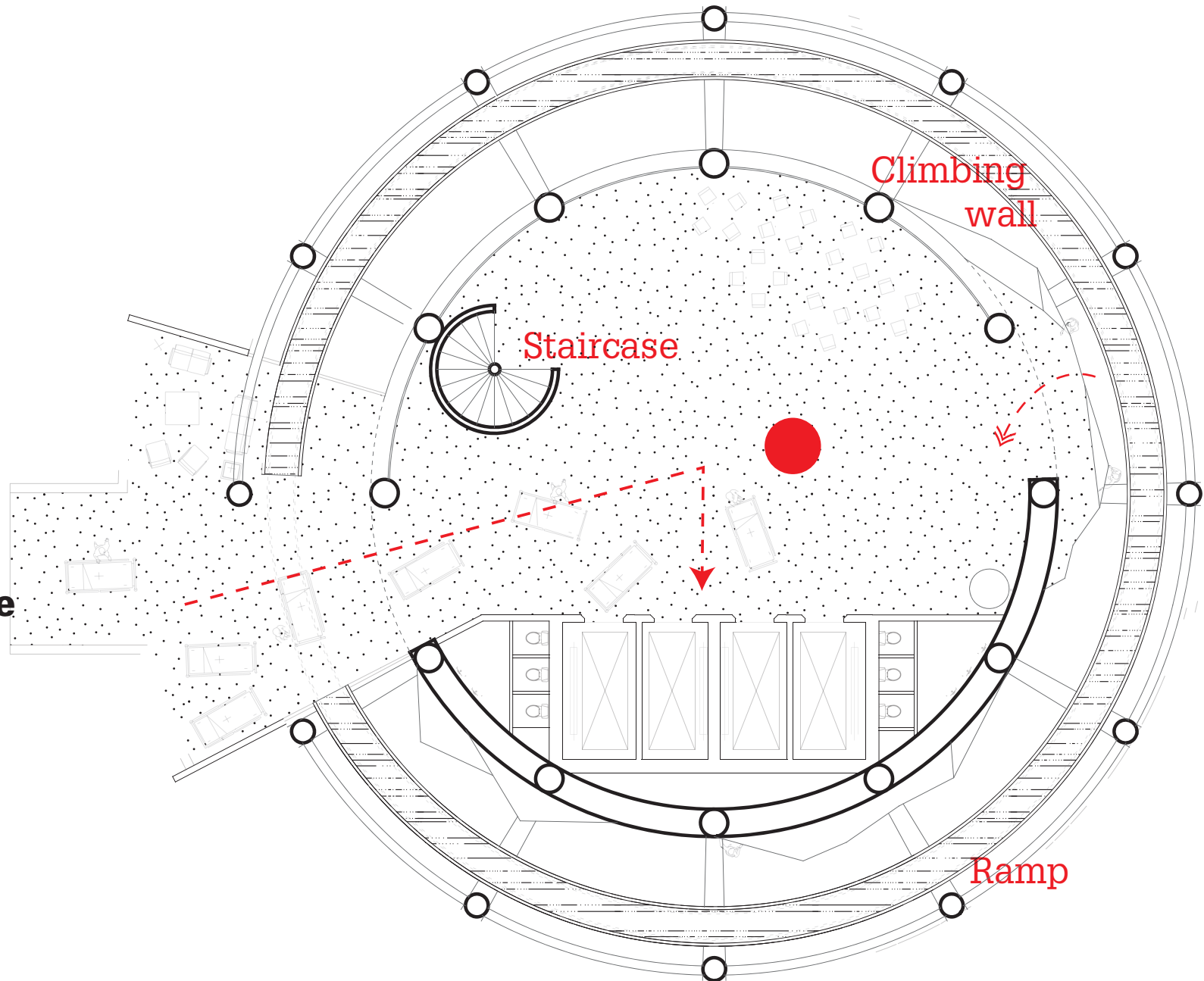
**Daily situation**



**Daily situation**



**From NYU  
Medical Centre**



**Level 1**



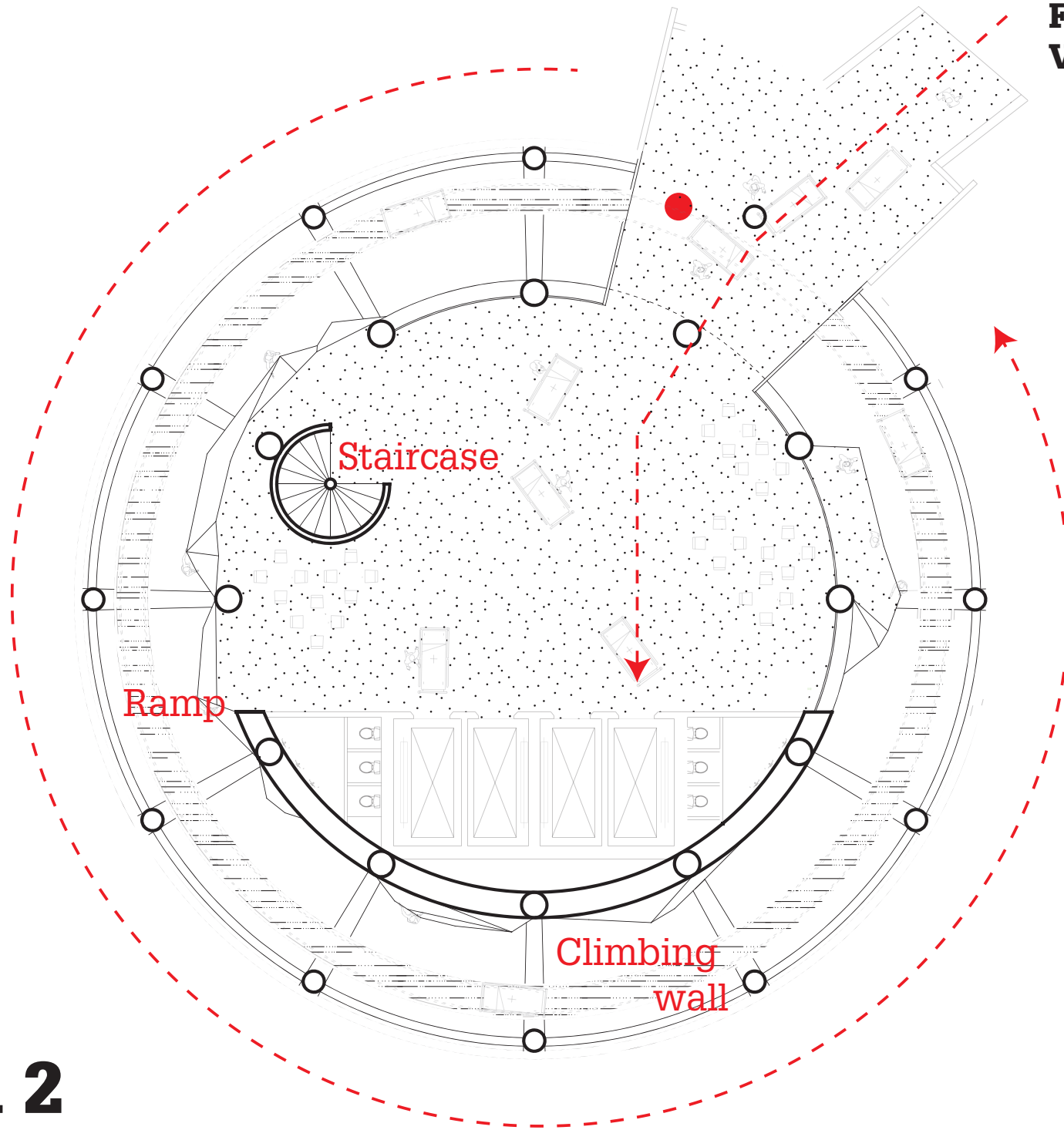
**Urgent situation**



**Daily situation**



**From  
VA Hospital**



**Level 2**



**Urgent situation**

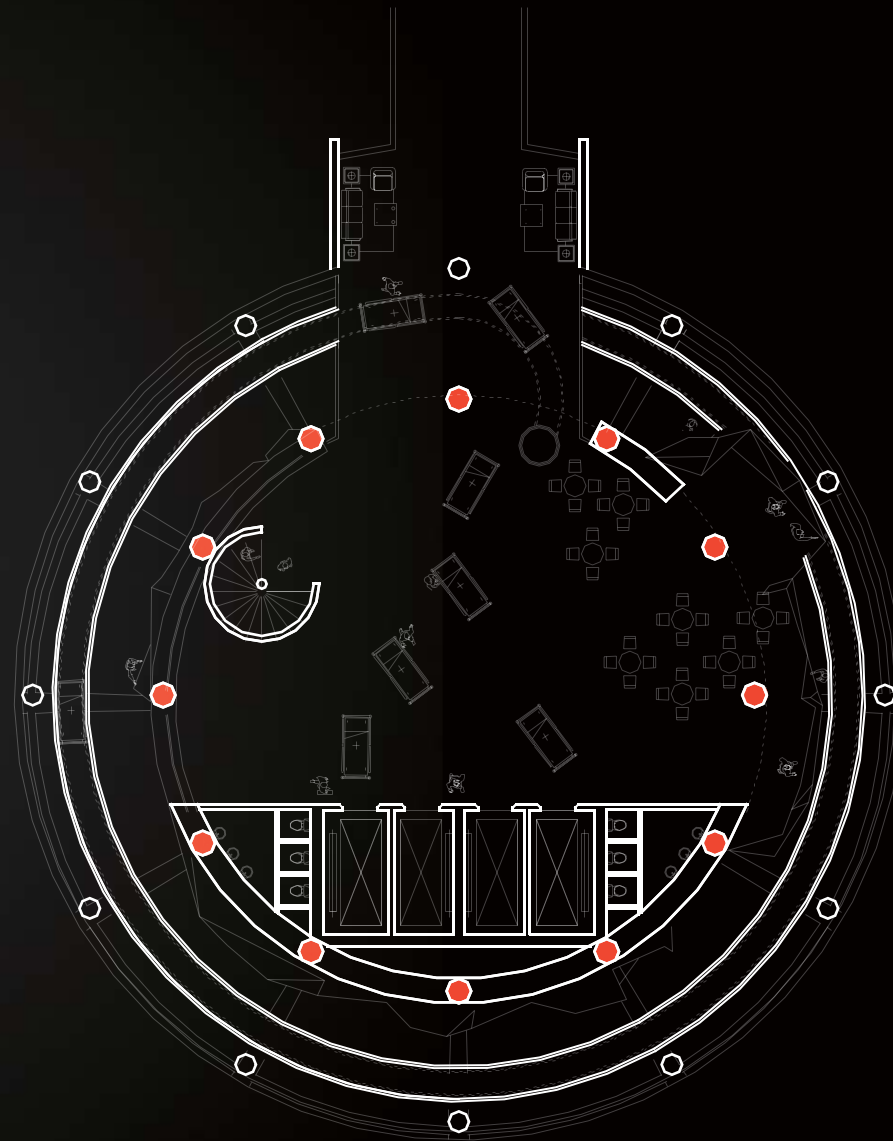
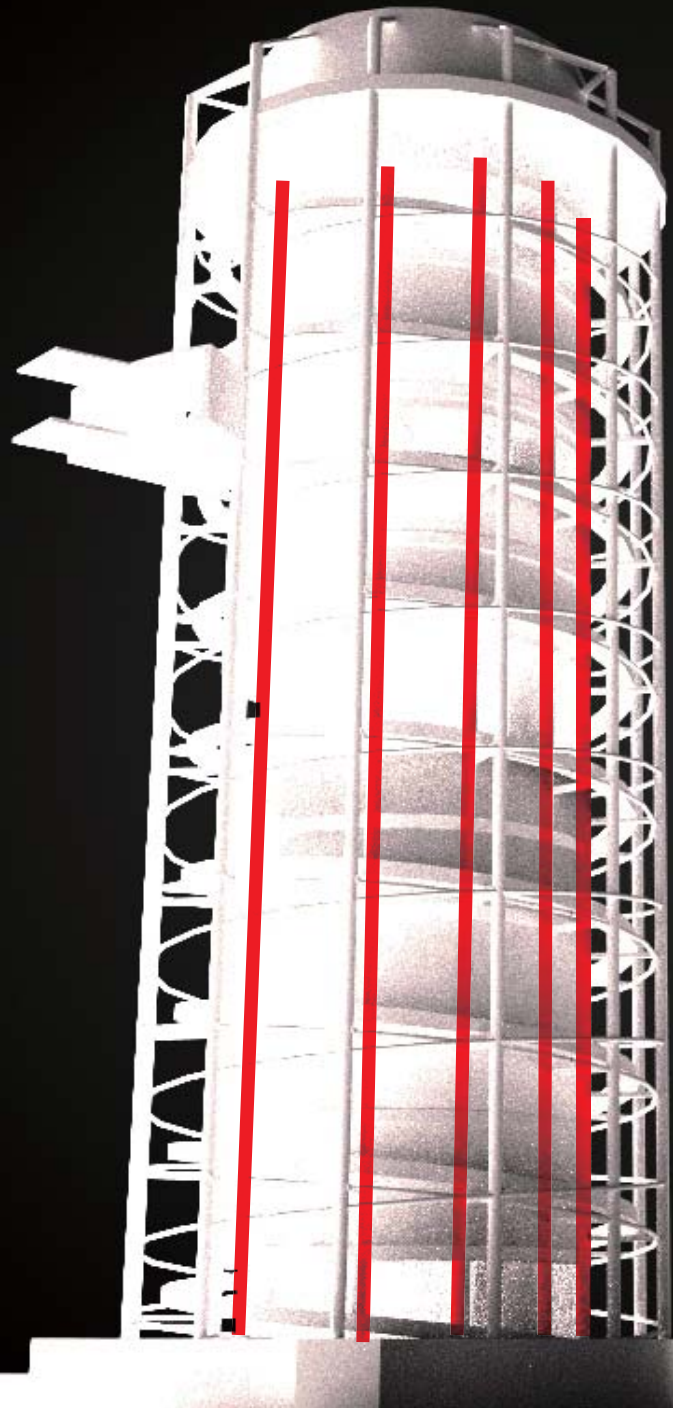


**Daily situation**





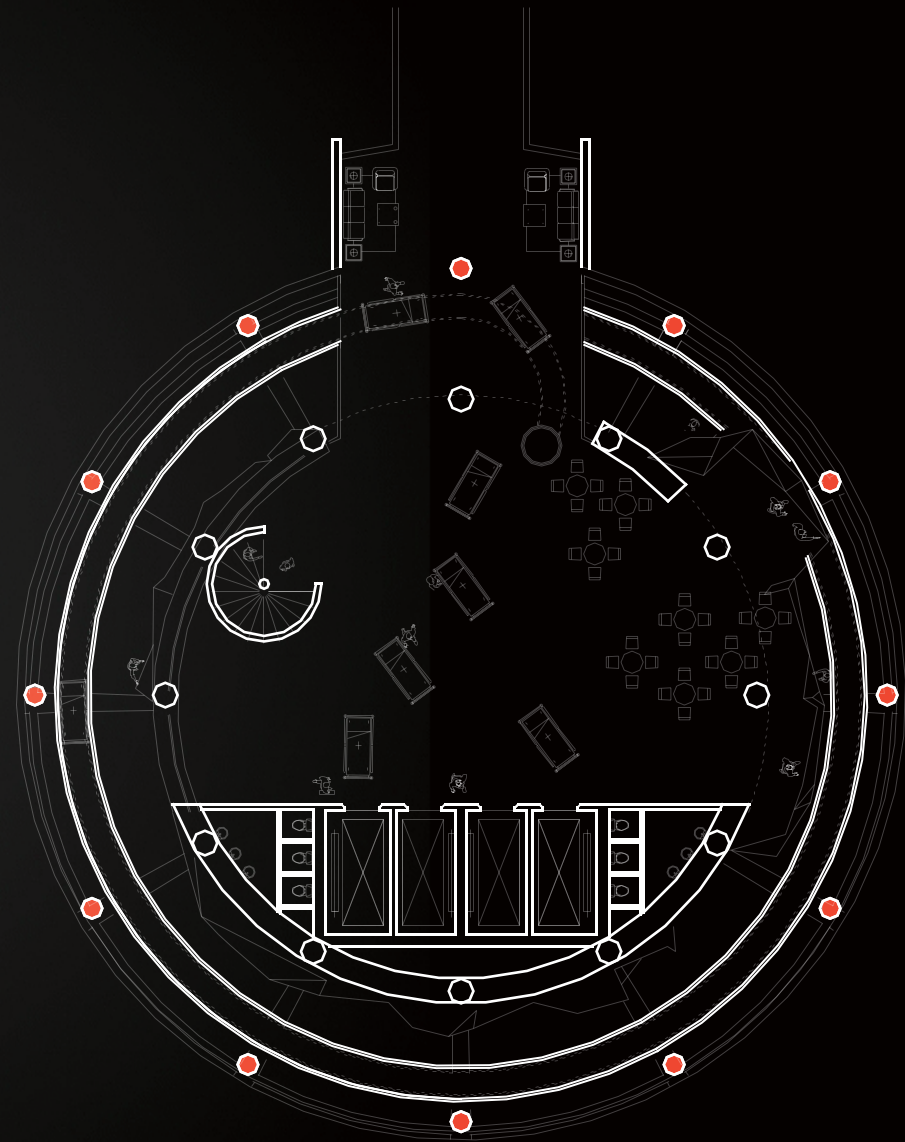
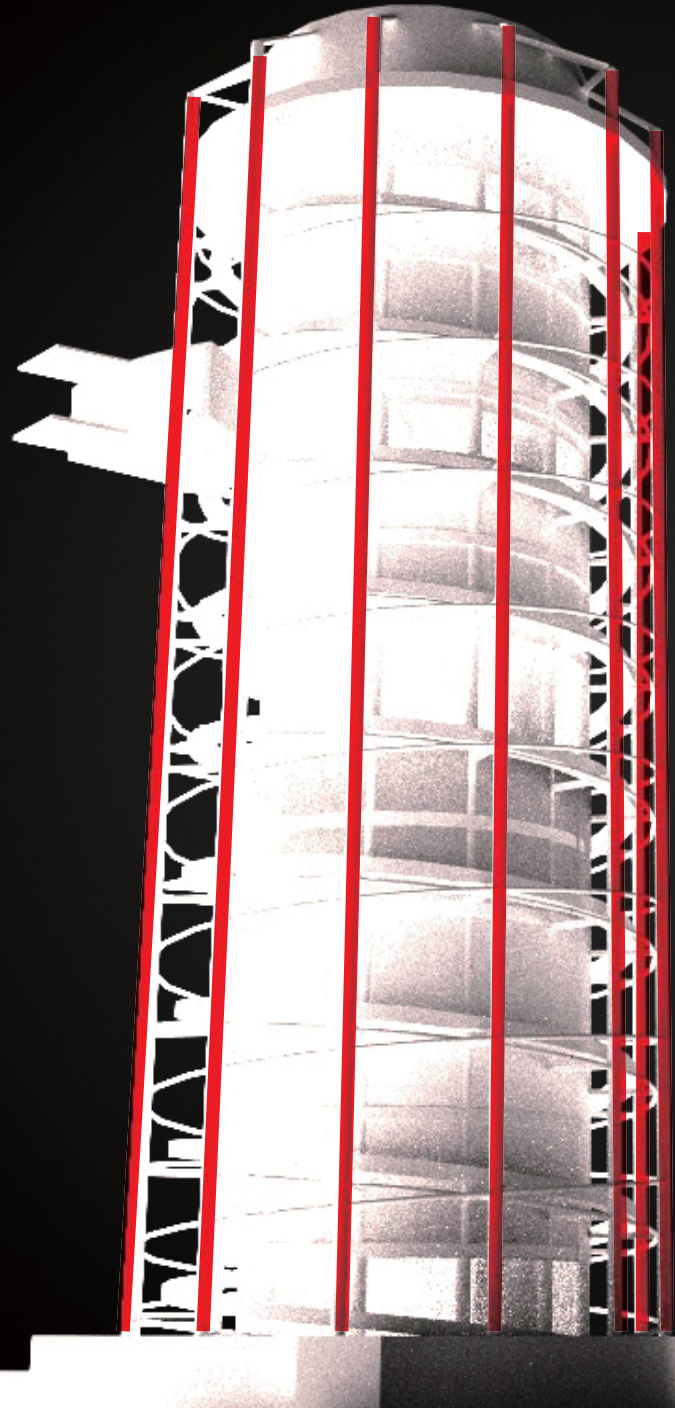
# Strcuture system



