Urban area
low buildings
low density

Coastal Area
seawall
abandoned park
1887's Map
followed the old urban plan
Houston's Expansion from 1836 to 1990s
Houston's Frontier Town on the Coast
Hurricane IKE's damage
First-Level Coast Protection

Site Location

Regular Hurricane Path

Surge (1/100 years)

Wind set up (Hurricane category 3)

Open
Closed

Site Location
Second-Level Coast Protection
The Street Elevation Analysis

The UTMB campus located along the main coastal road. But the whole building distribution of the campus seemed overwhelmingly concentrated in their inner environment. The elevation along the main road applied stone and concrete as their main material, which seems too strong and closing without enough windows and light materials. The lack of connection between the campus and the waterfront is an increasingly essential problem of this area.
BREAK UP

PARKING

CONNECTION

WATERRISK
MEASUREMENT APPLIED IN THE FUTURE

Faculty Recruitment
- Expand priority research programs
- Increase clinical service and revenue
- Support enrollment growth

Health System Capacity Management
- Meet patient needs
- Support academic programs
- Increase revenue

Facilities Restoration and Expansion
- Repair/mitigate Hurricane Ike damage
- Renovate/modernize existing facilities
- Plan for facilities expansion

CAMPUS STROM MITIGATION PLAN

Mission Critical Functions
- Located above 20 feet in existing buildings
- Located above 25 feet in new buildings

Uses Below 20 Feet
- Classrooms, conference rooms, and noncritical functions
- Protect against water infiltration where feasible
- Life safety and mission-critical functions to be preserved
- Designate alternate locations/arrangement
Are you satisfied with the current facilities in the Campus?

Are you satisfied with the current environment in/around the Campus?

Are you satisfied with the current transportation condition in the Campus?

Do you think it lack waterfront landscape in Galveston’s urban district?

Do you worry about the water safety in UTMB?
PROBLEM STATEMENT:

1. How to create connection between waterfront and campus? (mass)

2. How to fulfill the campus expansion requirement? (program)

3. How to solve the transportation problem from parking space to the campus? (interior)
NORMAL SITUATION

1. LIFTING
   - House can lift up and down based on the water level, and movable if fixed with a drive engine. Can survive from flood devastation.

BUILDINGS ALONG DIKE

- Buildings along the dike can be regarded as an expansion of the dike, ensuring water prevention by the strong concrete form and ensuring interior safety.

FLOATING

- Floating house can lift up and down based on the water level, and movable if fixed with a drive engine. Can survive from flood devastation.
Basic form according to the ideal design mass.

A bridge connecting waterfront and the campus.

Risk from this direction, ground floor should be protecting or removable.

The designed building should keep the Harborside Drive clear.

From Waterfront Park

Stream from Parking space
Function Distribution

Vertical distribution is the basis of the building's function program. The training center part is on the top floor and the ground floor is only for temporary facilities because of water risk.

Department of Therapy

Therapy rooms mainly located on the 1st/3rd floor. The 3rd-floor therapy rooms are examination rooms and therapy rooms with medical facilities.

Department of Recreation

Department of Recreation are mainly on the 2nd and ground floor except gyms on the 1st floor. Cause 2nd floor contents large area of public space and is the main corridor from the parking space to the campus.

Department of Administration and Housekeeping

Each floor are equipped with relevant housekeeping rooms.

Training Center

Training center is all on the 3rd floor, with a set of seminar rooms for lectures and laboratories for experiment and also offices and consultant rooms for the interns' career consultation.

Detailed Program

There is a part of intersection between the ranges of training and rehabilitation. For the rehabilitation part, it is divided into three groups. First is the department of therapy, including both normal therapy and some specific therapy with medical equipments (like ultrasonic equipment; ultraviolet equipment). The second is for all dietary and recreation demand, The third part is all administration and housekeeping program providing logistic guarantee.

The intersection part is a series of treatment room as well as a training place, the interns provide nursing service to the patient as their own career training.
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1. Concrete Core
2. Steel Columns
3. I-Beam Frame
4. Concrete Floor

5. Subfloor

6. Staircase
steel frame
IDES FLOOR and INFRA+ FLOOR are two types of overhead floor which can put HVAC system installations in the interlayers. They have different construction logic and different properties we list a pro and con to evaluate which type works better in our design.

INFRA+ FLOOR
PRO:
1. The steel cassette embedded in the concrete floor, better stability.
2. The cassettes are possessed lengthways, and the holes on the cassettes enable installation pipes penetrate both crosswide and lengthways.
3. Still space beneath floors for ceiling.

CON
1. The total height of the system is more than the IDELS system, so it will take more floor space.

IDES FLOOR
PRO
1. Save floor space
2. Precast concrete floor slab, lower cost.

CON
1. The main beams block the expansion crosswide of the installation pipes, they can only be installed freely along one direction.
2. Lack of integrity, cause every floor slab is fixed to the main beams independently.
Ventilation System
When it comes to the ventilation system, more attention should be paid when dealing with health care building than other normal buildings. Cause health care buildings require a higher air condition than other buildings, the requirement of ventilation installations are also different from other buildings.

HVAC system are regularly applied into health care buildings, which means Heating, Ventilation, Air Conditioning system. There are various types of installations of HVAC systems. Decision should be made carefully based on the specific program.

Constant Air Volume System or Variable Air Volume System?

Constant Air Volume System
Pro:
1. Centralized layout, easy to maintain.
2. Lower initial investment and maintenance cost.
Con:
1. Higher energy cost compared with variable air volume system because of a constant flow rate all the time.

Variable Air Volume System
Pro:
Smaller dimension of fan. Reduce energy cost by turning down flow during off-peak period.
Con:
Higher initial investment.

Double Duct System or Single Duct System?

Double Duct System
Pro:
Better thermal control
Better humidity control
Fit for both Constant Air Volume System and Variable Constant Air Volume System.
Con:
More installation space required.

Single duct system
Pro:
Fewer flexibility on temperature and humidity.
Con:
Easy maintainance.

Therefore after such an evolution process it seems clear a variable air volume, single duct system is more fit for our project.
B-- Determine the air inlet location in each room.

C-- Determine the new air volume, the dimension of supply duct.

I search on ventilation manual and find the calculation method of the dimension.

Duct Cross-Sectional

**Area = Air Volume / Air Speed**

**Air Volume= Room Volume * Ventilation Rate**

Ventilation Rate means How many times do we renew the indoor air per hour. And there are existed routine of ventilation rate for different functional rooms.

The normal ventilation rate is 1 t/h, For some odor-causing rooms such as toilets (5-15t/h), printing rooms (5 t/h), dressing rooms (5 t/h) , the ventilation rate is higher than normal rooms.

Generally, offices ventilation rate is 2-5 t/h; patient rooms ventilation rate is 2-4 t/h; seminar rooms ventilation rate is 3-8 t/h, infection room s is more than 6 t/h.

Here we take one of the patient rooms as an example. The area is 26m^2, room height is 4.2m.

**Room Volume = Area * Height = 26 m^2 *4.2m = 109.2m^2**

We set the ventilation rate as 4 t/h, so

**Air Volume = Room Volume * Ventilation Rate = 109.2m^2 * 4 t/h= 436.8 m^3**

Here the air speed is also based on the experience ( secondary duct in public building 4-6 m/s ), so

**Duct Cross-Sectional Area = 436.8 m^3 / 4 m/s /3600 = 0.03 m^2**

All available dimension of duct included 675*150; 550*175; 450*200; 400*225; 350*250; 300*300

Here I choose 550*175 one, it fit for the size of the infraplus vloer.