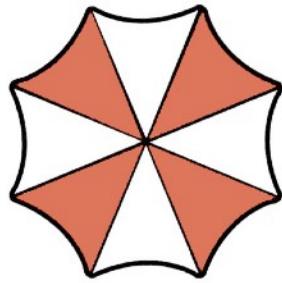


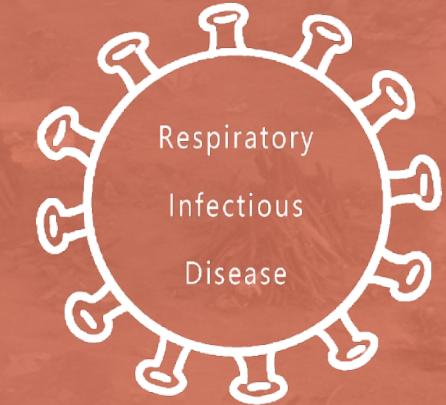
# Portable Medical Isolation Device

Based on the renovation of existing buildings



U M B R E L L A

Transboundary research in medical field



COVID - 19  
MERS - 12  
SARS - 03

39.15%

ON AVERAGE

## CONTENT

- Part-1 Background Analysis
- Part-2 Principle And Prototype
- Part-3 Design And Model
- Part-4 Future Outlook

## DESIGNERS

Students: Fujian Zhao | Xuan Yang | Biaoping Wu | Jiankun Yang  
Instructors: Xuefan Zhou | Zhe Dong



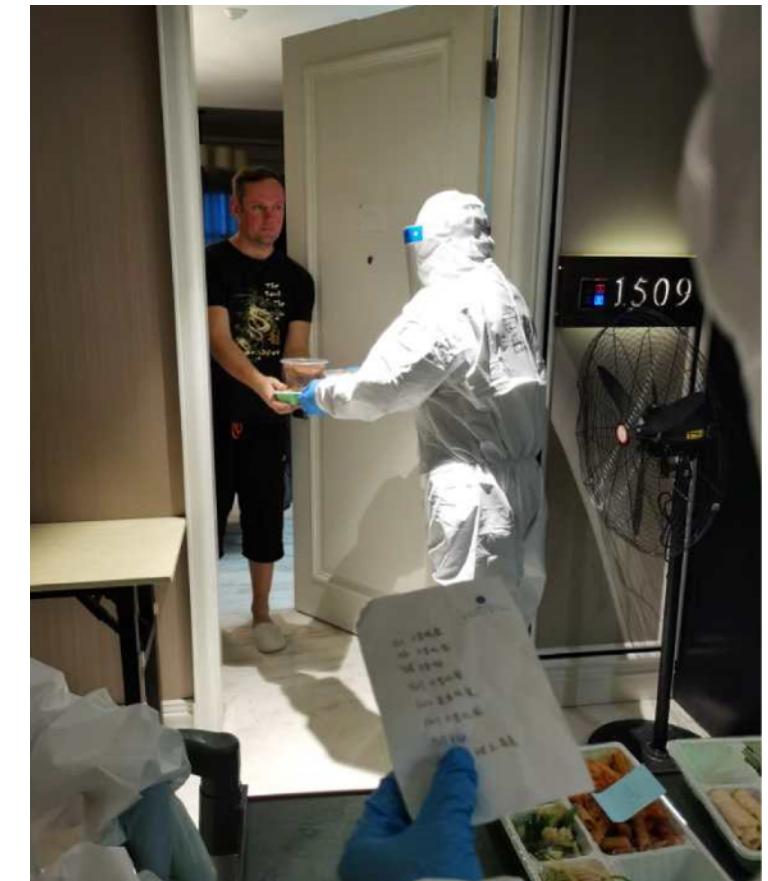
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Part-1 Background Analysis

「 Fangcan 」  
g



Large space isolation: Gyms | Theaters



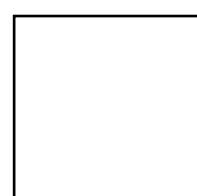
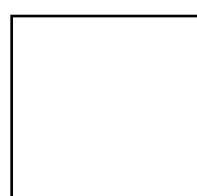
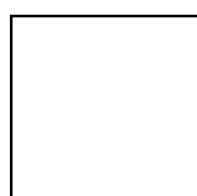
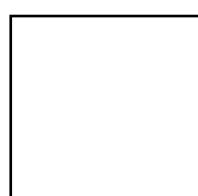
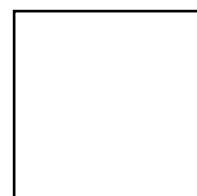
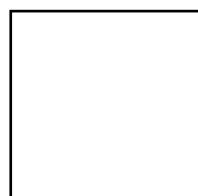
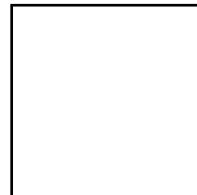
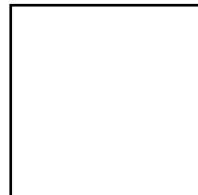
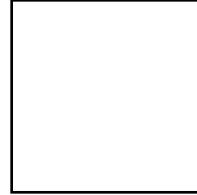
Single room isolation: Hotels | Dorms