● Outer circle  
Steel column

Level 3

# Strcuture system

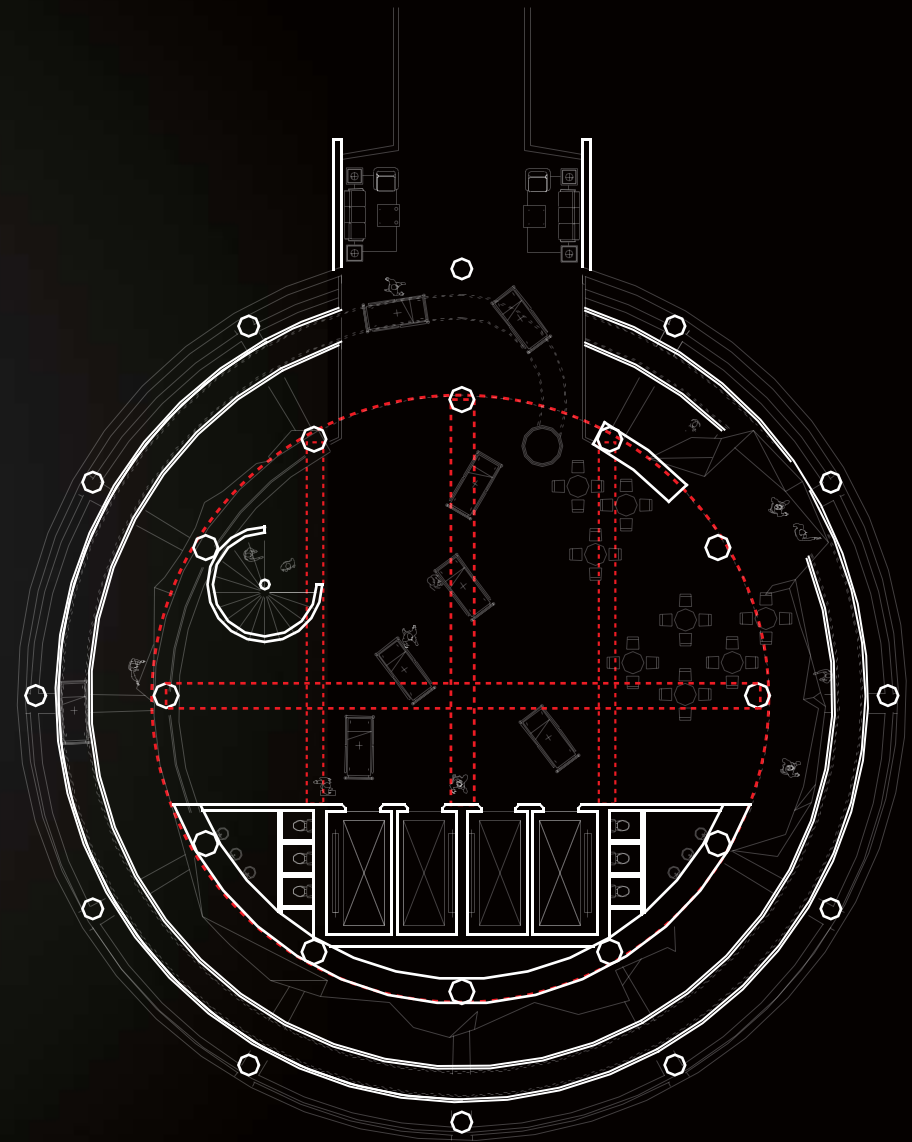
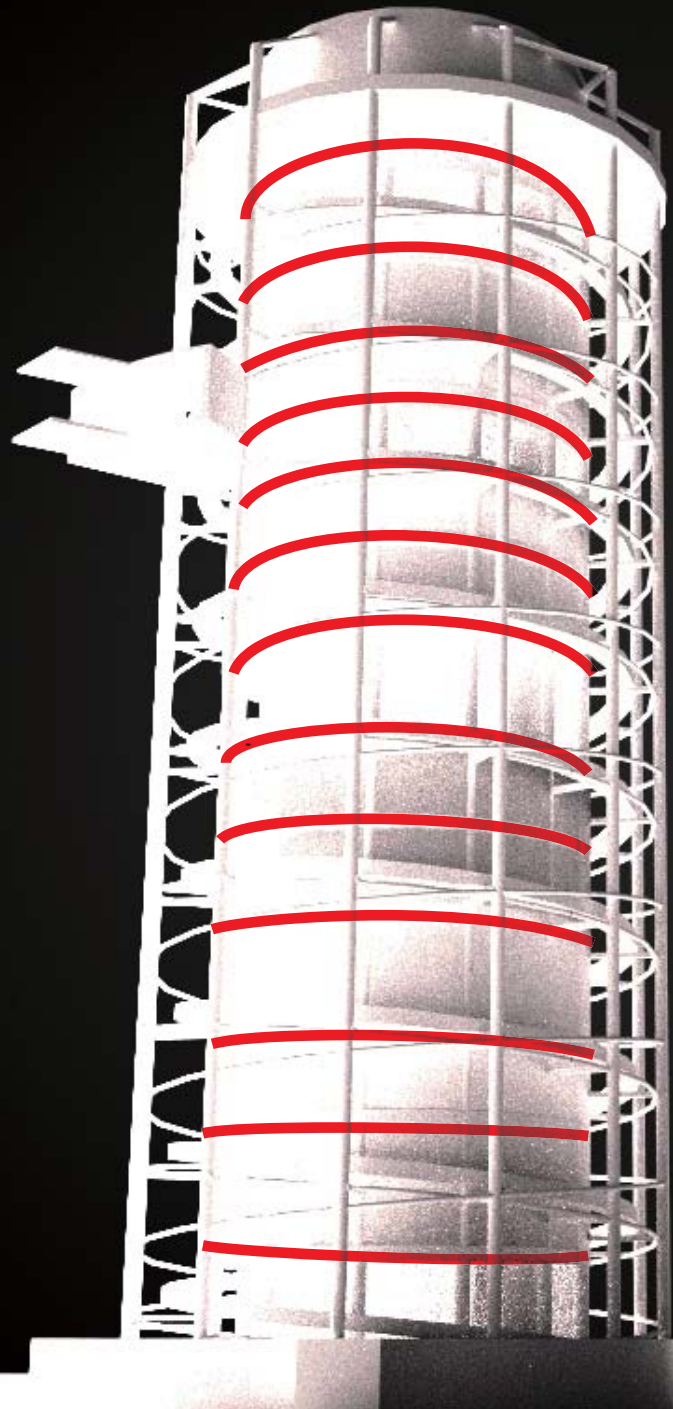


● Outer circle  
Steel column

Level 3



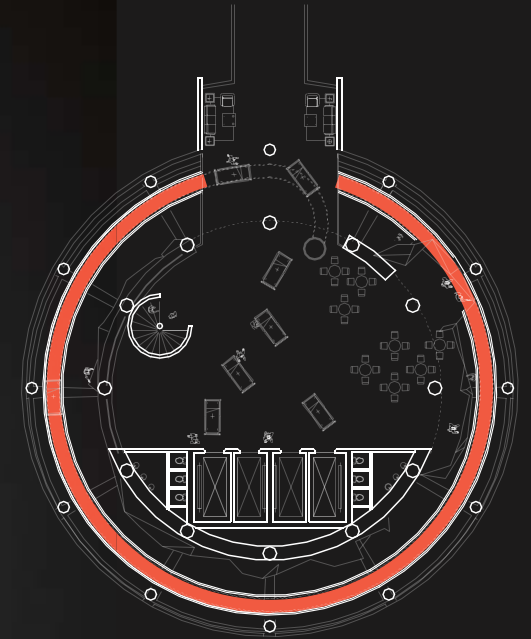
# Strcuture system



 Beams of floor

Level 3

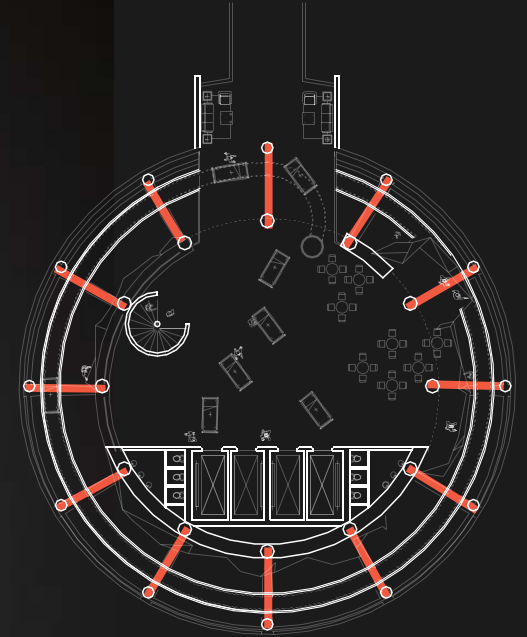
# Strcuture system



 Ramp



# Strcuture system

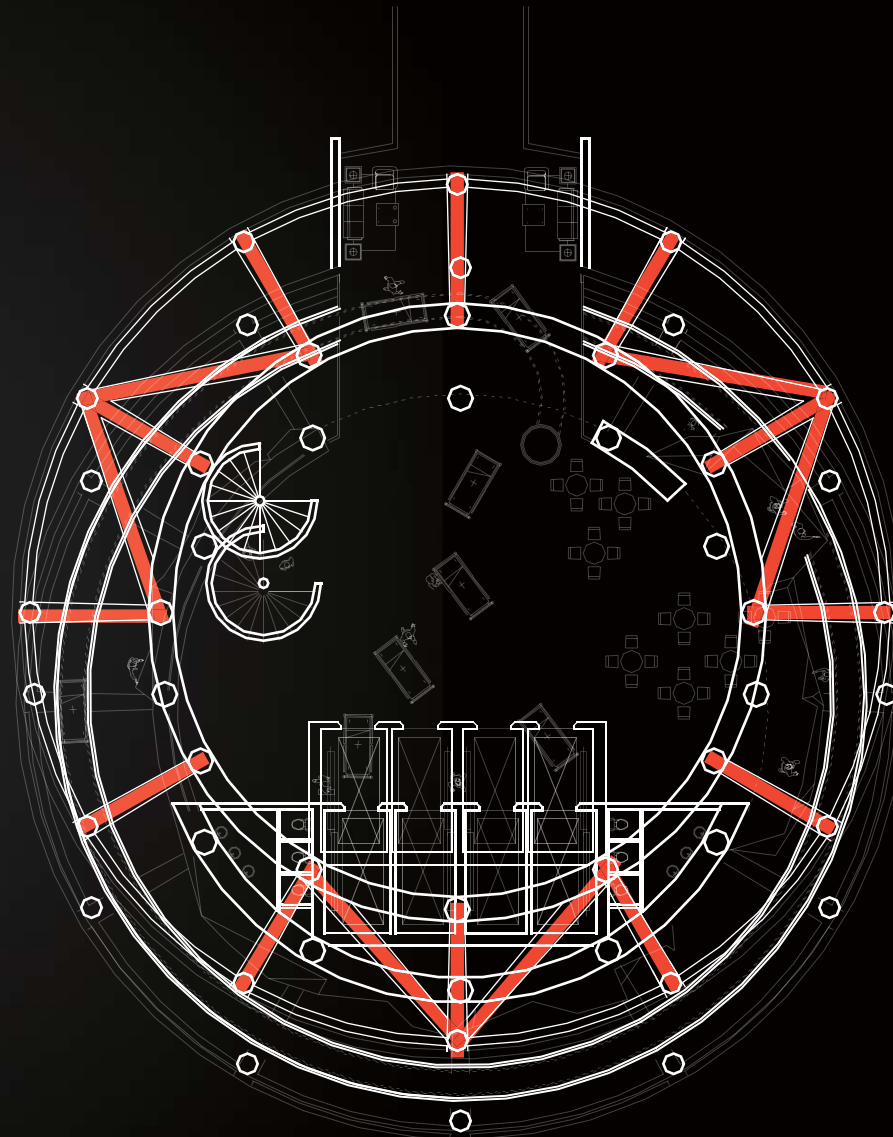
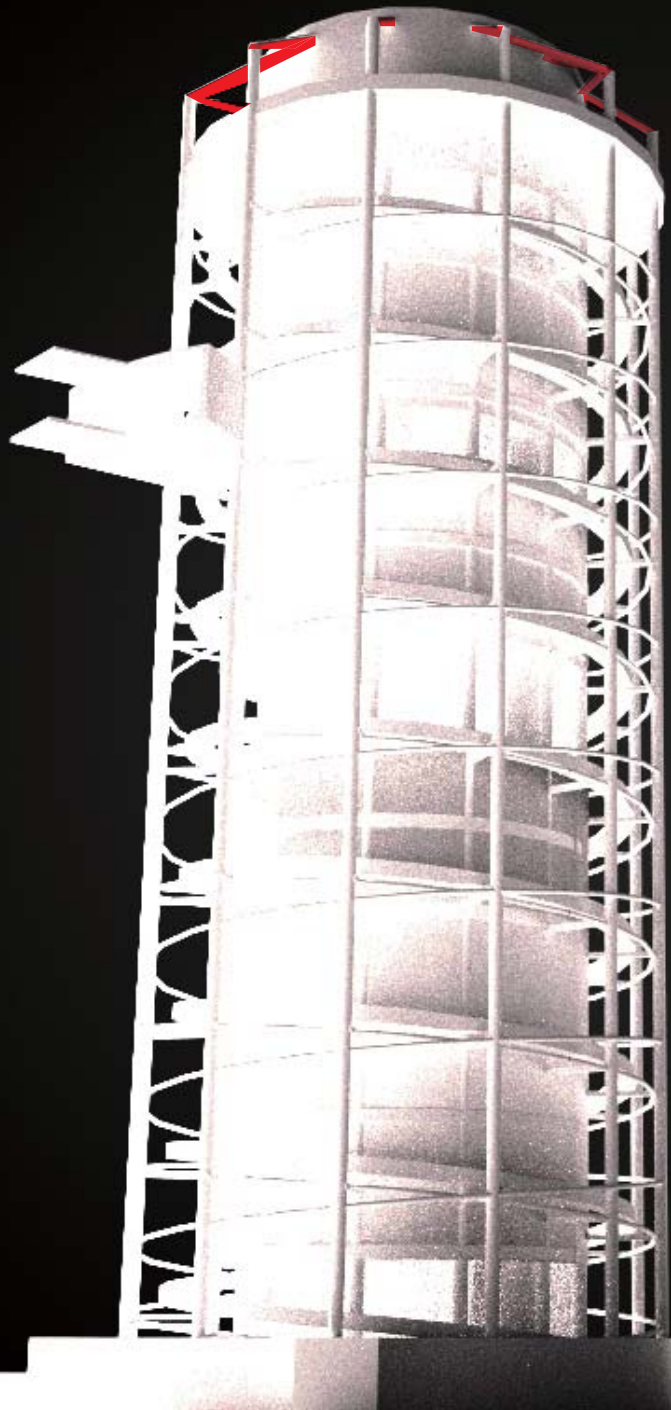


 Beam of ramp

Level 3



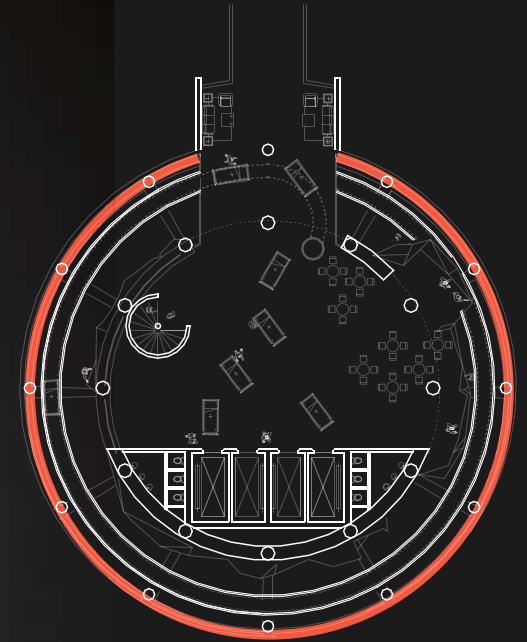
# Strcuture system



● Steel beam

Roof top

# Strcuture system

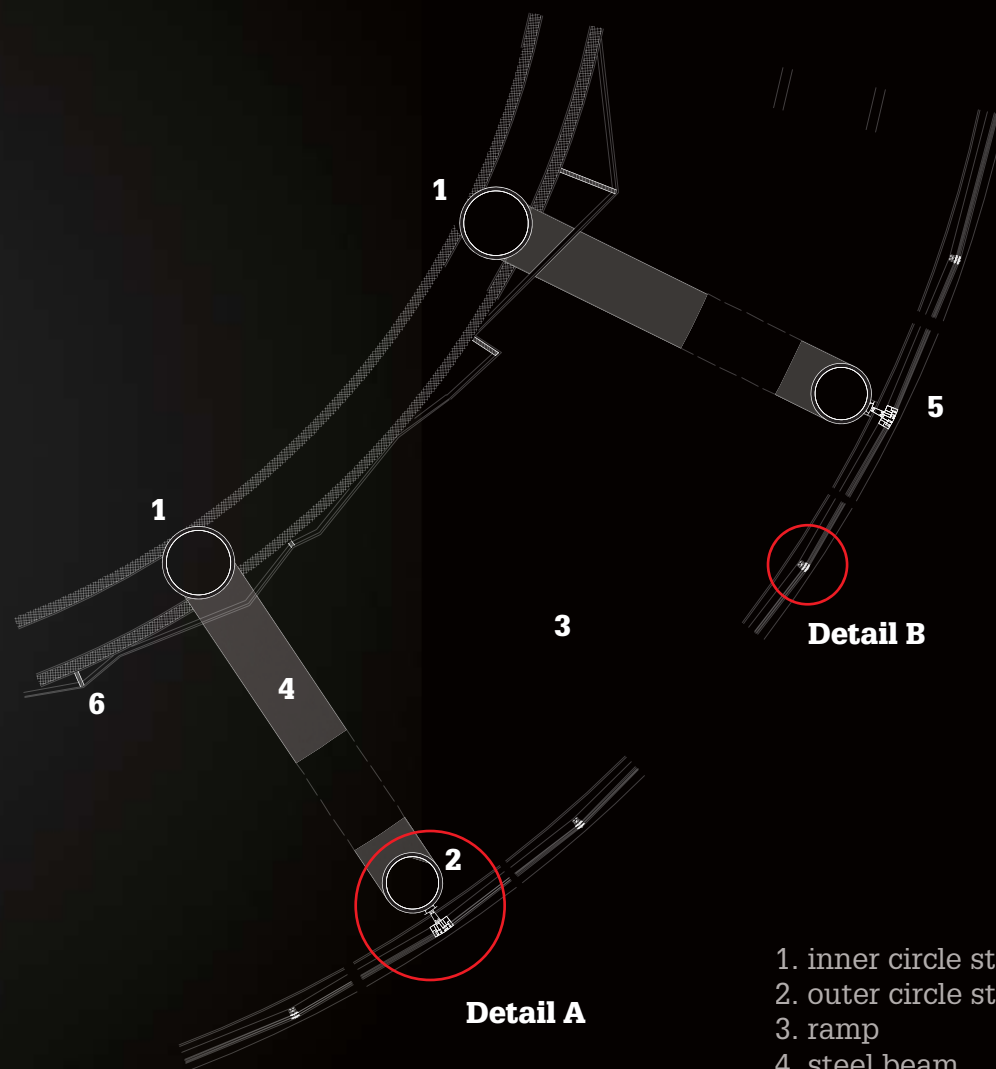
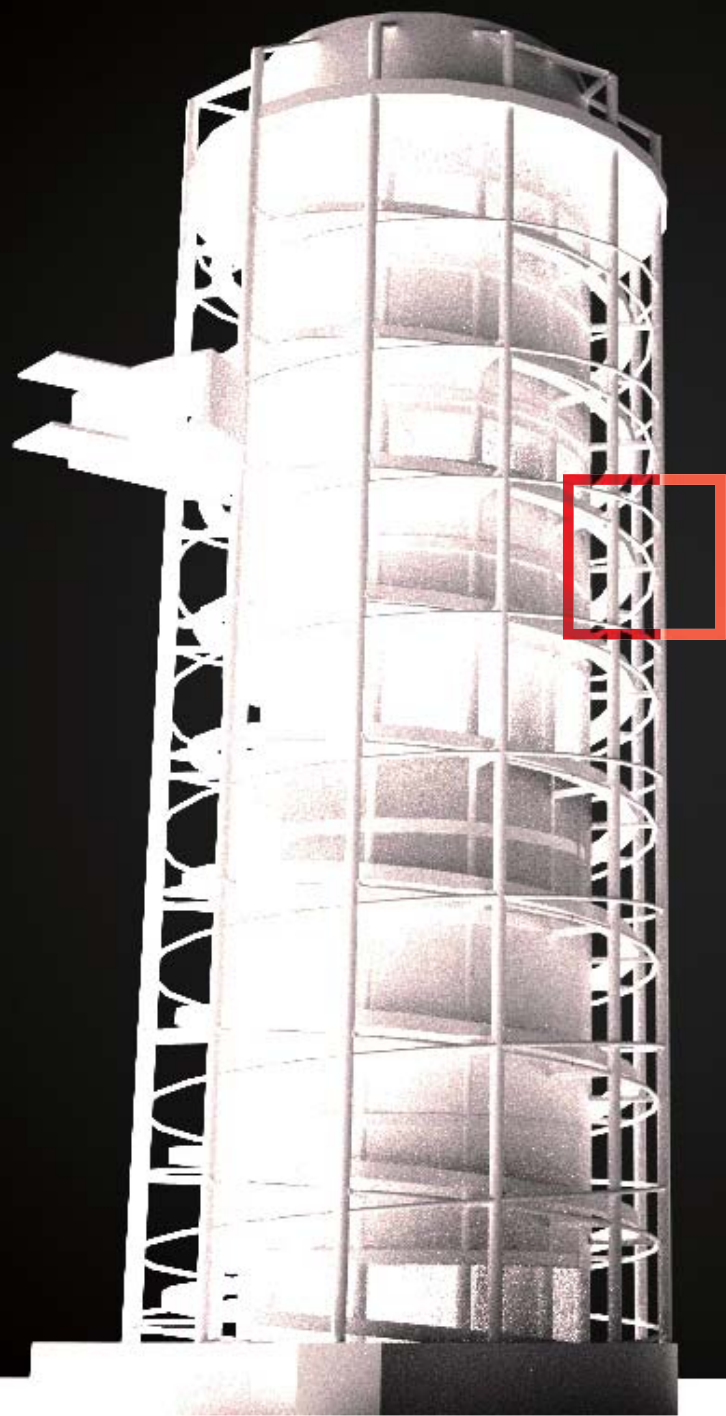


