PLAN B

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

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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.

Source: http://www.businessweek.com/ Mail online
Emergency ambulance snake around a corner outside 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.

Flood: basement and backup generator.

Evacuated 215 patients.

Flood: basinment and backup generator.

Evacuated 215 patients.

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

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

VA Harbor Hospital
828 beds

Bellevue Hospital

NYU Langone Medical Center
705 beds

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

Source: http://www.businessweek.com/ Mail online
Backup generator failed (basement) --- power outage --- evacuated 215 patients

VA Harbor Hospital 2431

Evacuated all patients in advance

Con-Ed power substation explosion --- power outage

Shortage of fuel for backup generator --- power outage --- evacuated 300 patients

Bellevue Hospital 828 beds

Backup generator failed (basement) --- power outage --- evacuated 215 patients

NYU Langone Medical Center 705 beds

To Maimonides Medical center Brooklyn

To Memorial Sloan Kettering cancer center

To Mount Sinai Hospital

To ST. Luke Roosevelt Hospital

To Memorial Sloan Kettering cancer center
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.
Research

001_ The lesson learn for Hurricane Sandy

002_ Flooding risk

003_ Typology of hospital
Airports
Tappan Zee Bridge
Brooklyn Battery Tunnel
Hollen Tunnel

MTA
76 Evacuation Shelters
VA Harbor Hospital

Zone A
Mandatory CLOSED

NYU Langone Medical Center (Tisch)
EVACUATED

Bellevue Hospital
EVACUATION

ConED Power Substation
EXPLOSION

Limiting care to the neediest patients

VA reopened the urgent care
NYC restarted the labour and delivery unit

001 _ The lesson learn for Hurricane Sandy
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 locations which have similar situations.
- The design proposal should also consider the daily life not only urgent.
Functional Division

Initial Hospital

Single Building

Separated Buildings

Vertical

Horizontal

Input Garden

Centred

Linear

Random

Shape

Basic Typology

Match Box

I Type

Ring

K Type

Cluster

Street Hospital

T Type

H Type

Pavilion

Source: The architecture of hospitals
003_ Typology of hospital
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
**EXISTING PROGRAM**

- **Ward**
  - Patient accommodation
- **Treatment**
  - Medical care: examination
  - Medical care: treatment
  - Paramedical care
- **Management**
  - Management and training
- **Service**
  - Civil and technical service
  - Staff supply
  - PM position
  - Rest
  - Commercial function
- **Education**

**NORMAL CONDITION**

**FLOOD**

**EXISTING PROGRAM**

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

**EXTENSION**

- **Service**
  - Visitor accommodation
  - Rest
  - Gym
  - Conference room
  - Day activities area

**EDUCATION**

**Route**
Paul Baran 'decentralized networks

FIG. 1 – Centralized, Decentralized and Distributed Networks
Evacuation plan
By NYC government
Hospital Transformation

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

NYU Langone Medical Center

Q U A L I T Y
-- Sky Garden
-- Cafeteria

B e l l e v u e
H o s p i t a l

V A Har b o r
H o s p i t a l

S P E E D
04 // Architectural design

Element A: Evacuation tower

Element B: Bridge

Element C: Hotel B
Bellevue Hospital

Evacuation Tower
Concept Scheme Structure system Detail Materialization Inter climate design
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

Generator

Diesel tank

Elevators

PULLEY

CLASP

Concept
Level 3
Diesel tank
From Bellevue Hospital

Level 2
Generators
From VA Hospital

Level 1
Generators
From NYU Medical Centre

Level 0.5

Level 0
Diesel tank

Level 0.5
Fitting room // Shower

Level 0
Lobby // Reception
Urgent situation -- normal

Daily situation

Urgent situation -- flooding
Level 1

From NYU Medical Centre

Climbing wall
Staircase
Ramp
Urgent situation

Daily situation
Structure system

Level 3

- Outer circle
- Steel column
Structure system

Level 3

Outer circle
Steel column
Structure system

Level 3

Beams of floor
Structure system

Ramp
Structure system

Level 3

Beam of ramp
Structure system

Roof top

Steel beam
Structure system

Beam of outer circle

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

6. stainless steel rope
   22 mm dia
7. EPDM bearing
8. M10X20 screw
9. double glazing
1. steel circular hollow section
   70 dia X 10 mm, with EPDM ring inside
2. steel flat, welded to steel circular hollow section and web plates
3. bottom flange
4. sheet metal capping
5. stainless steel rope

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
Level 1
From NYU Medical Centre

Level 2
From VA Hospital

Level 3
From Bellevue Hospital

Diesel tank

Generators

Materialization
Interior climate design

Winter

- Double glazing
- Floor and wall heating
- Isolation layer
Interior climate design

Summer

North side

South side
Concept
Structure System

- Compression
- Tension
- Reaction
self-regulation window

1. Wooden sun shading
2. Double glazing
3. Metal panel
4. Rope hanging system
5. Interior sound isolation
6. Concrete floor
Fascination
Urgent situation

Daily situation
Interior Climate System

Mechanical ventilation system of bridge

Natural ventilation

Buffer zone

Flow by self-regualuation window

Mechanical ventilation system of hospital

Buffer zone
SERVICE

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

QUALITY

SPEED

NYU Langone Medical Center

Hotel A
-- alternative Ward

Office
-- Emergency Responding Center

Sport Center
-- Alternative Ward

Accommodation for staff

Bellevue Hospital

Sky Garden

VA Harbor Hospital

Extreme
-- Cafeteria

Sport Center

Evacuation Tower

Evacuation Route