「 Fangcan – Ark of Life 」

「 Fangcan – A kind of temporary hospital 」  
g

# Fangcan – A kind of temporary hospital g

Area       Hospital



City: collection of people and space

# Fangcan – A kind of temporary hospital

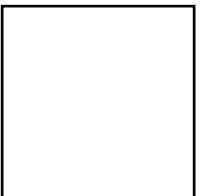
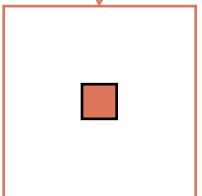
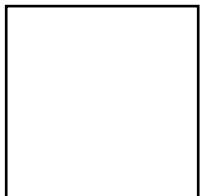
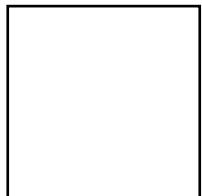
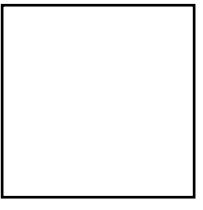
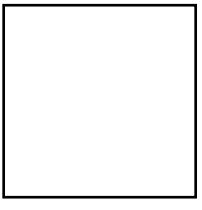
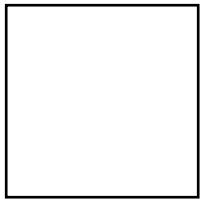
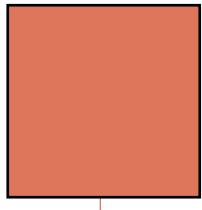
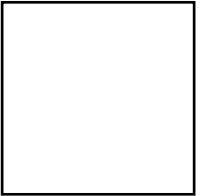
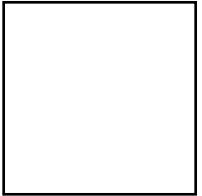
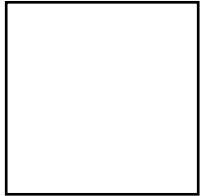
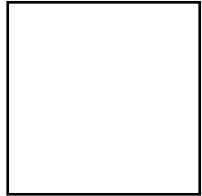
Area

Hospital

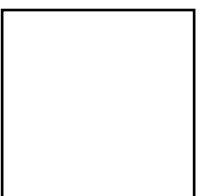
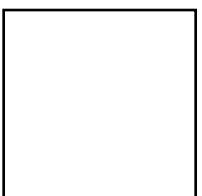
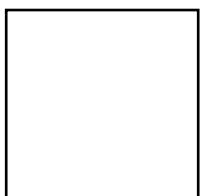
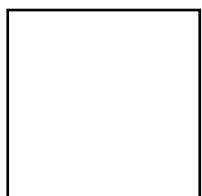
Infected Area