■ Beam of outer circle

Level 3

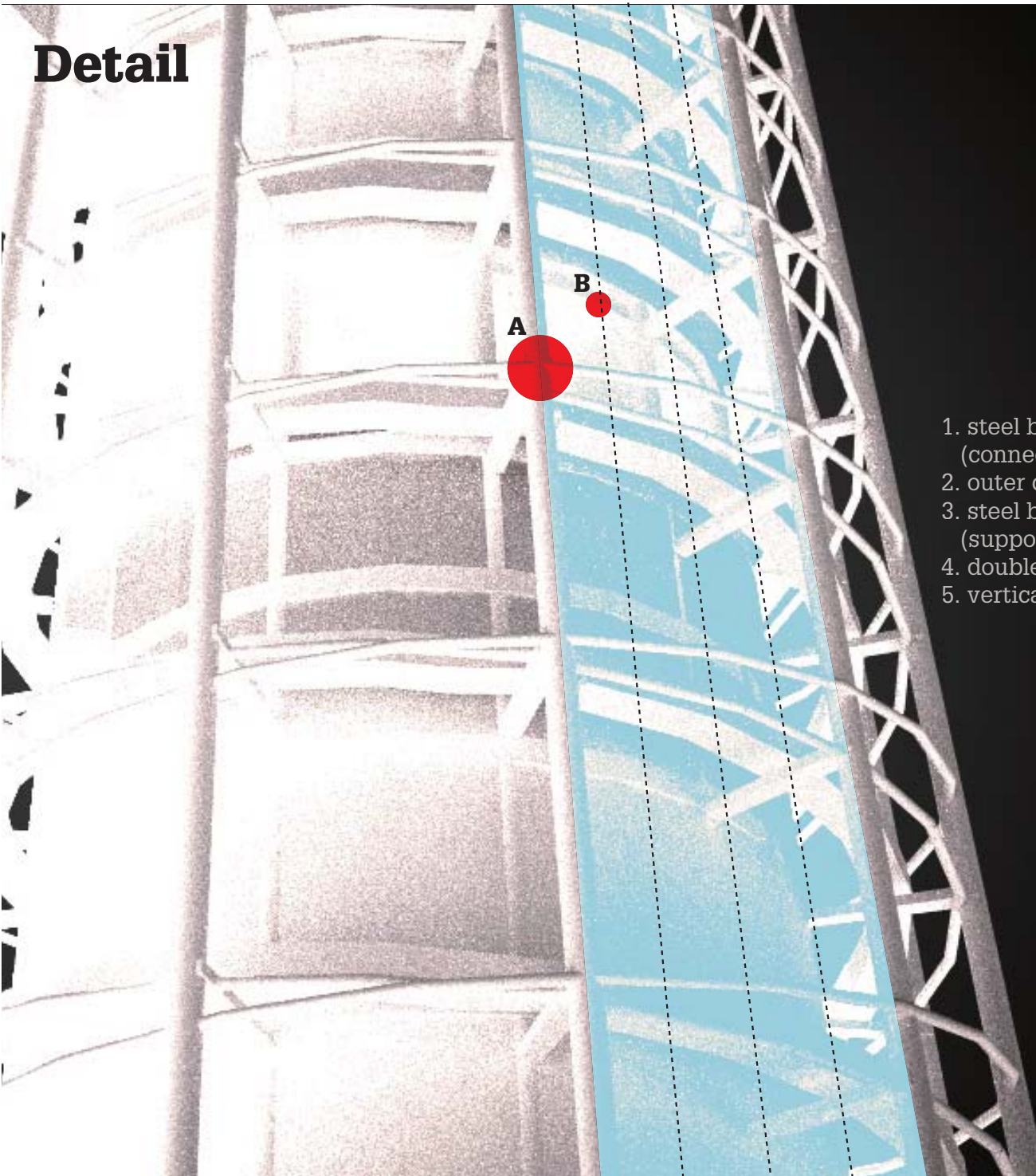


# Detail

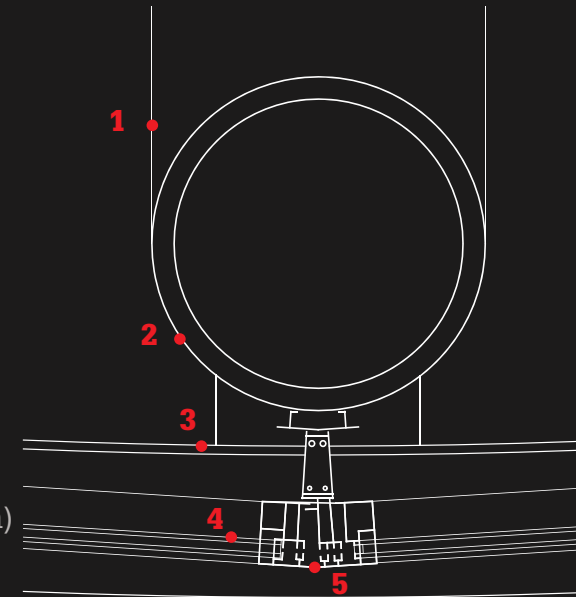


- 1. inner circle steel column
- 2. outer circle steel column
- 3. ramp
- 4. steel beam
- 5. curtain glazing system
- 6. climbing wall

# Detail

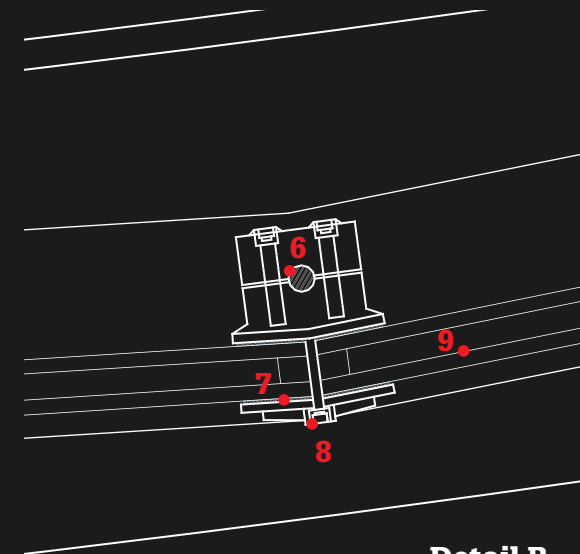


1. steel beam  
(connect inner and outer core)
2. outer circle steel column
3. steel beam  
(support curtain glazing system)
4. double glazing
5. vertical window frame



**Detail A**

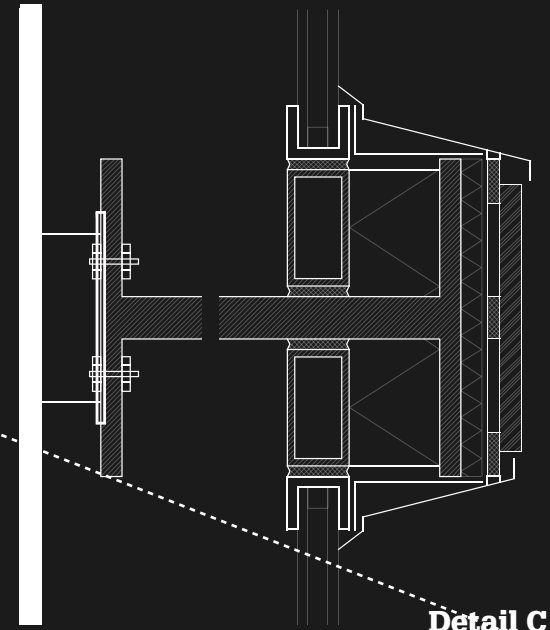
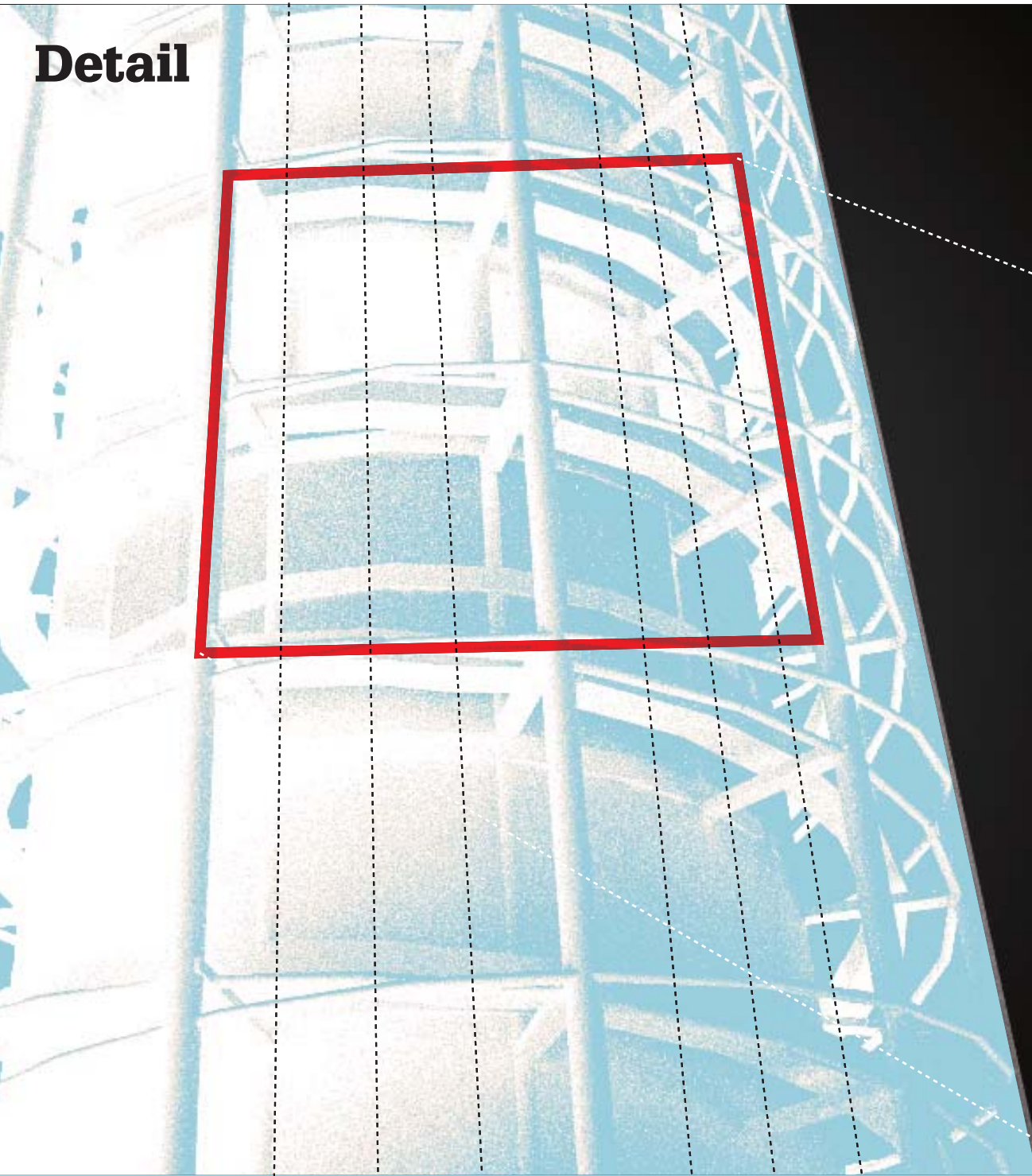
6. stainless steel rope  
22 mm dia
7. EPDM bearing
8. M10X20 screw
9. double glazing



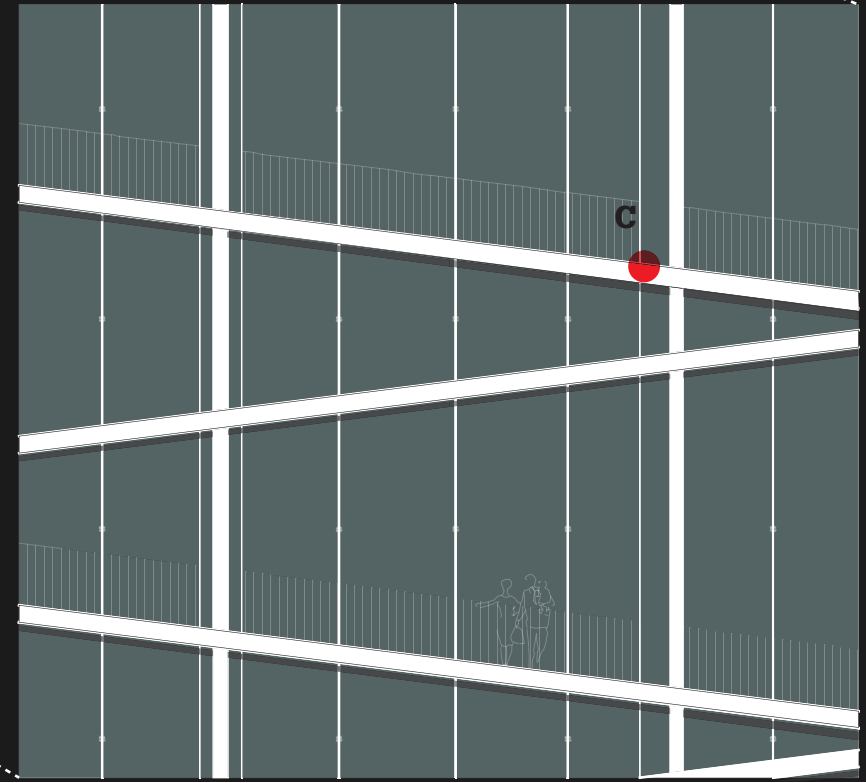
**Detail B**



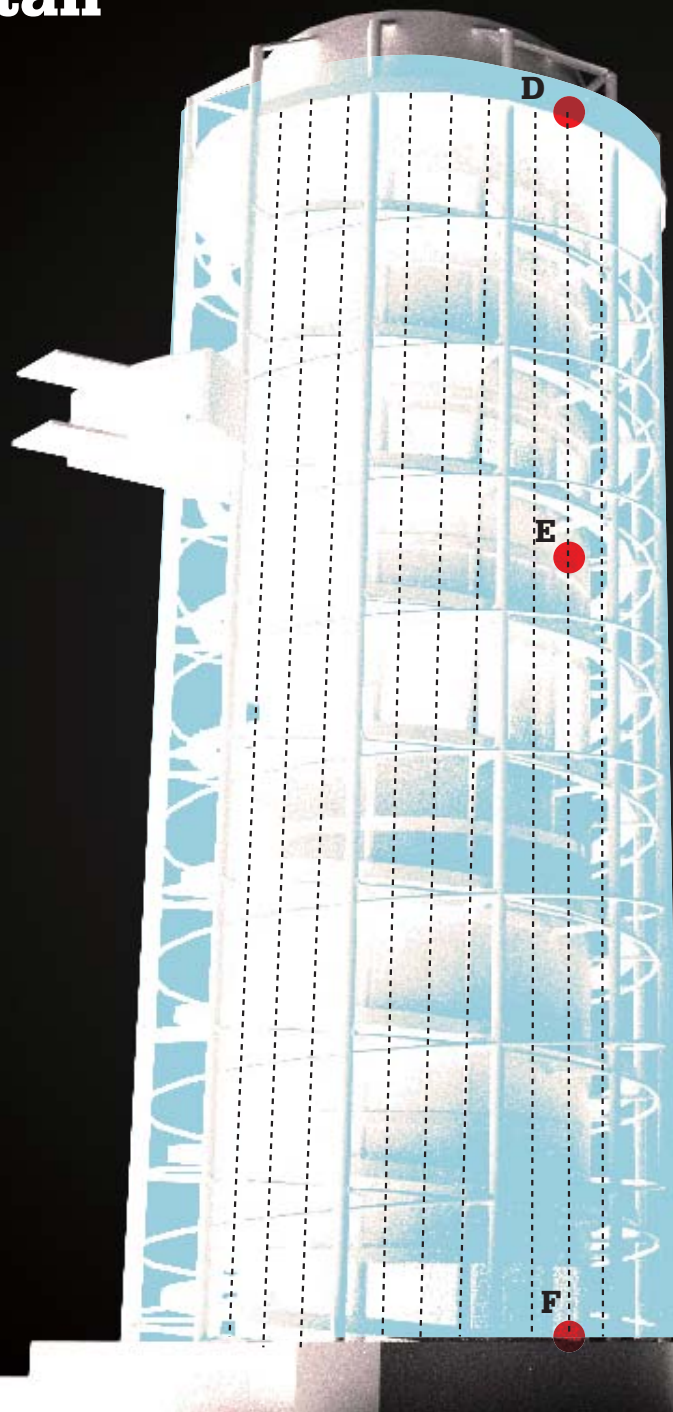
# Detail



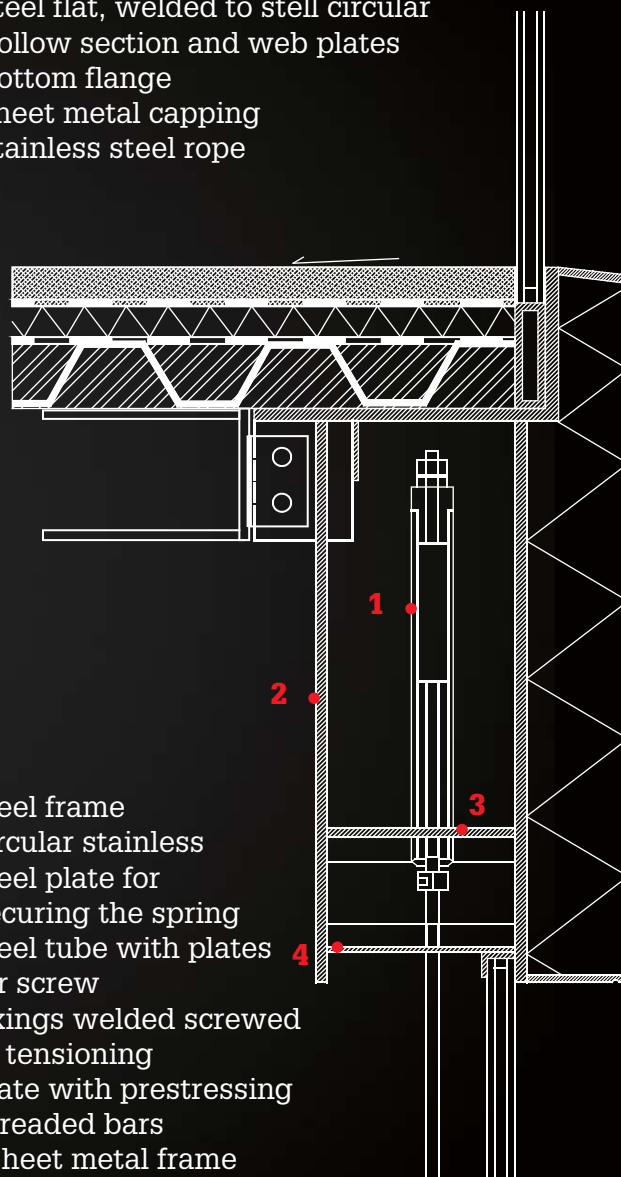
Detail C



# Detail

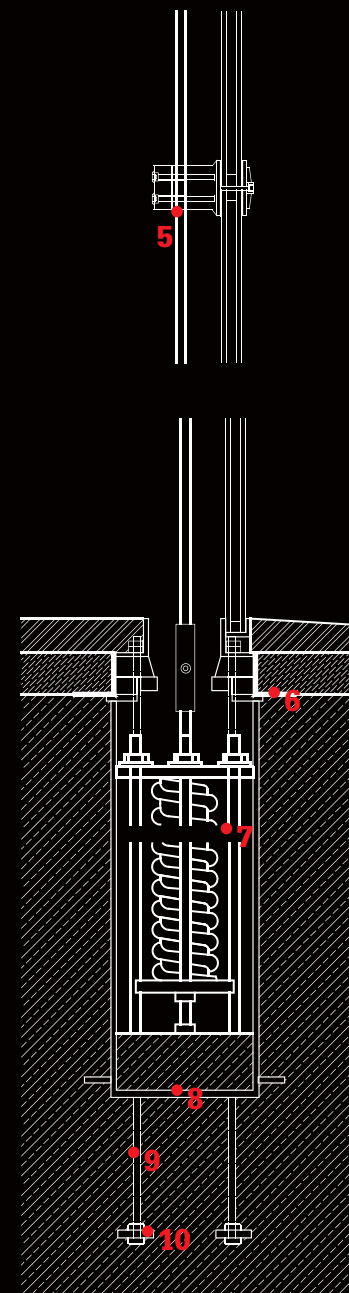


1. steel circular hollow section  
70 dia X10 mm, with EPDM  
ring inside
2. steel flat, welded to stell circular  
hollow section and web plates
3. bottom flange
4. sheet metal capping
5. stainless steel rope