Beginning: transfer to hospital



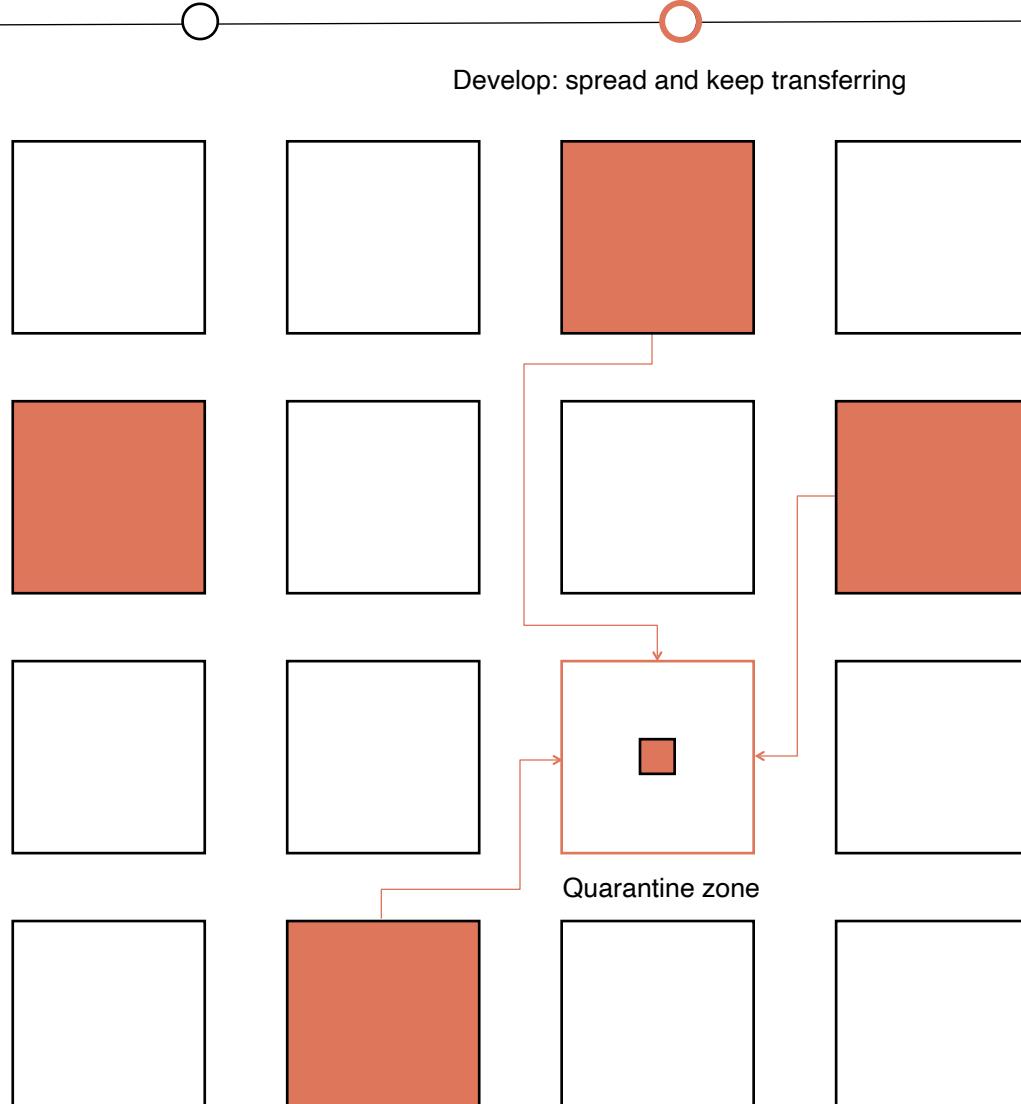
Quarantine zone



Quarantine zone: the doctor is treating patients

# Fangcan – A kind of temporary hospital

□ Area      □ Hospital      □ Infected Area



Virus spread with the fast move of urban population

# Fangcan – A kind of temporary hospital

Area

Hospital

Infected Area

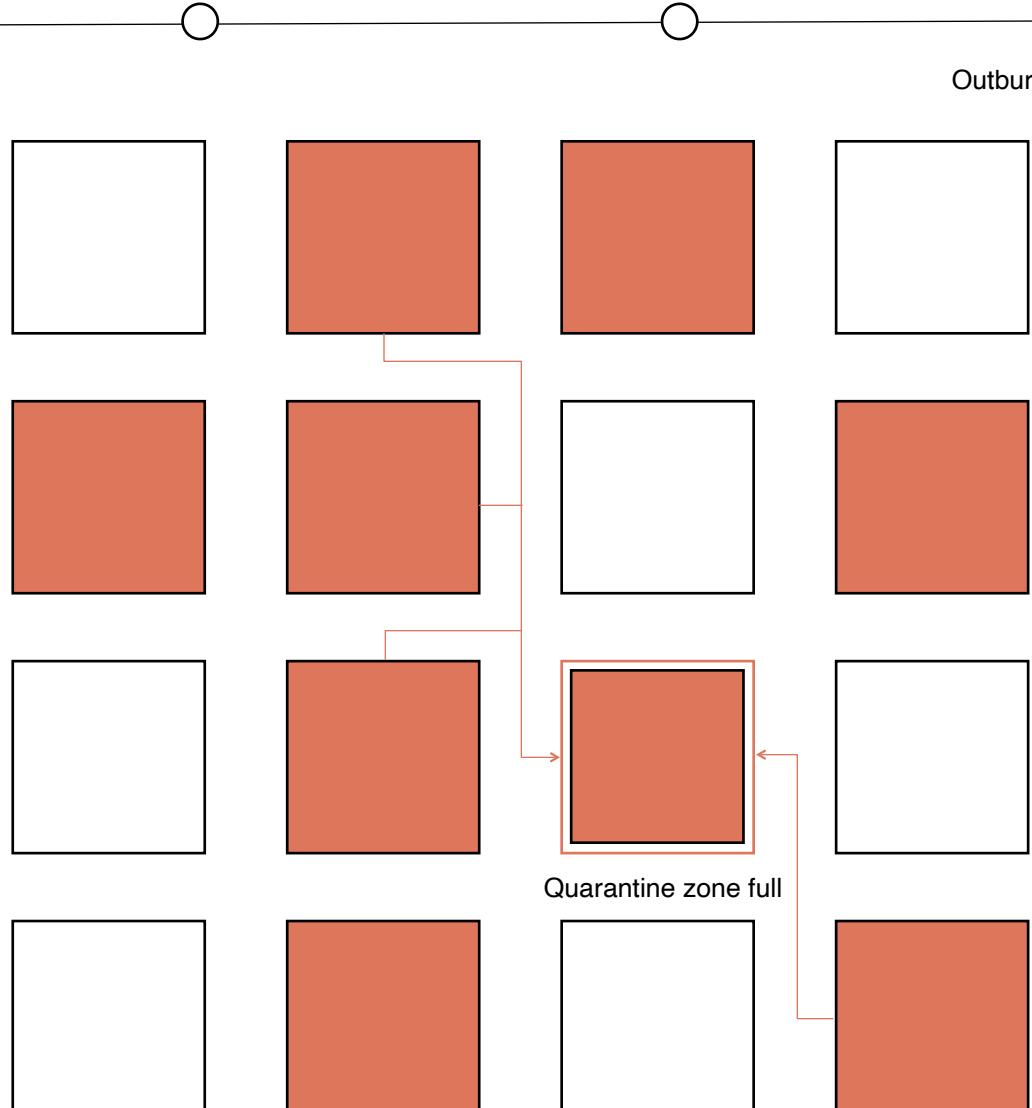


# Fangcan – A kind of temporary hospital g

Area

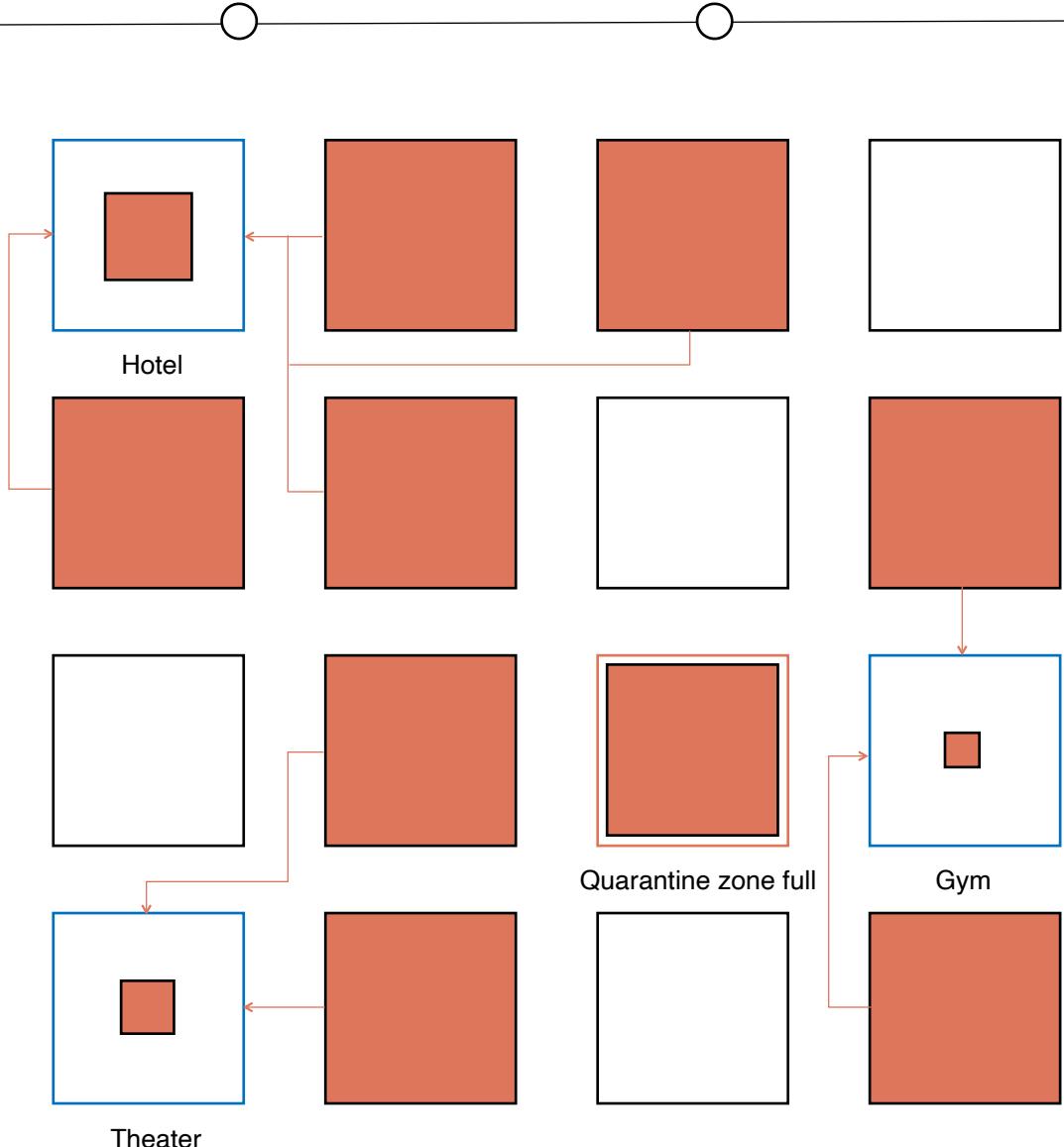
Hospital

Infected Area



# Fangcan – A kind of temporary hospital

Area Hospital Infected Area Fangcang



Emergency: build Fangcang



A gym is transferred into a Fangcang hospital