**Detail D**

6. steel frame
7. circular stainless  
steel plate for  
securing the spring
8. steel tube with plates  
for screw  
fixings welded screwed  
to tensioning  
plate with prestressing
9. threaded bars
10. sheet metal frame



**Detail E**

**Detail F**



# Materialization

## Level 3

From Bellevue Hospital

Diesel tank

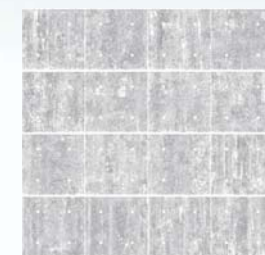
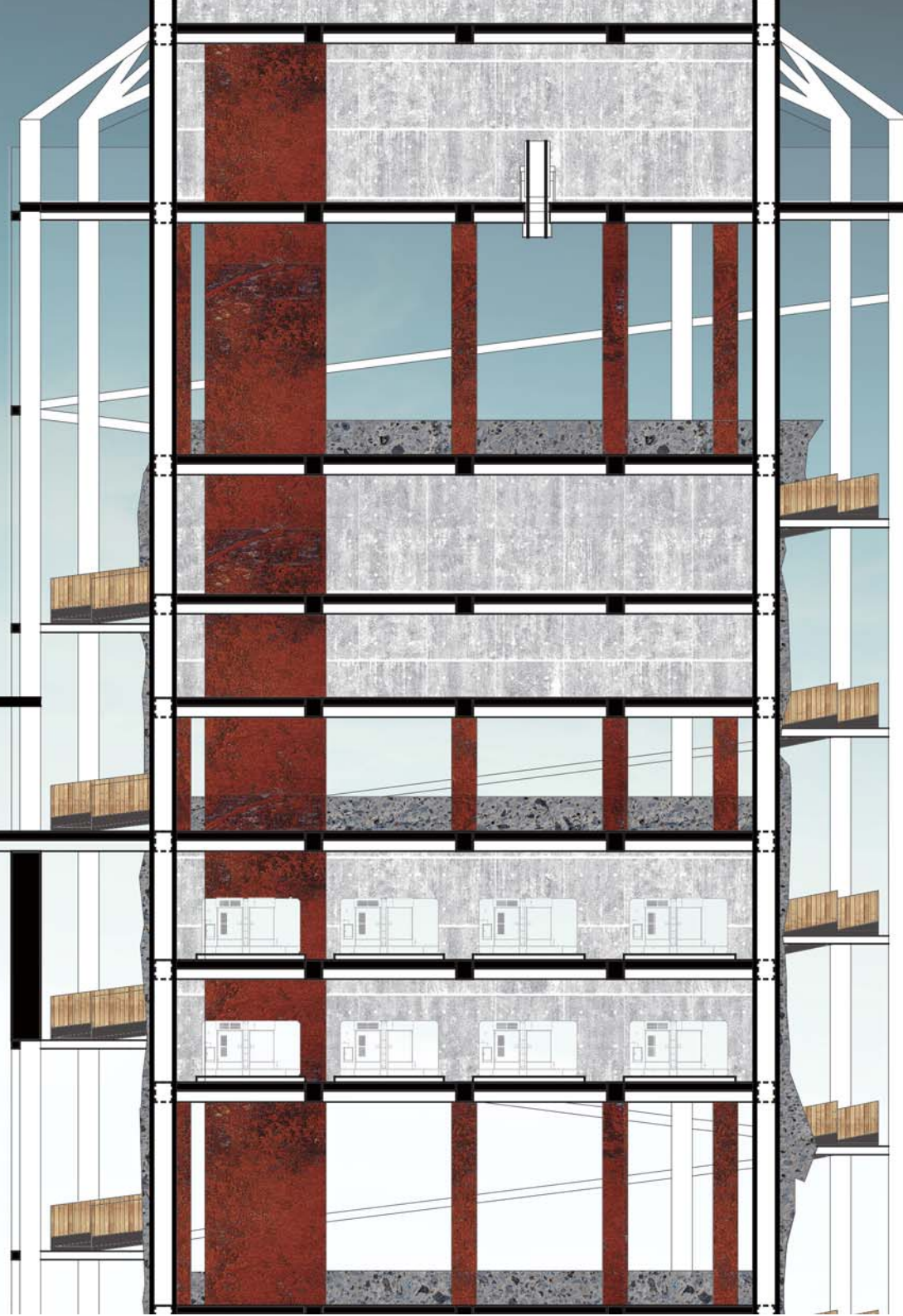
## Level 2

From VA Hospital

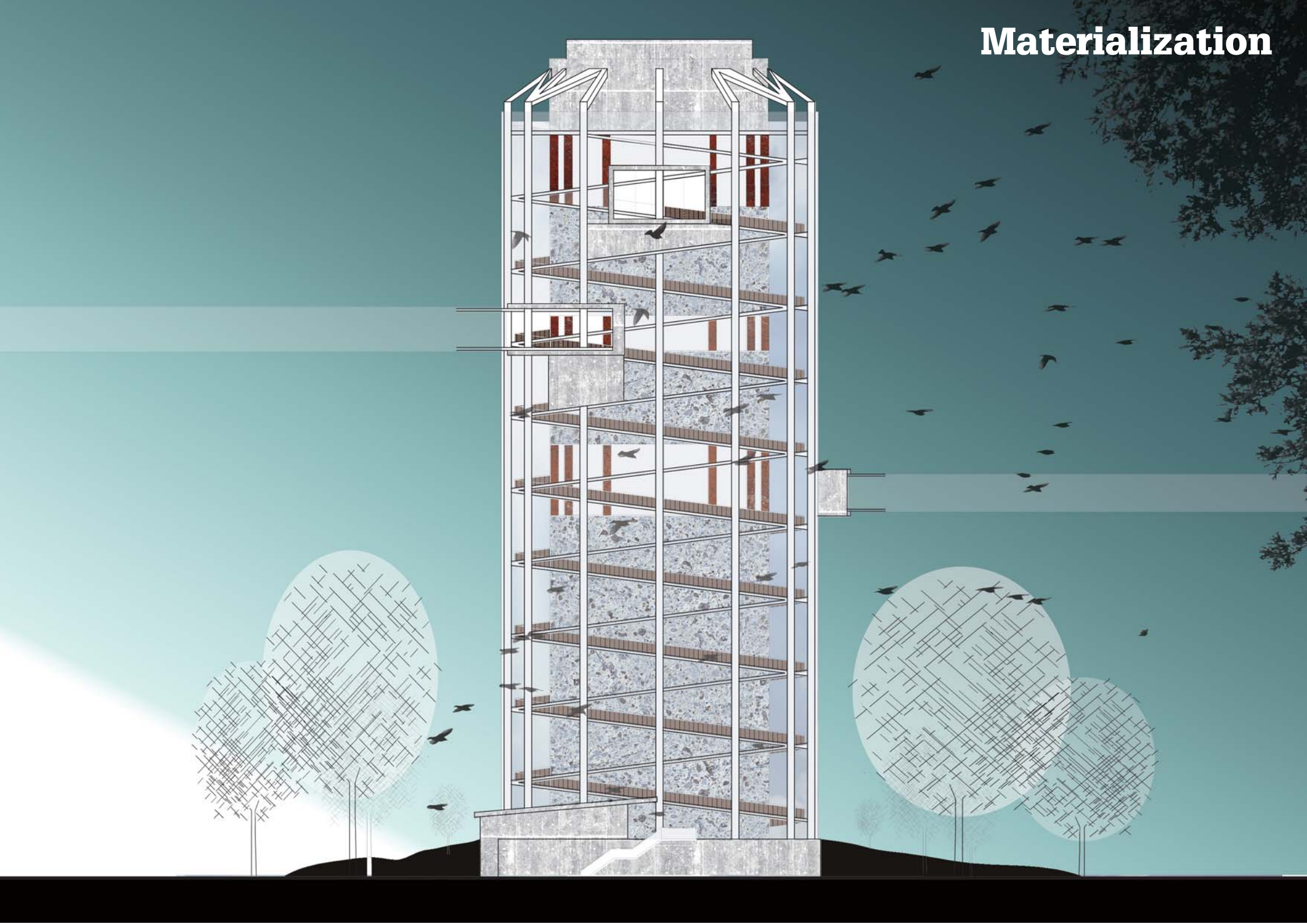
Generators

## Level 1

From NYU Medical Centre



# Materialization

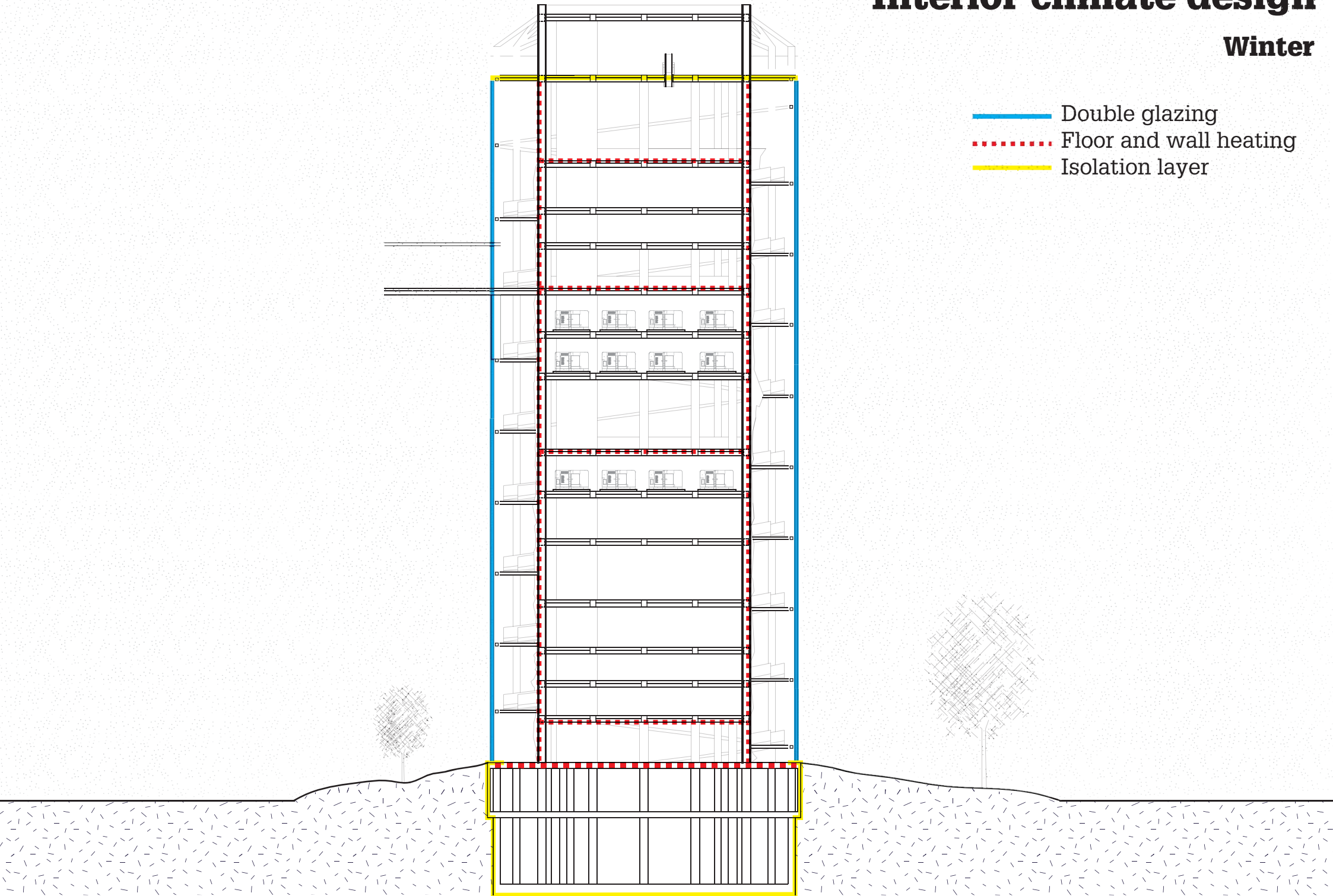




# Interior climate design

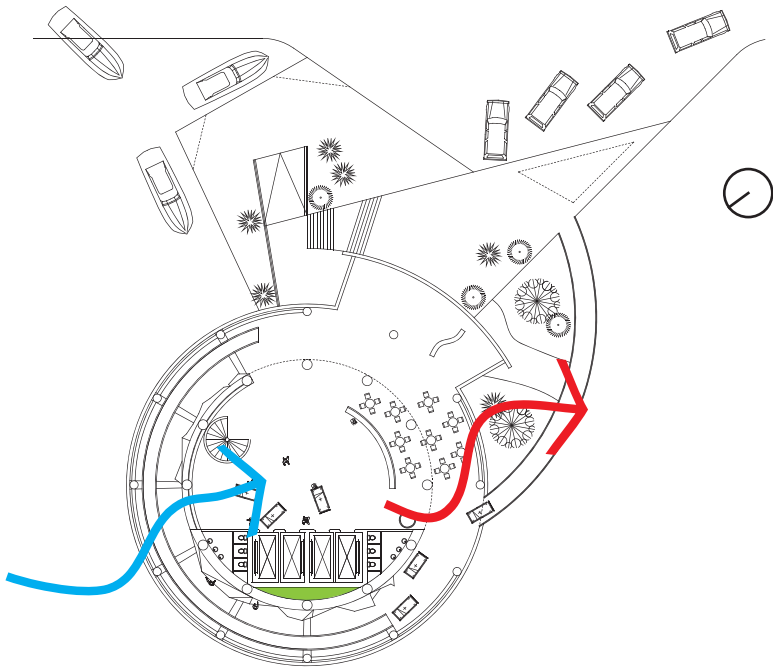
Winter

- Double glazing
- Floor and wall heating
- Isolation layer



# Interior climate design

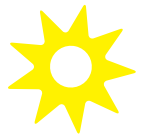
Summer



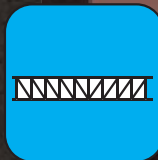
North side



South side



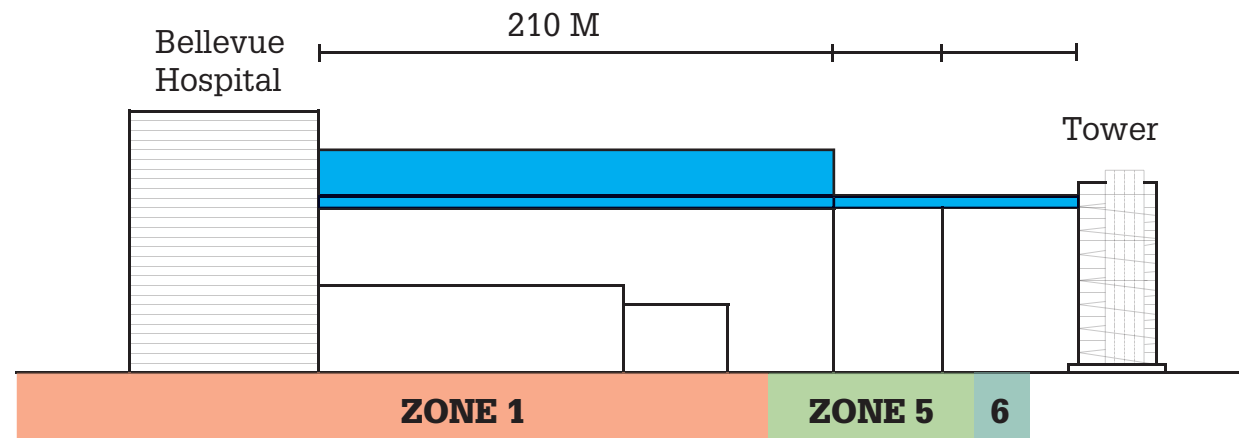
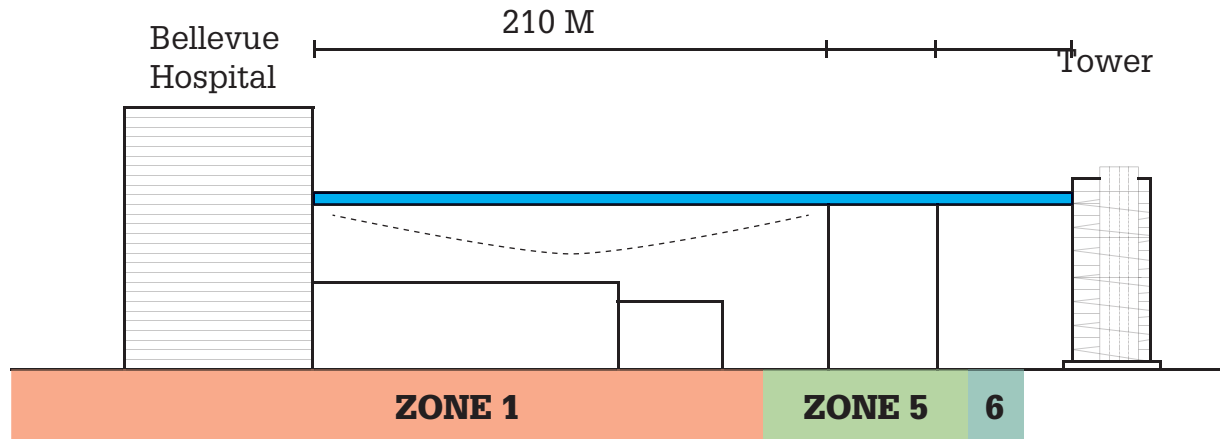
Bellevue  
Hospital