## Fangcan – A kind of temporary hospital

Fangcang

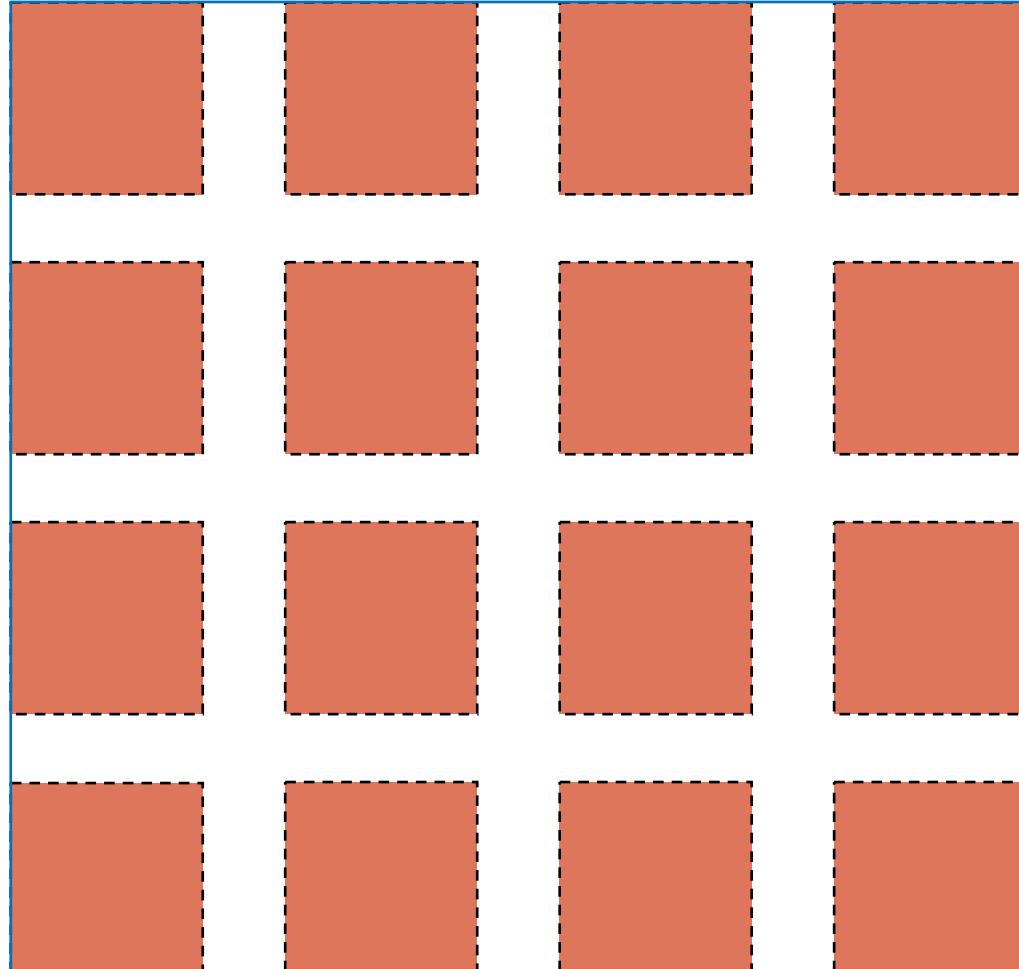
Fangcang: a kind of temporary hospital



There is no effective isolation methods in Fangcang, patients are treated together

# Fangcan – A kind of temporary hospital

□ Fangcang ■ Patients



—  
—  
—  
—

Fangcang: a kind of temporary hospital