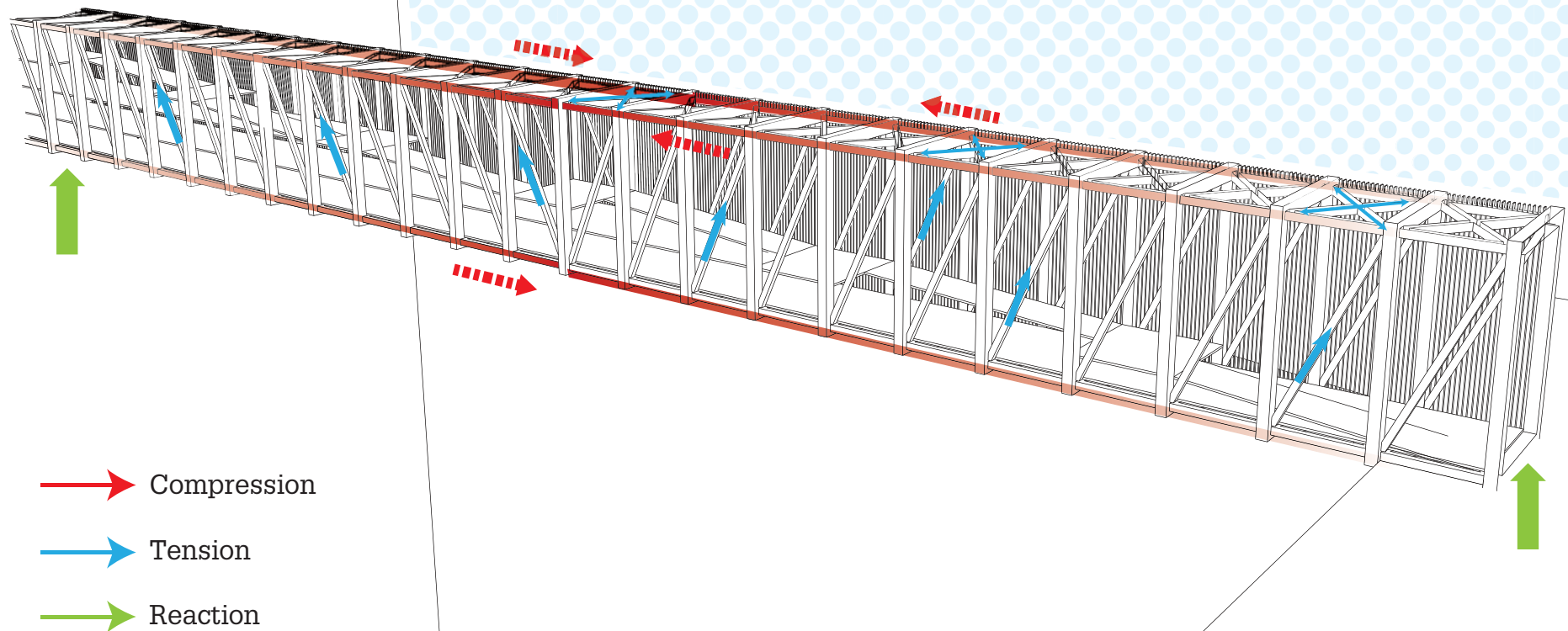
**SPEED**

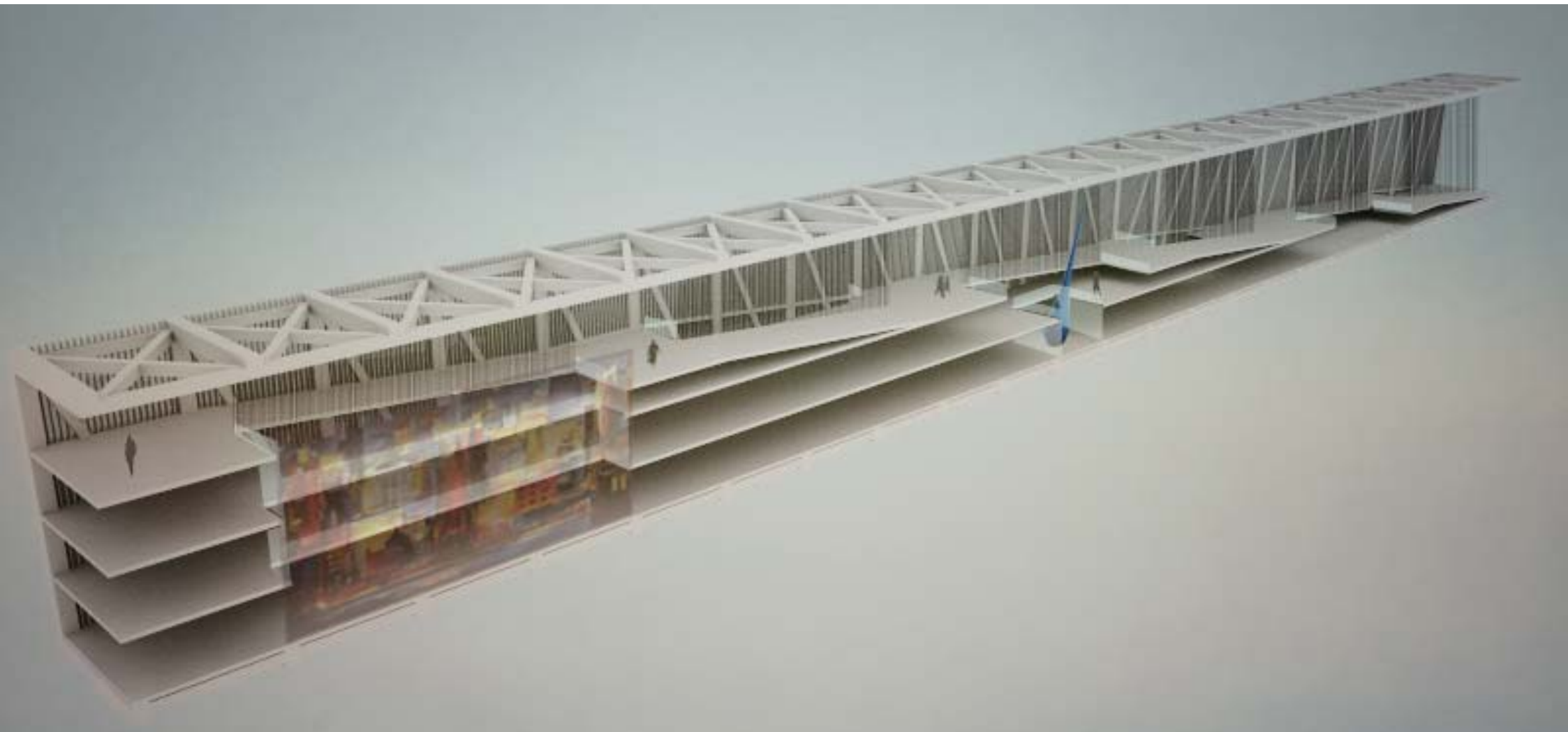
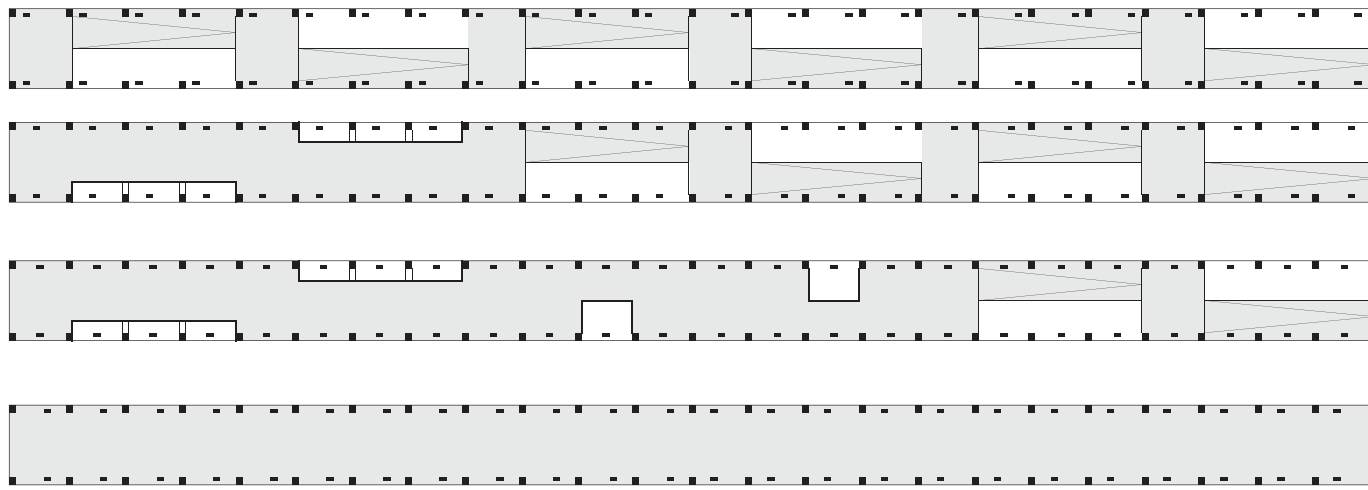