Doctors are dancing with patients in Fangcang wearing chemical protective clothing

Γ Medical system's anti-epidemic capabilities are still poor ↴  
( Speed Tenacity )

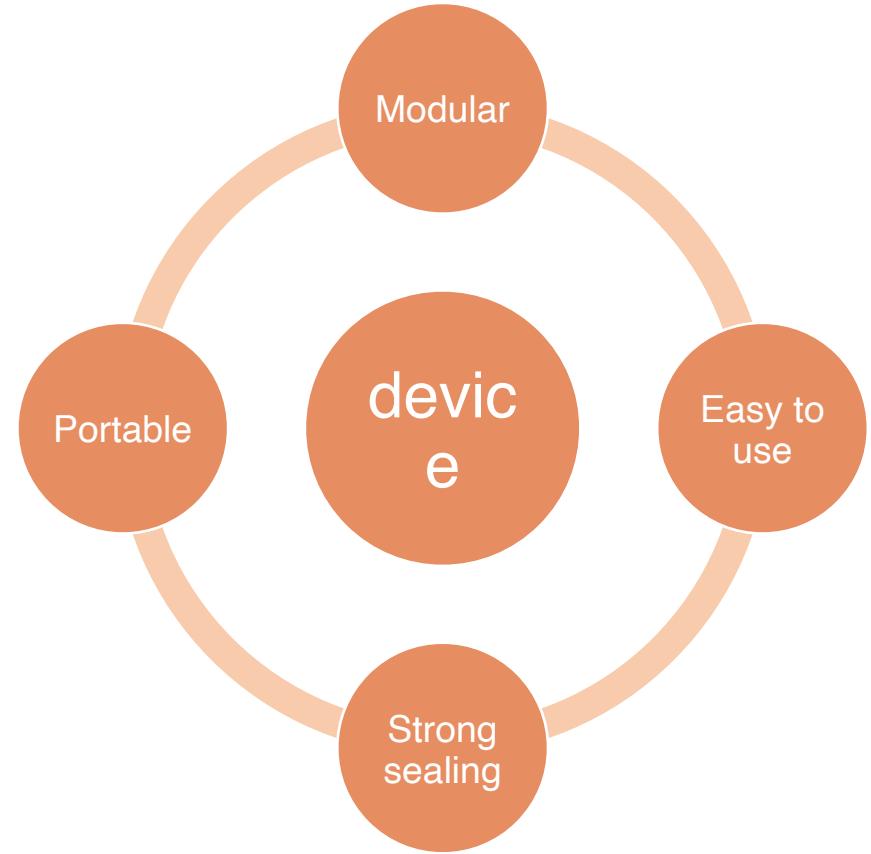
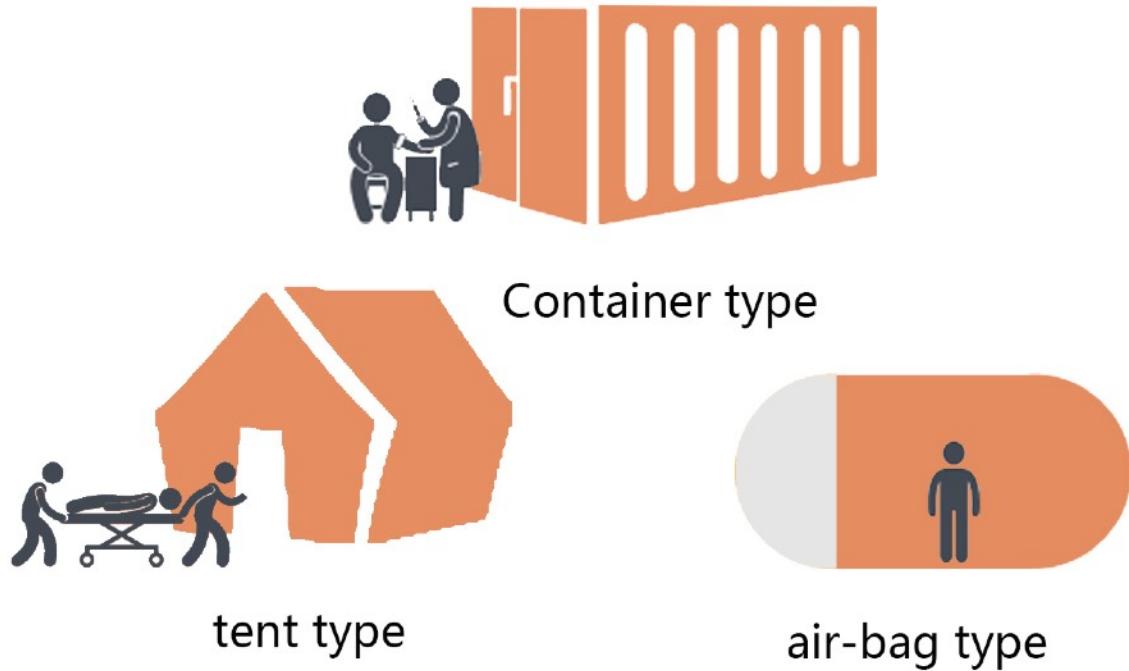
Γ The potential of existing building medical isolative  
renovation  
( Security Method )