# Concept

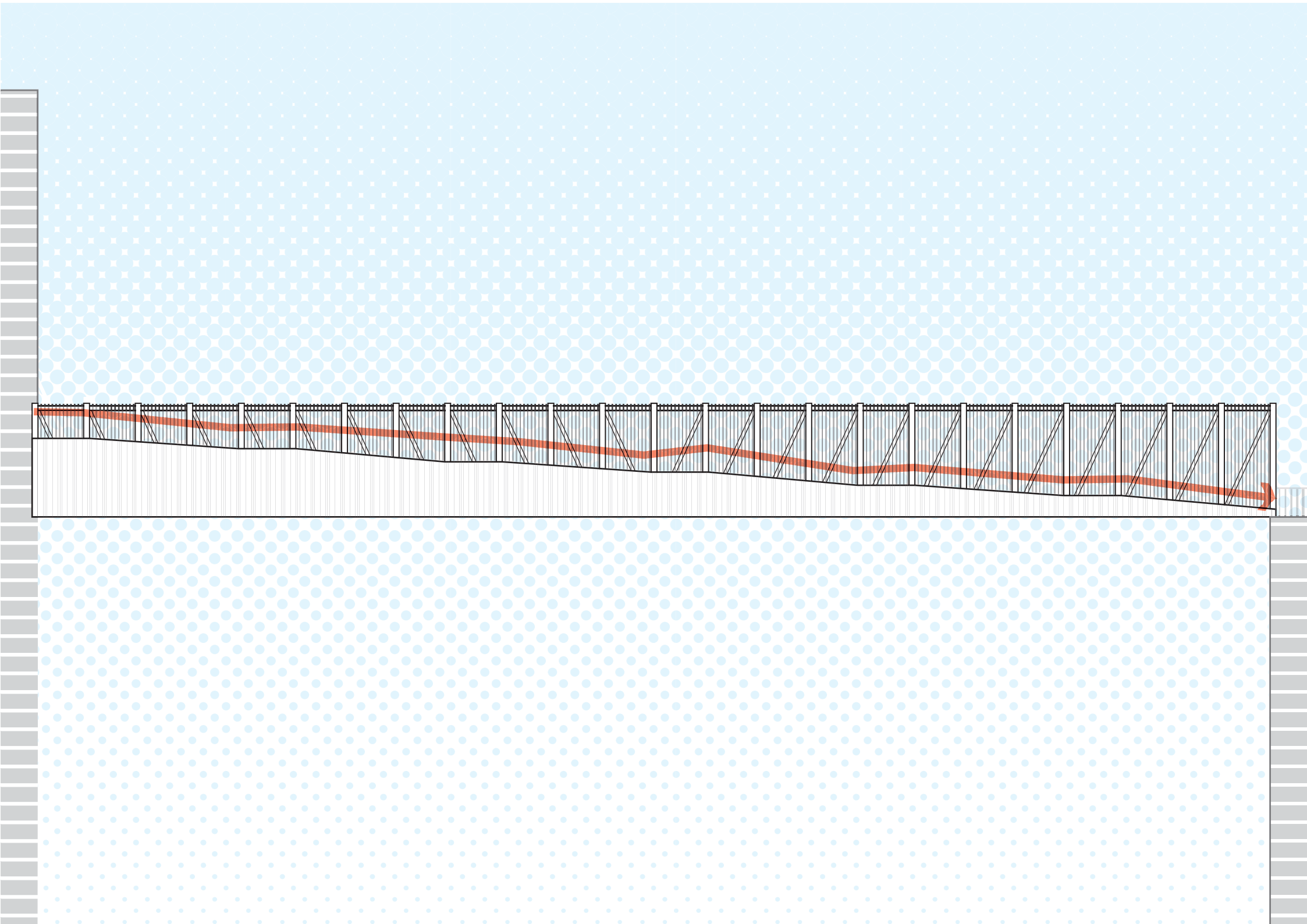


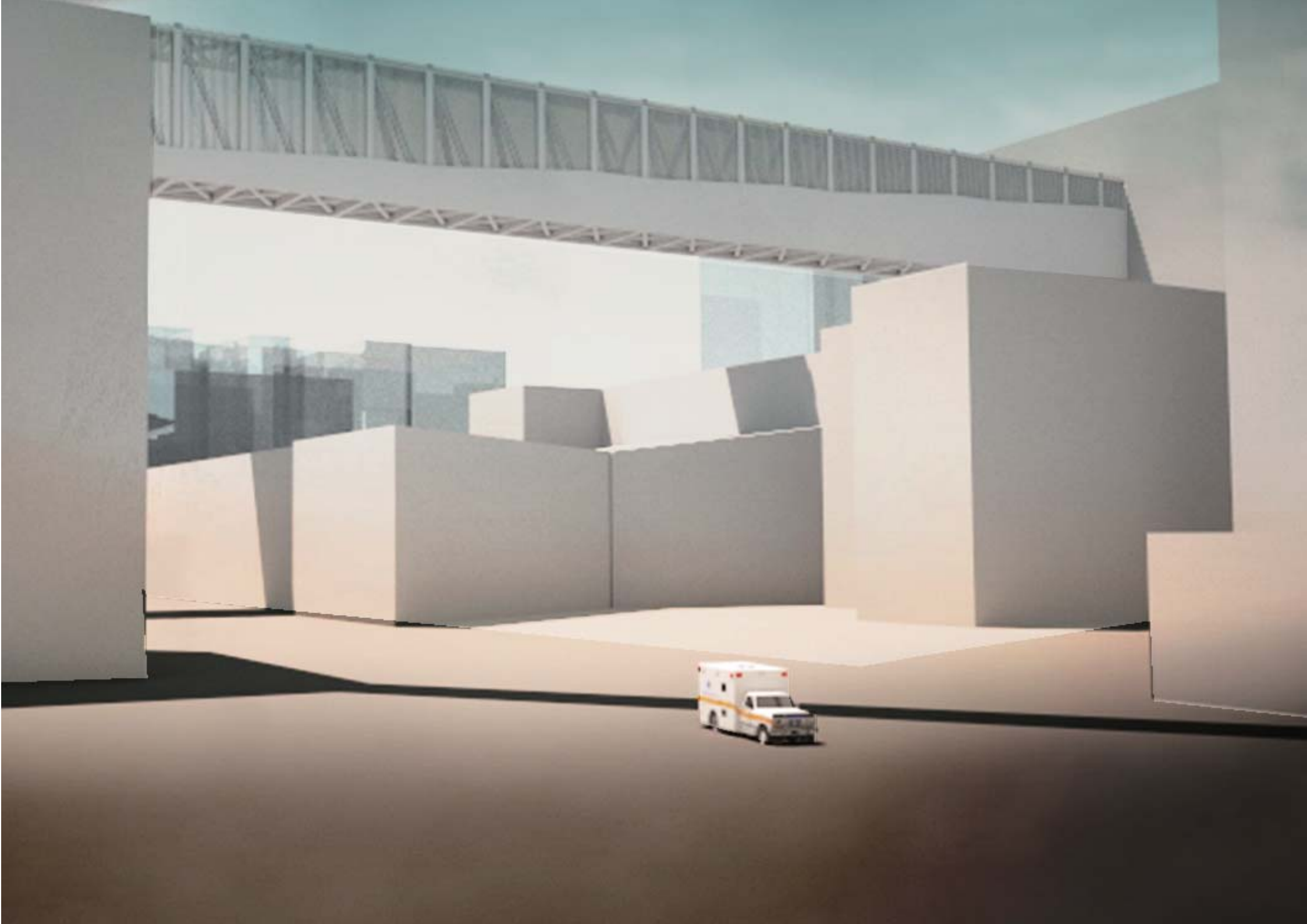
# Structure System

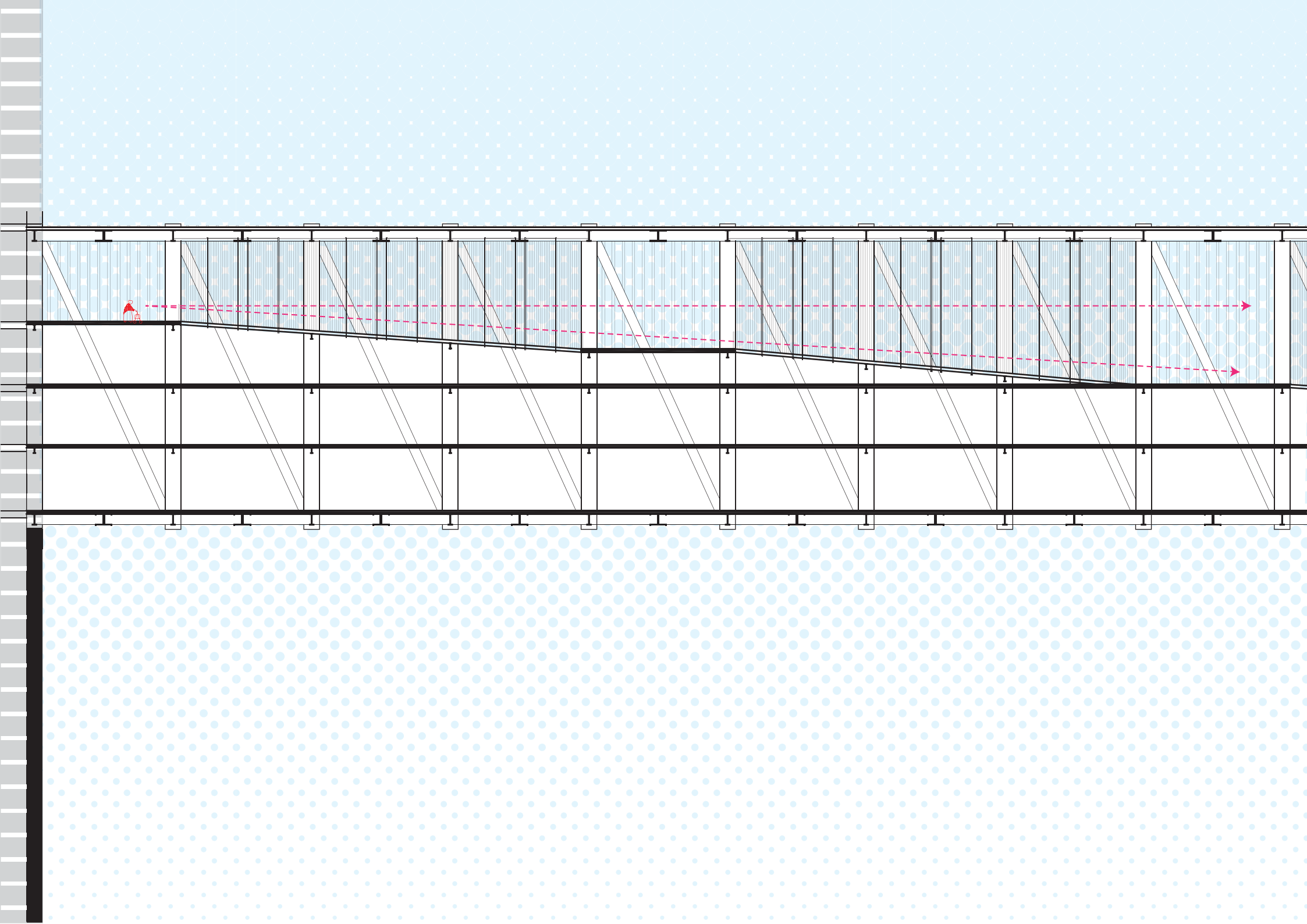




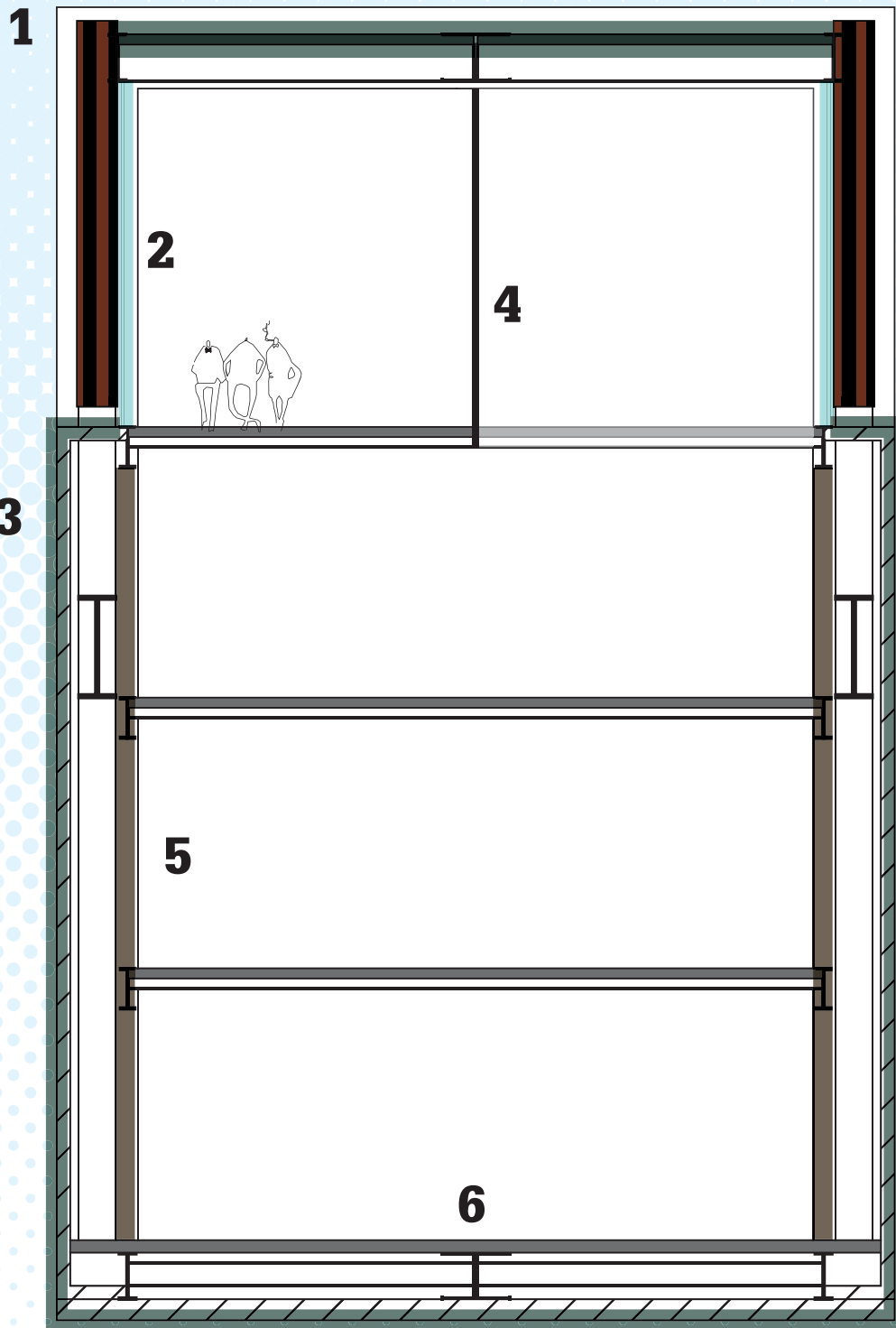












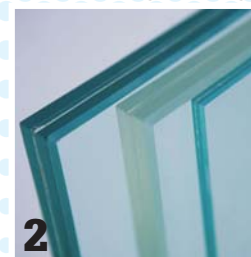
self-regulation  
window



Wooden  
sun shading



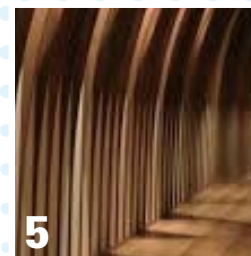
Double  
glazing



Metal  
panel



Rope  
hanging  
system



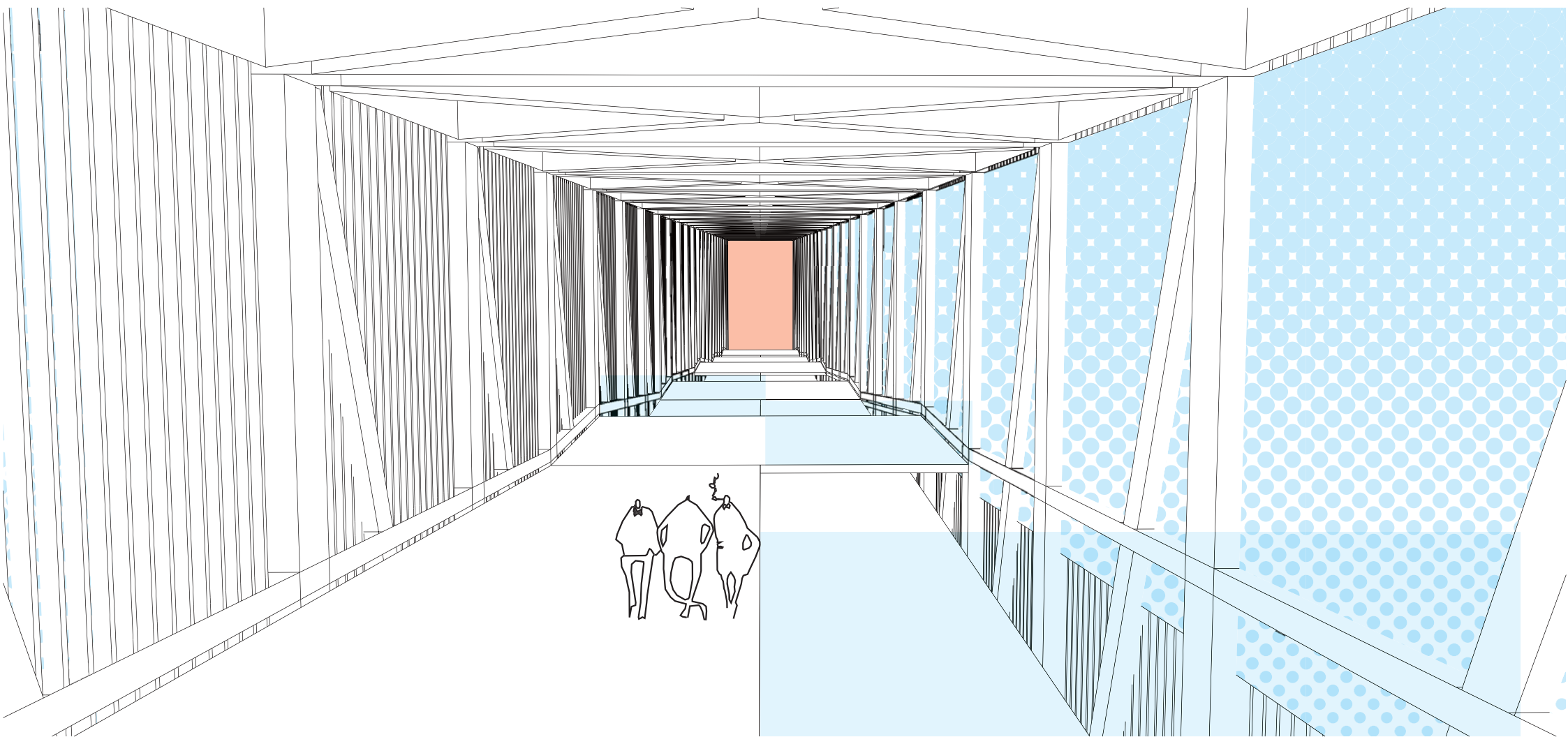
Interior  
sound  
isolation



Concrete  
floor



# Fascination





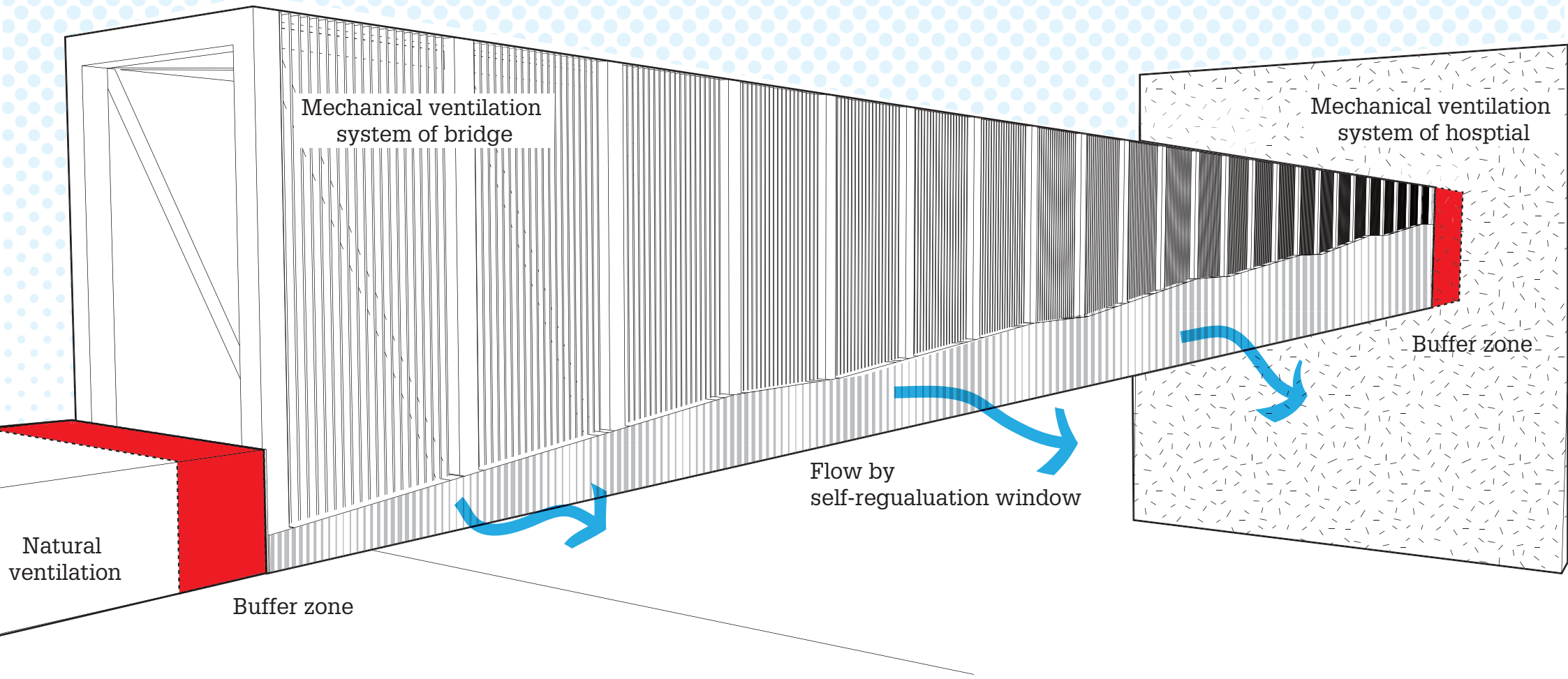
**Urgent situation**



**Daily situation**



# Interior Climate System

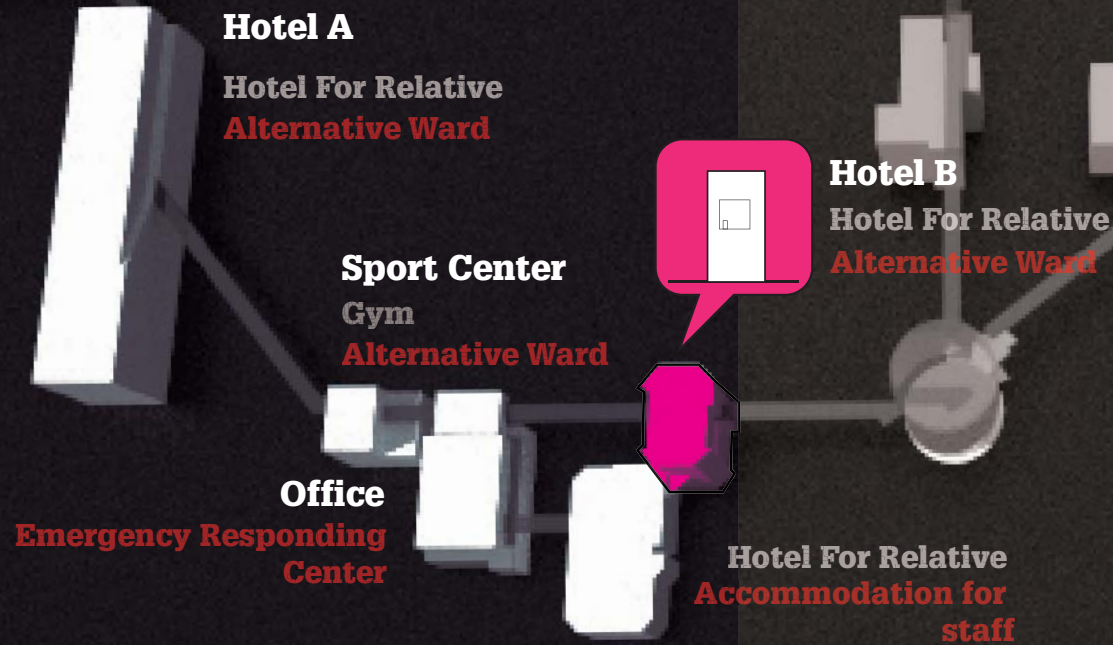




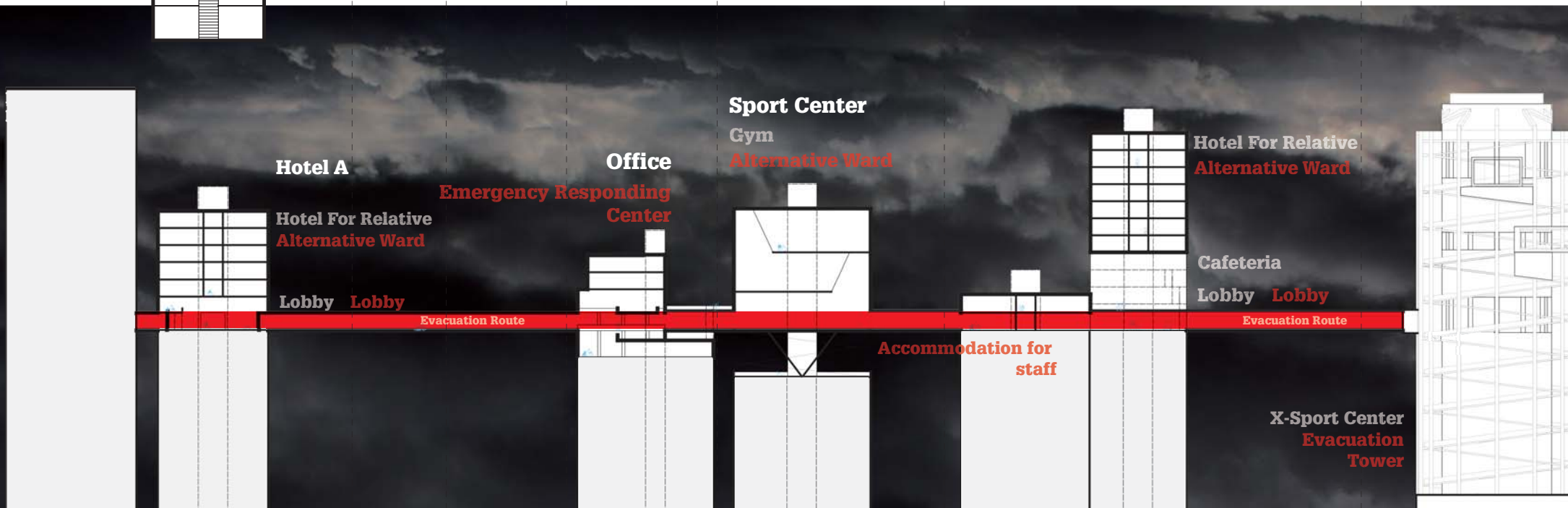
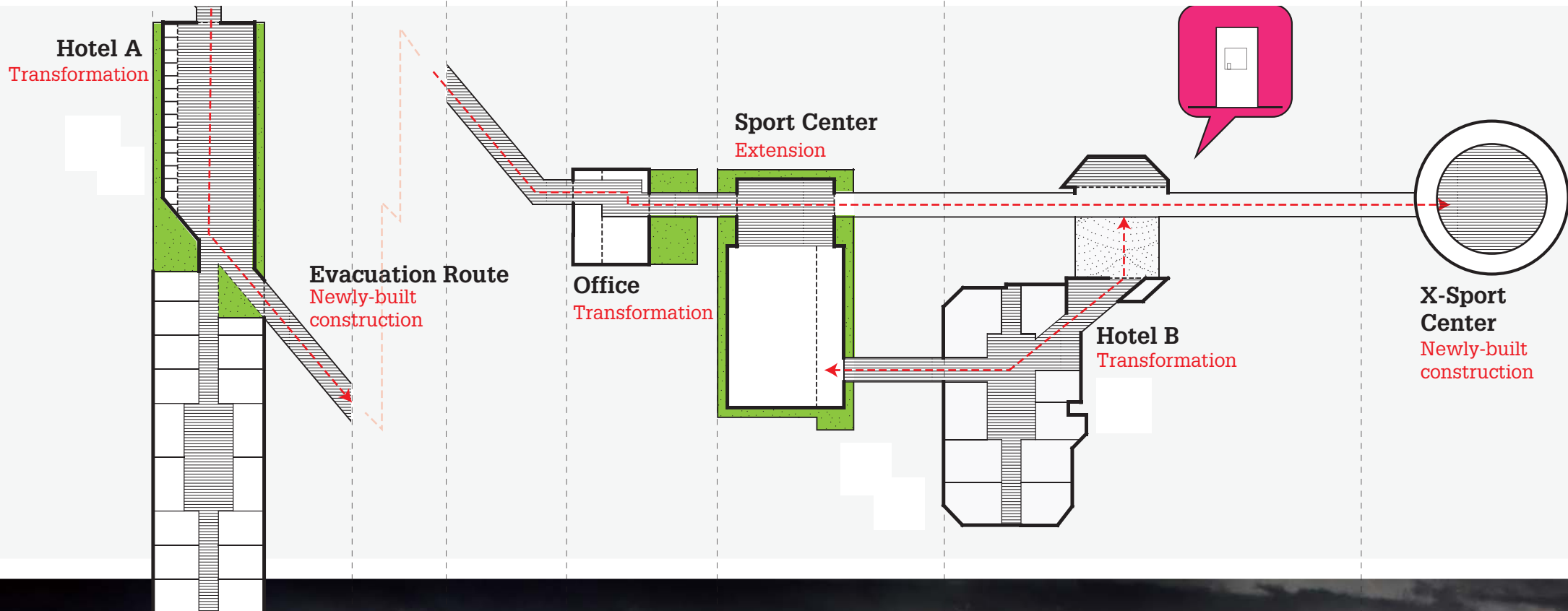
# SERVICE

- Hotel A // Alternative ward
- Hotel B // Alternative ward
- Sport Center // Alternative Ward
- Office // Emergency Responding Center

NYU Langone  
Medical Center



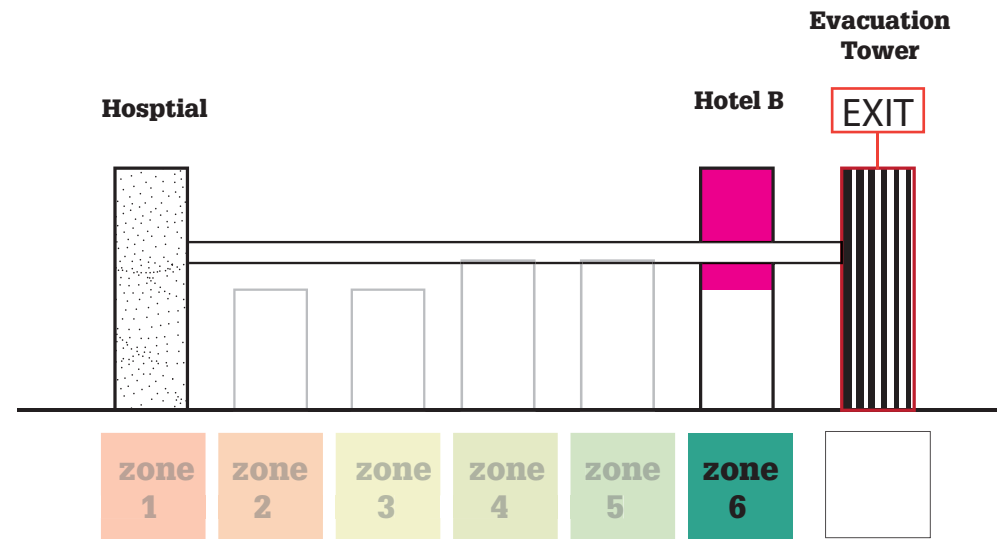
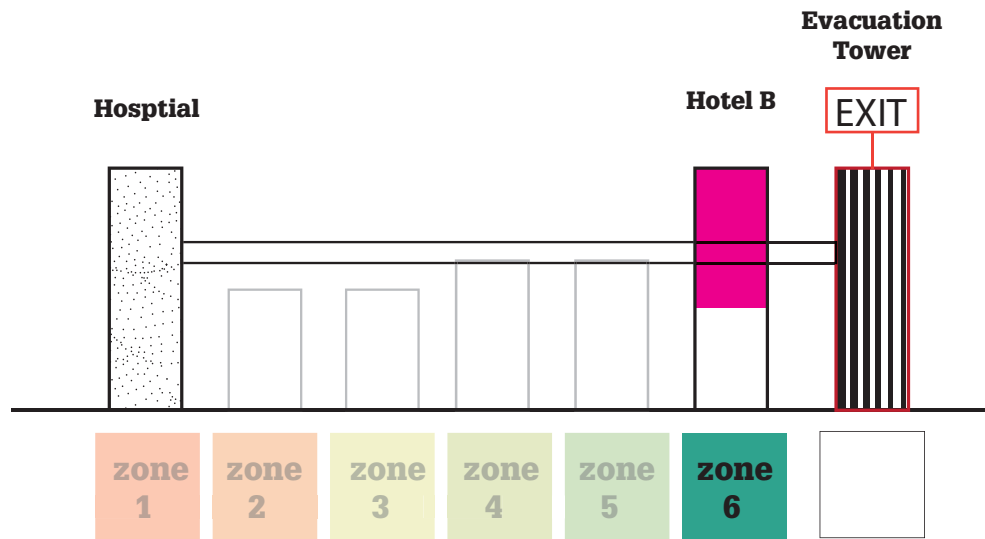