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Part-2 Principle And Prototype

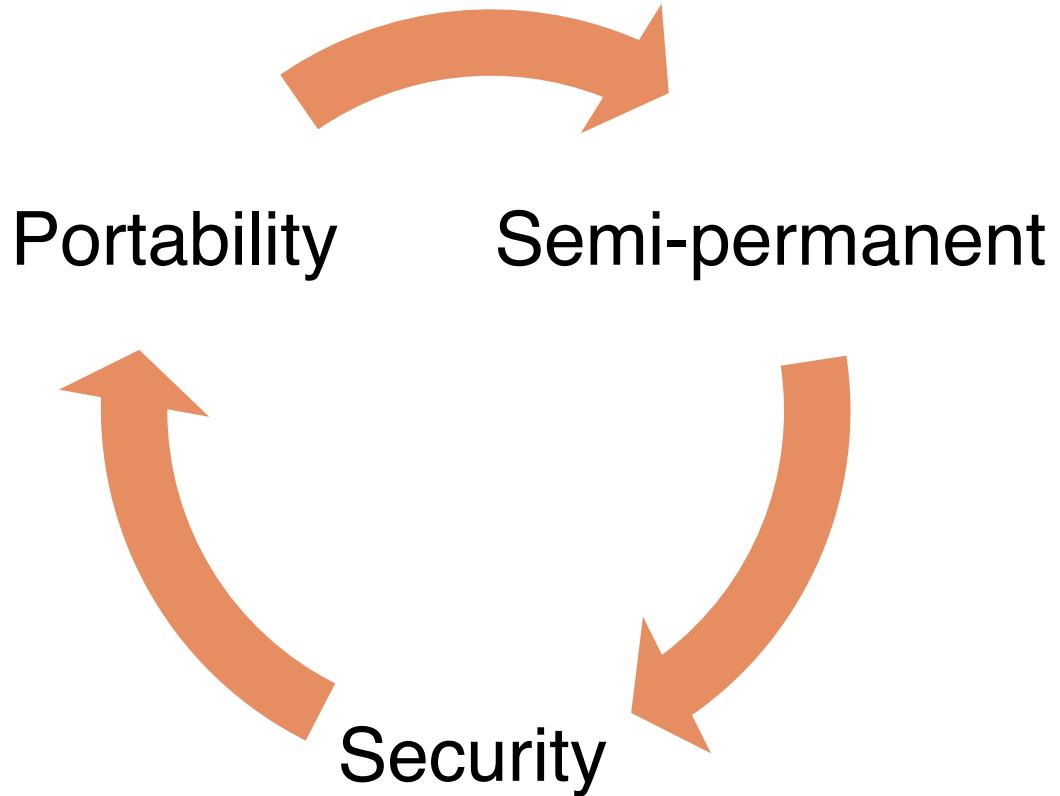
## Design principle



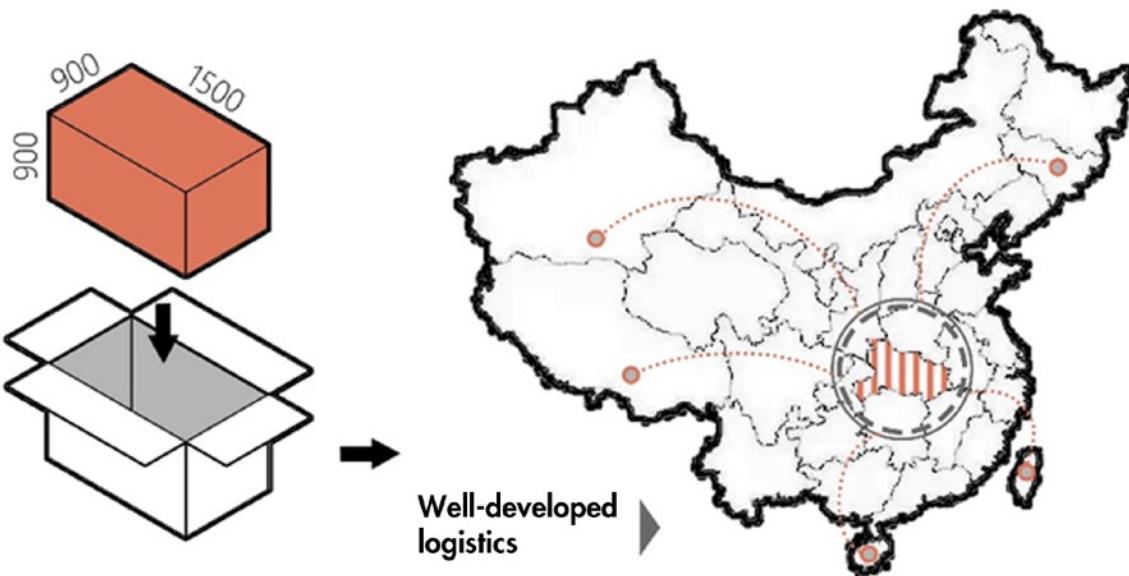
The three main modes of isolation devices : **Container type, tent type, air-bag type.**

- The container type has a unified module, can be assembled, can be mass-produced, and has a relatively long lifespan.
- The tent type has less construction cost, lower technical requirements, and the smallest construction site.
- The air-bag type is an ideal and space isolation device. It has strong isolation, takes up the smallest area, and is the easiest to build.