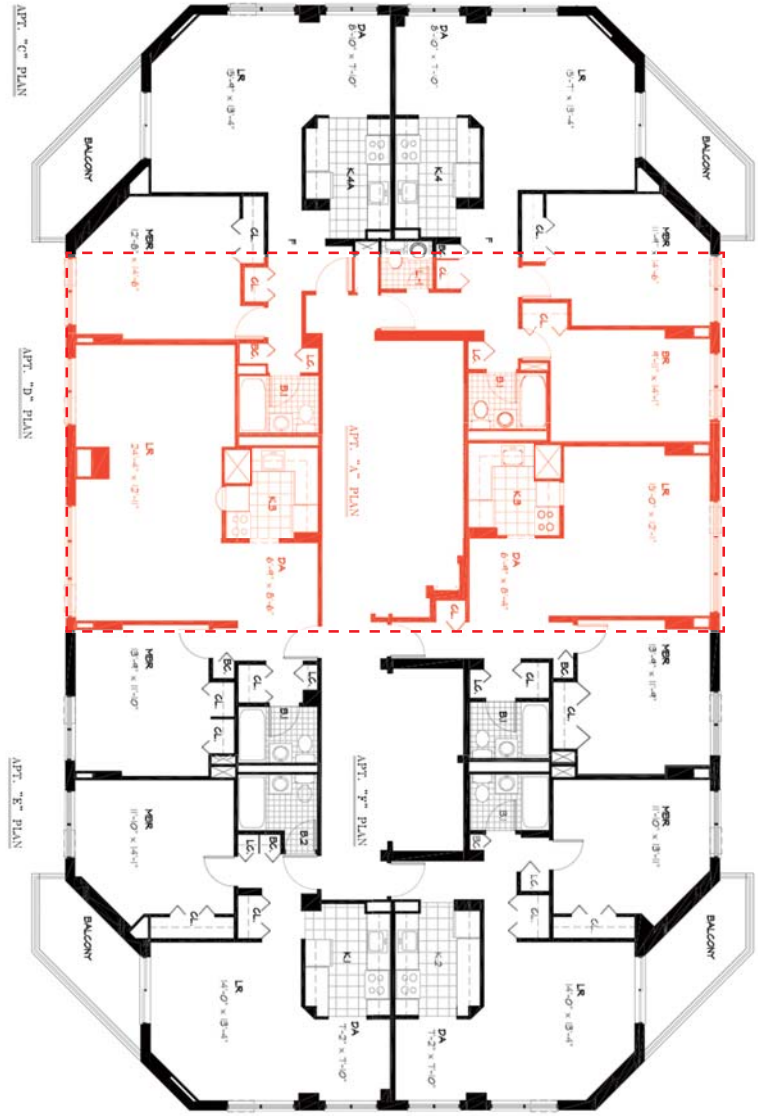
ZONE 1

ZONE 6

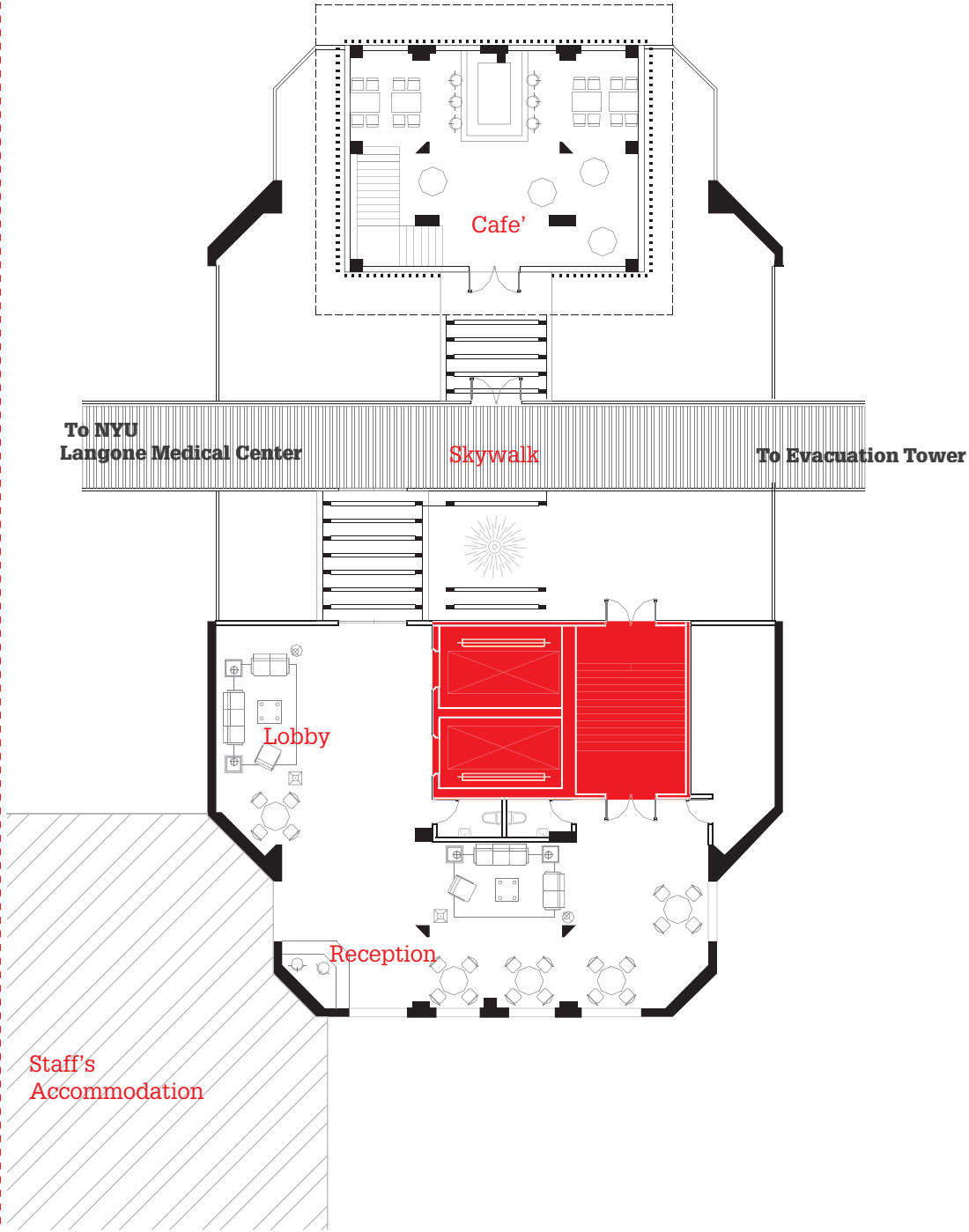
SAFE ZONE



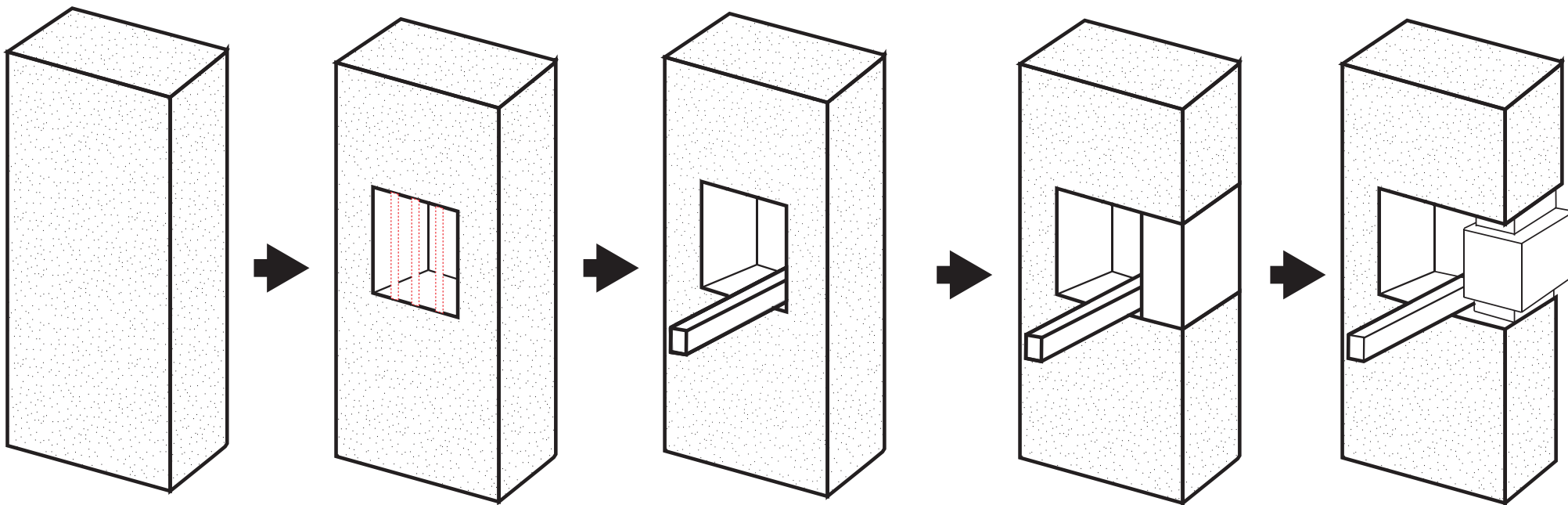
Before



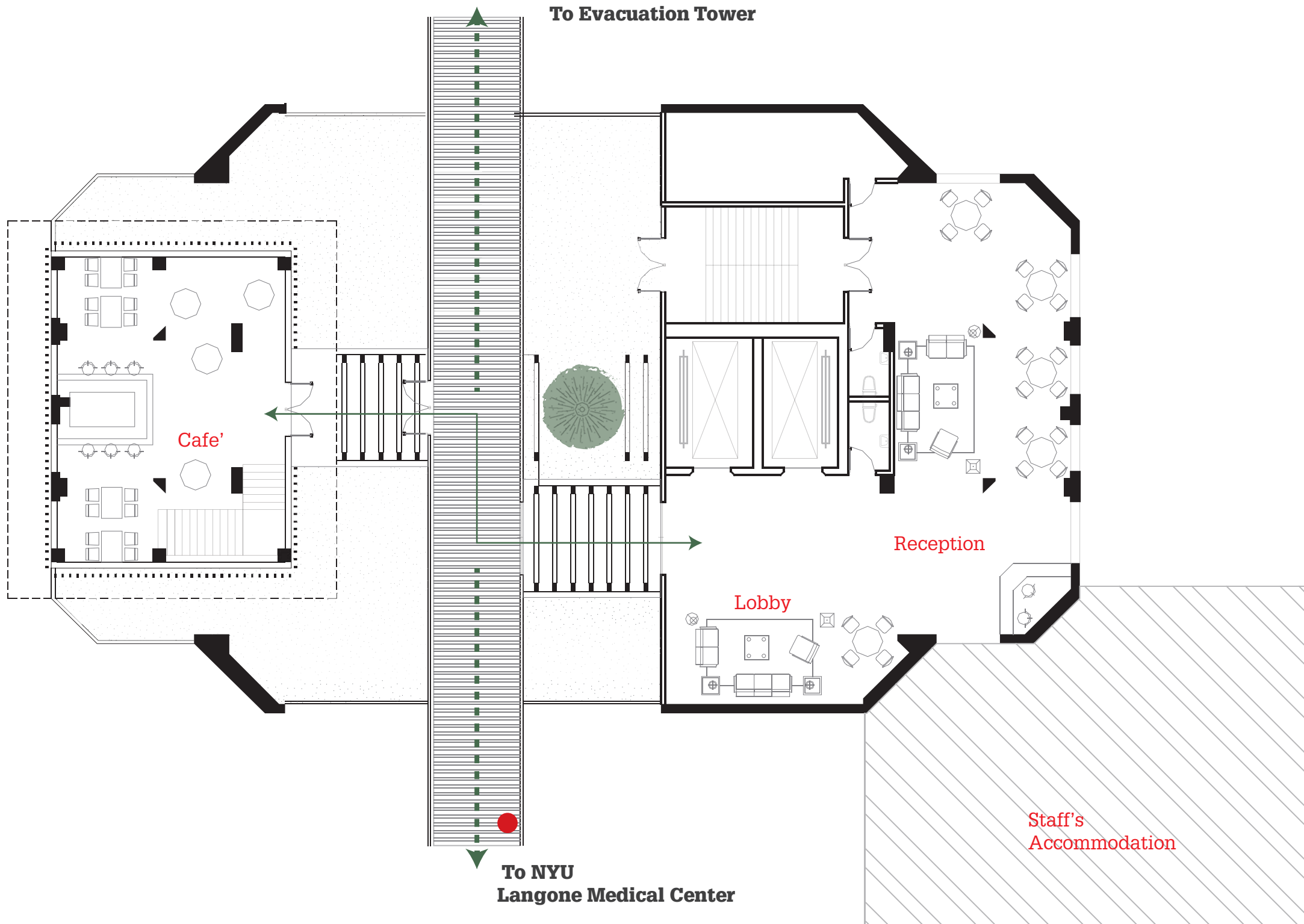
After





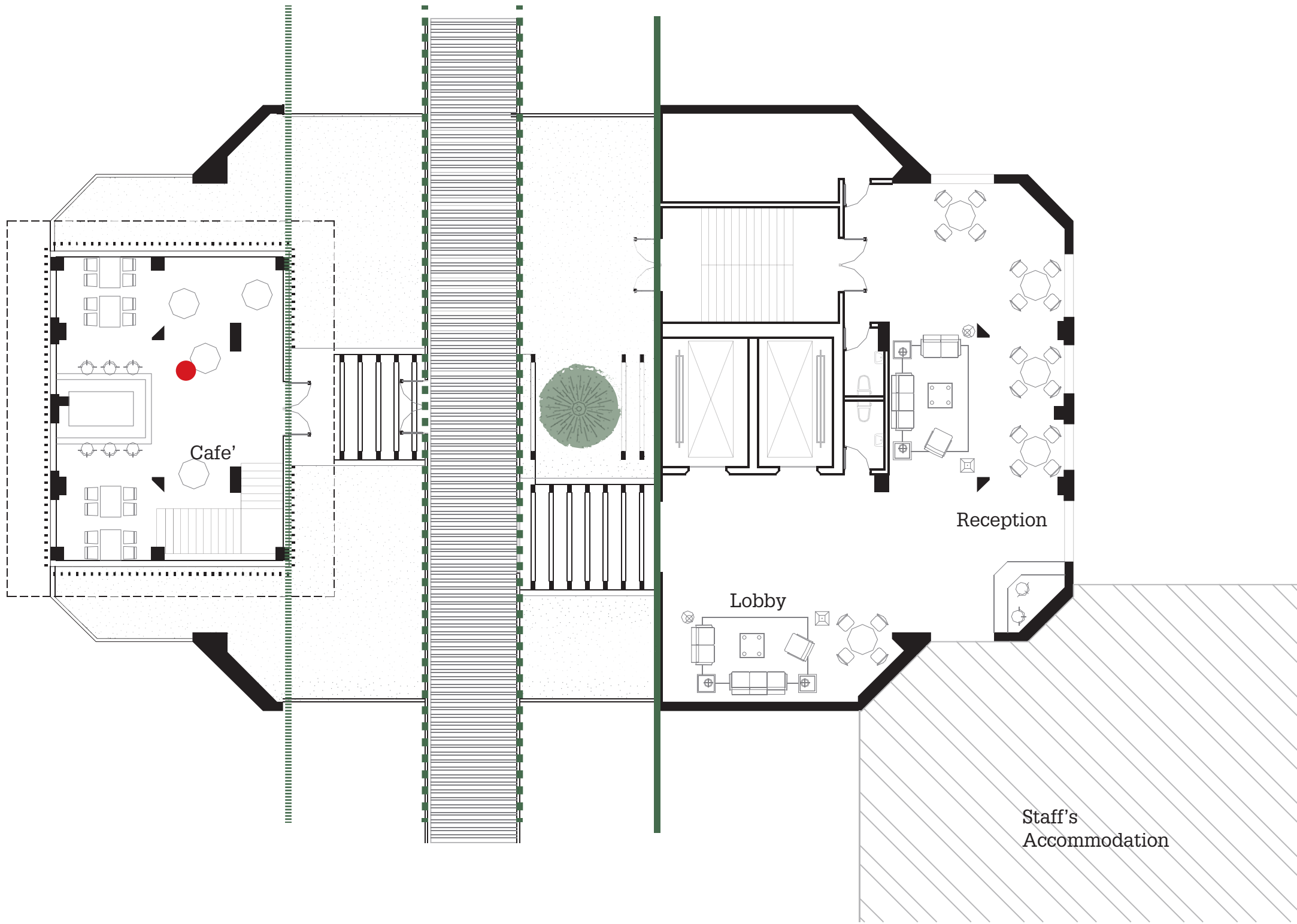








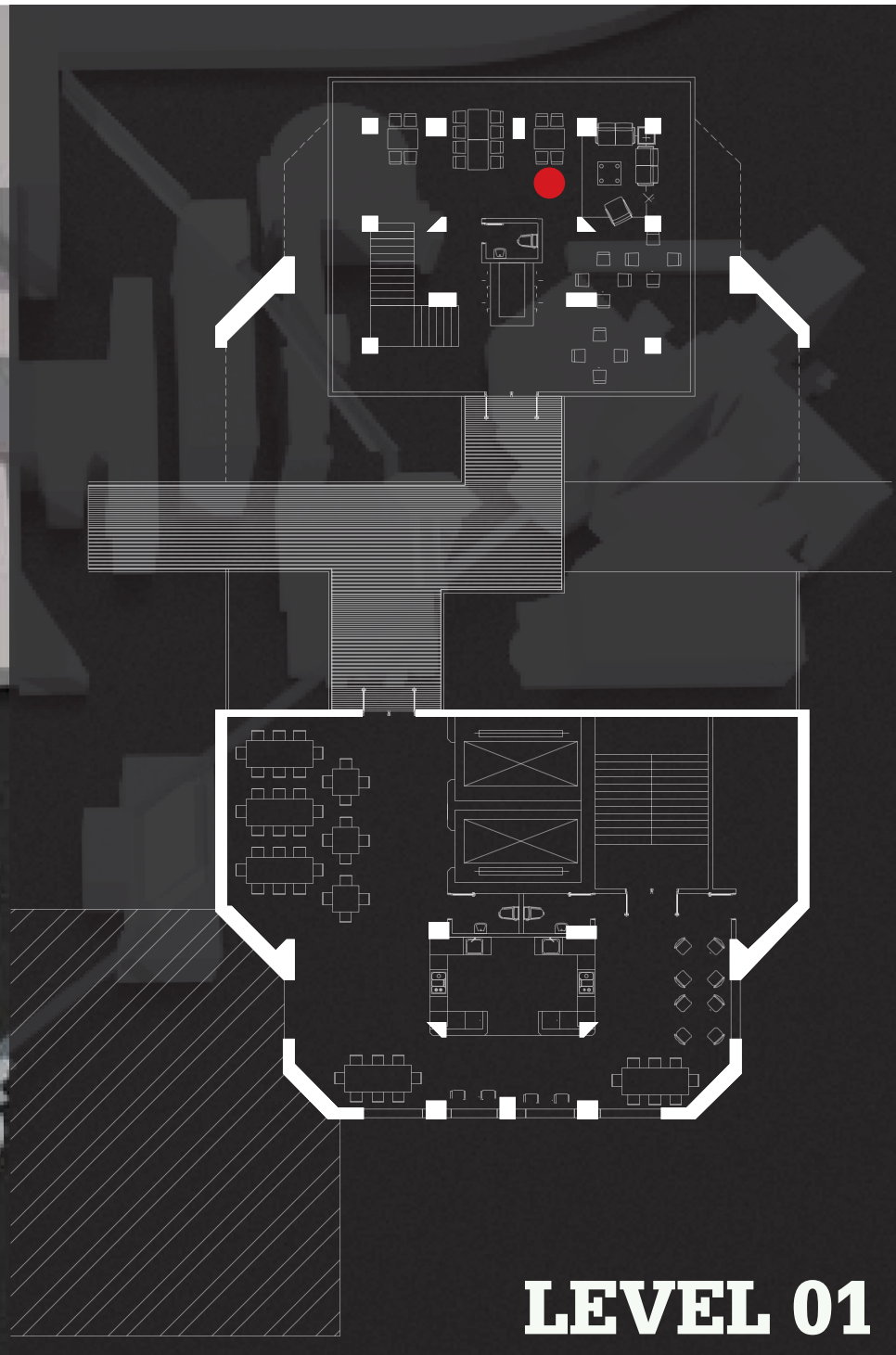
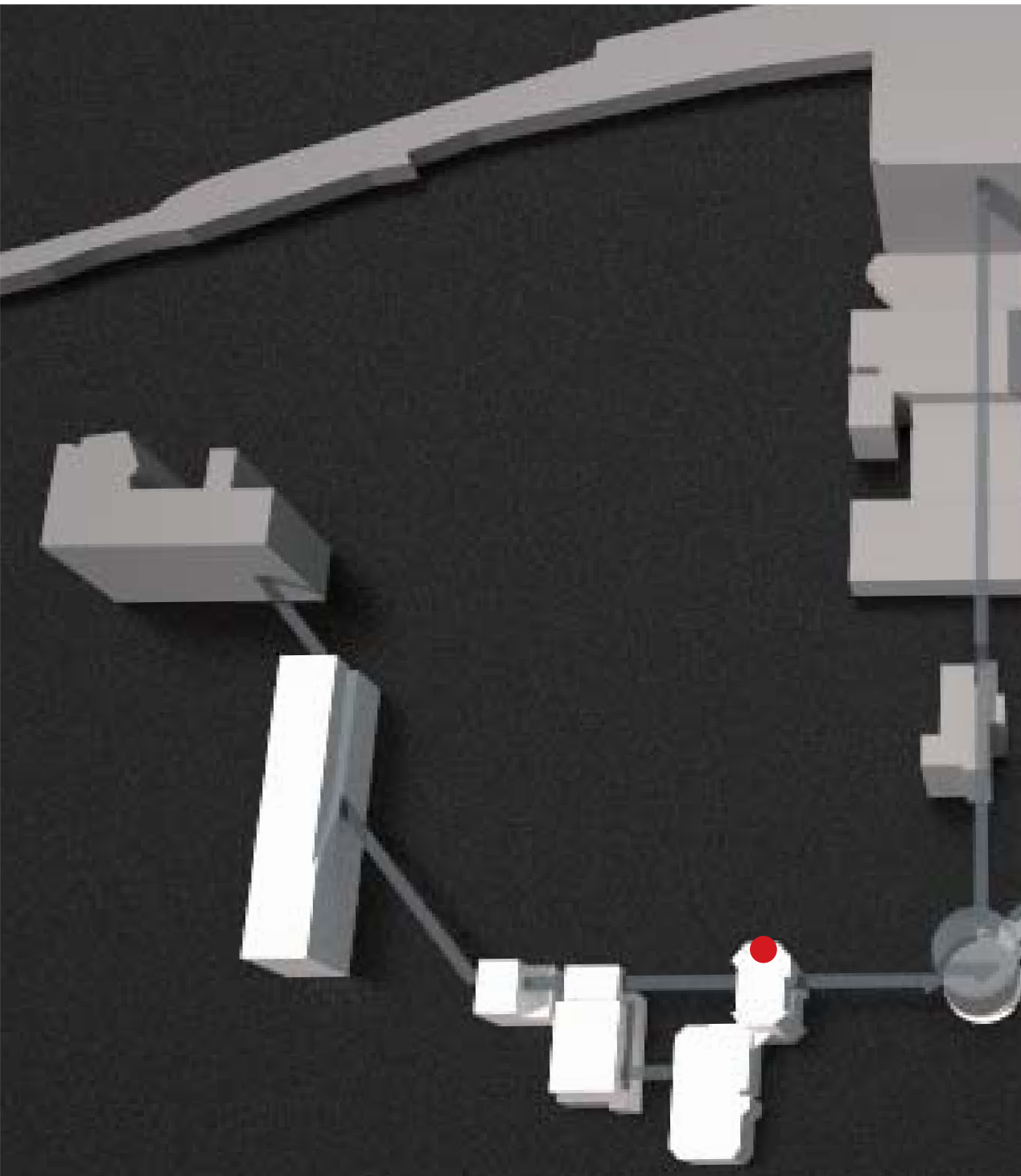




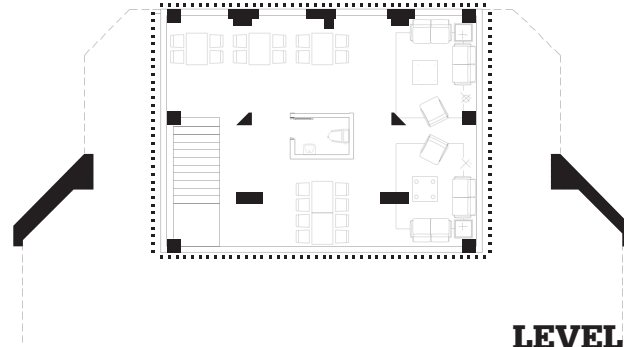




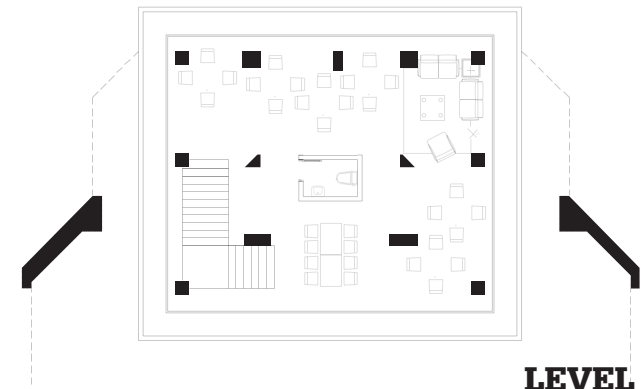




**LEVEL 01**

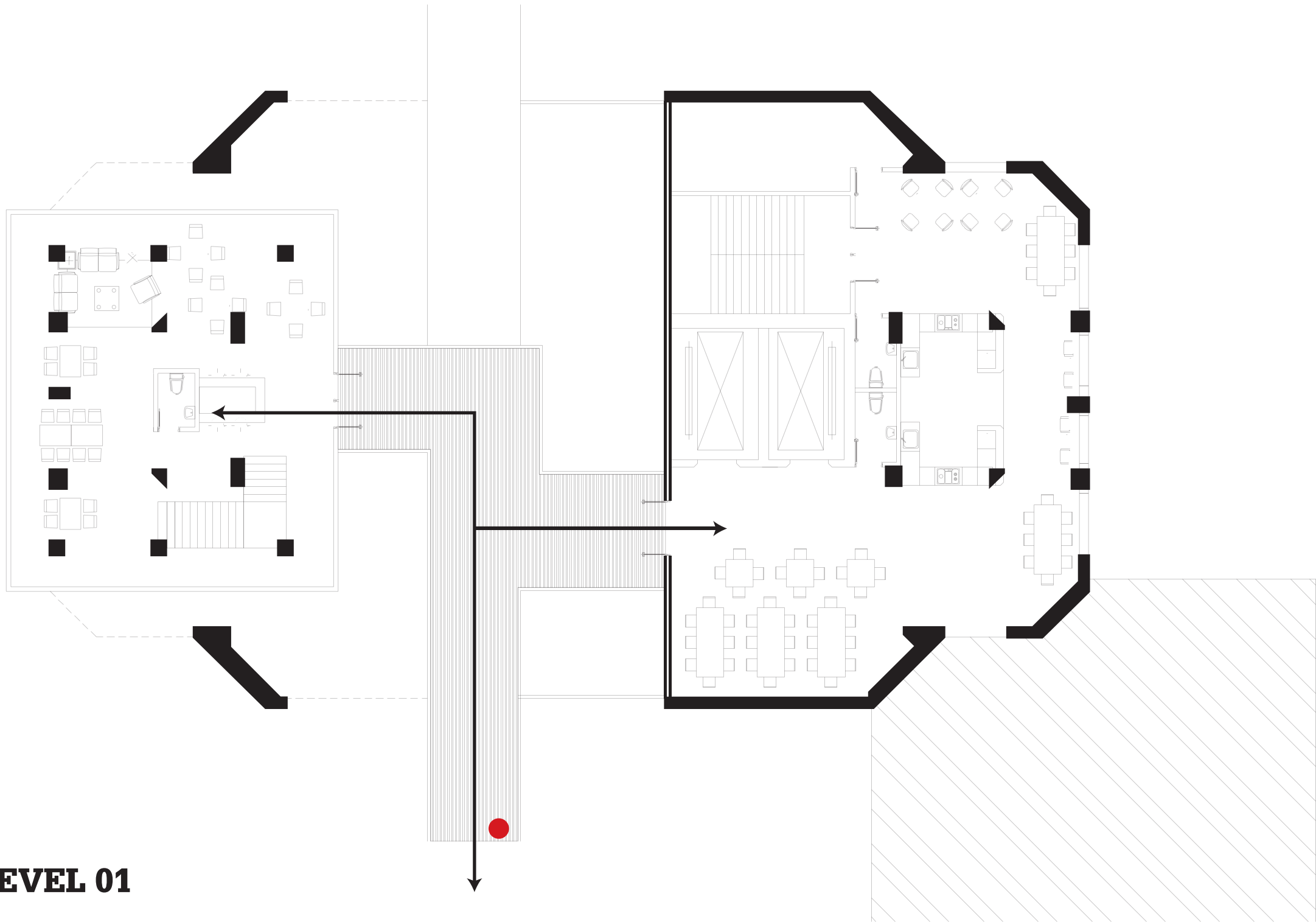


**LEVEL 03**



**LEVEL 02**



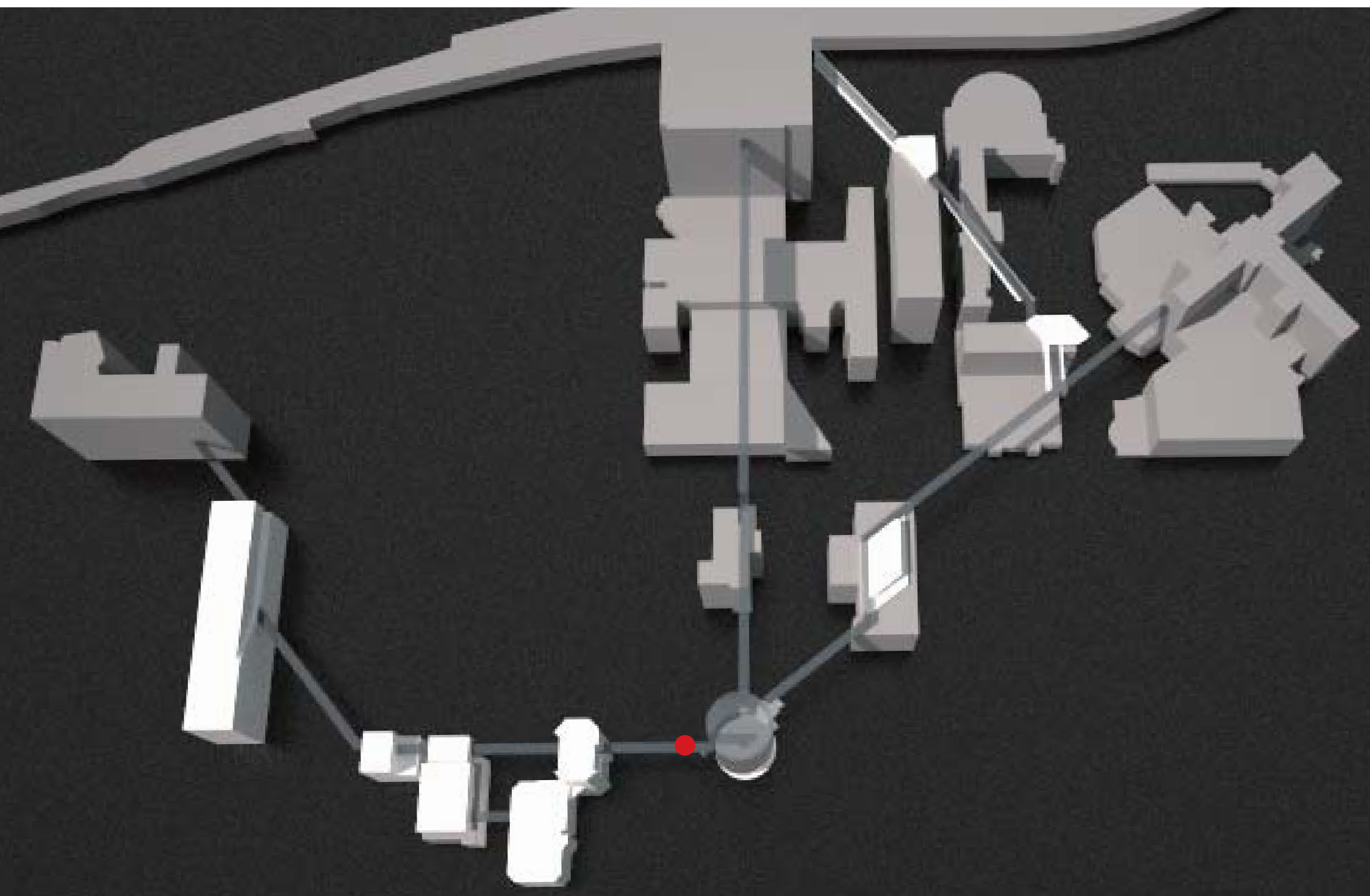


**LEVEL 01**





Welcome  
...TO BRU'S  
SPECIALTY  
COFFEE BAR

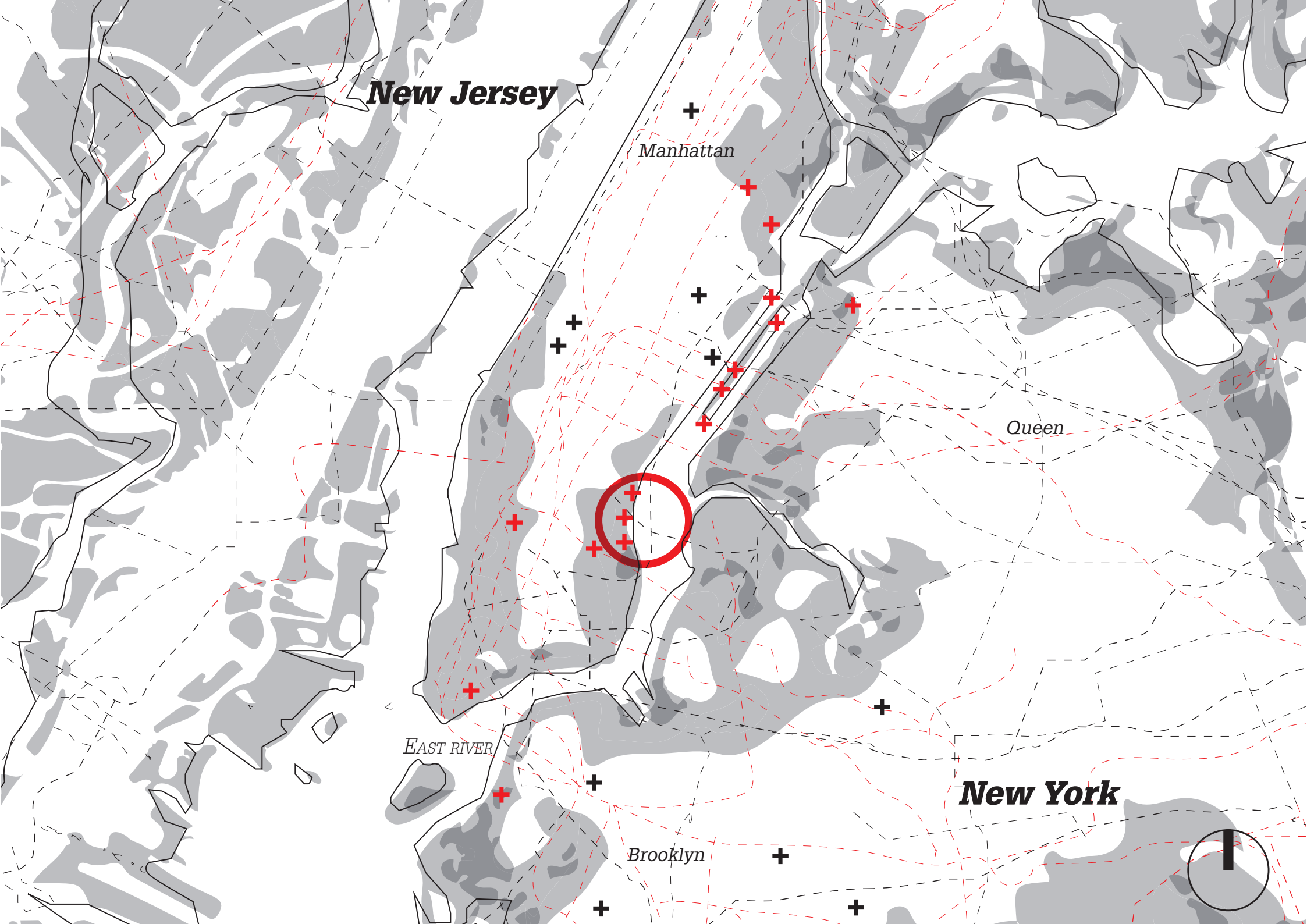






# **05 //**

# **Conclusion**



**New Jersey**

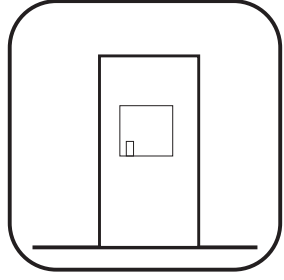
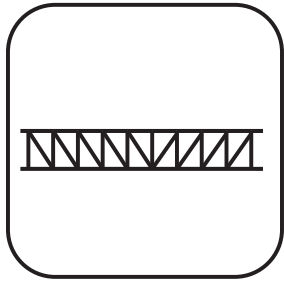
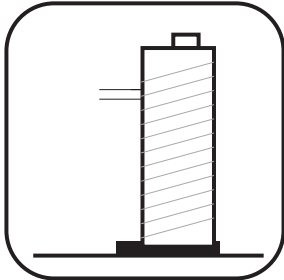
Manhattan

Queen

EAST RIVER

Brooklyn

**New York**





**Shelter in place or evacuation?**

**How to evacuate?**

**Where to evacuate to?**

Decentralize the risk

Reducing the distance of evacuation  
Avoiding the limitation in mobility

Avoiding the overcrowd in the supporting hospitals

Thank you for attention.

Questions?

# SERVICE

- Hotel A // Alternative ward
- Hotel B // Alternative ward
- Sport Center // Alternative Ward
- Office // Emergency Responding Center

NYU Langone  
Medical Center

Hotel A  
Alternative Ward

Office  
Emergency Responding  
Center

Sport Center  
Alternative Ward

Accommodation for  
staff

Hotel B  
Alternative Ward

Bellevue  
Hospital

Sky Garden

VA Harbor  
Hospital

Sky Garden

-- Sky Garden  
-- Cafeteria

Extreme  
Sport Center

Evacuation  
Tower  
Evacuation Route

# QUALITY

# SPEED