## Design principle

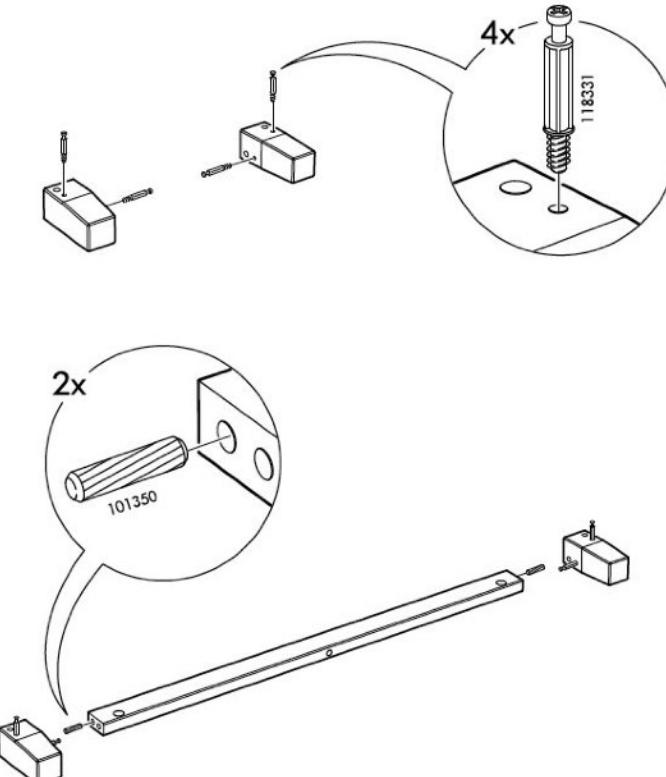


## Portability



- **Convenient and fast transportation**

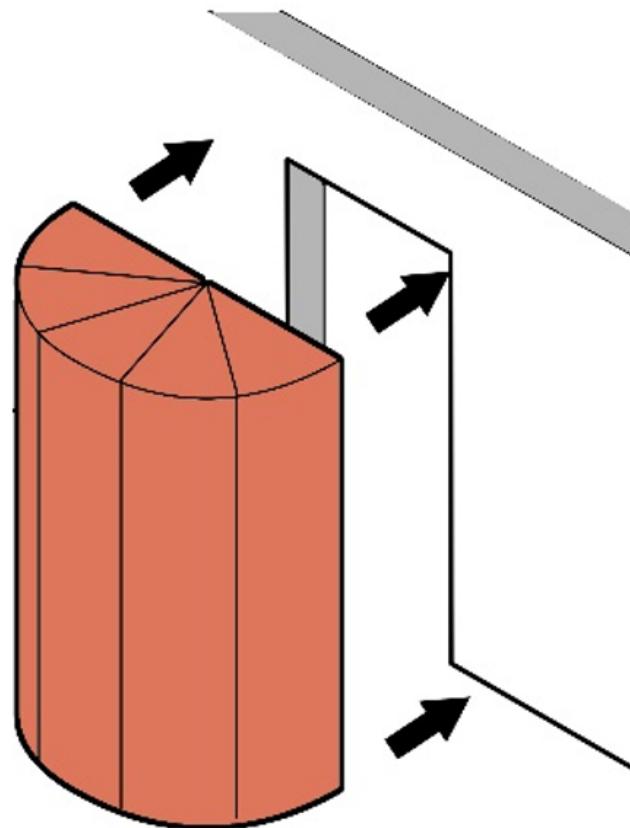
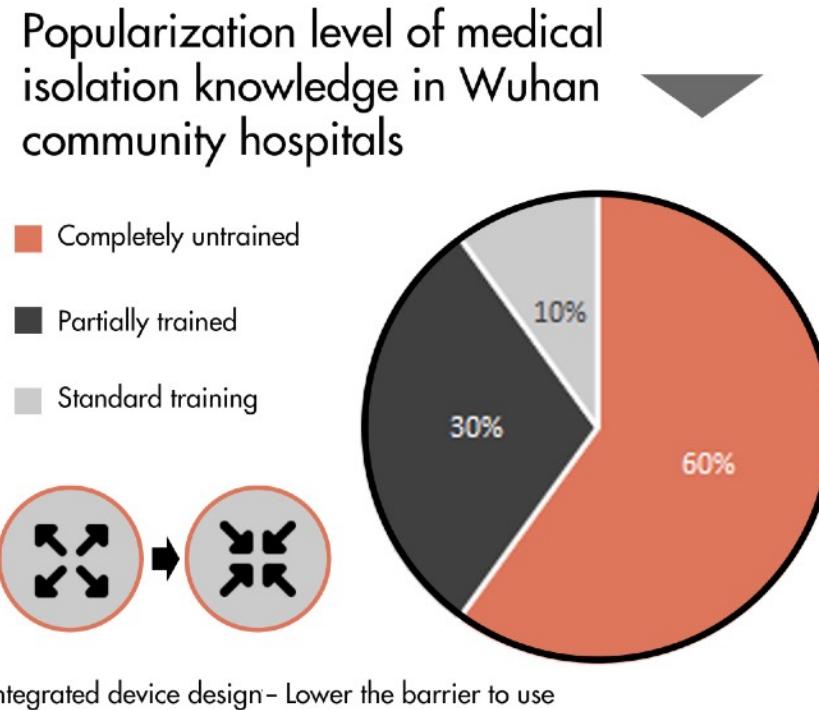
The folding device can be stored in a 900\*900\*1500 box, combined with the developed domestic logistics network, fast transportation, and quickly meet the needs of medical isolation in special periods



- **Simple and fast installation**

This device draws on the rapid assembly mode of "IKEA Furniture", realizes simple and rapid assembly of the device in any scene, and meets the needs of fast installation in special conditions when it is not used in normal conditions.

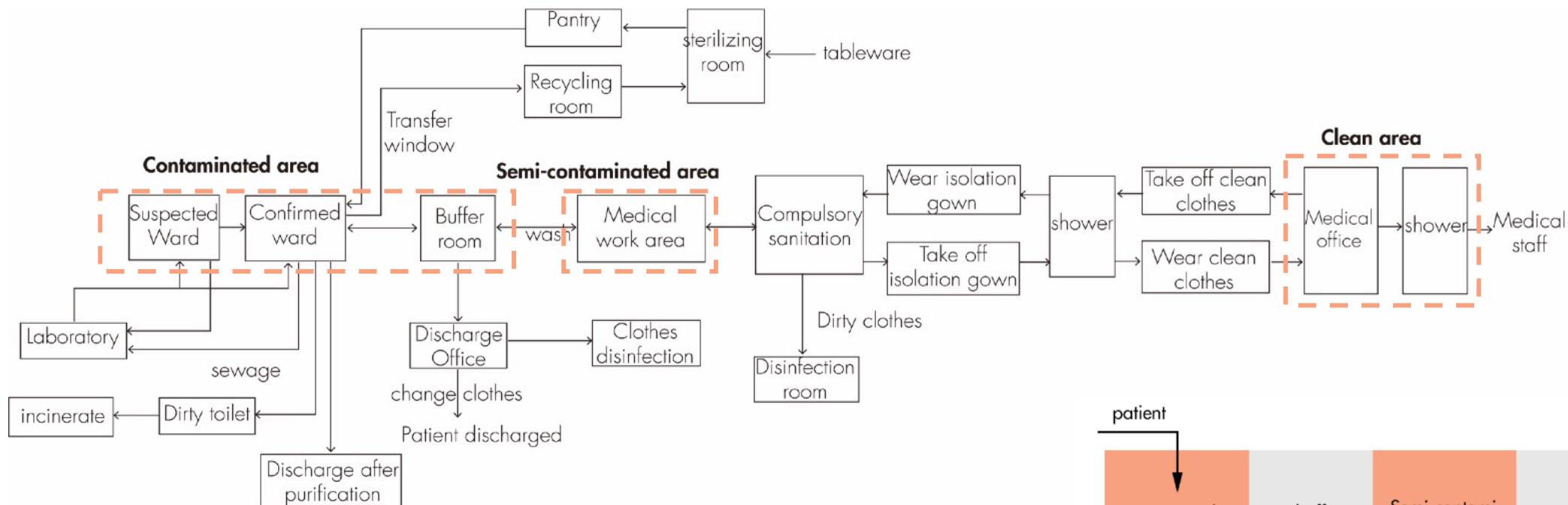
## Semi-permanent



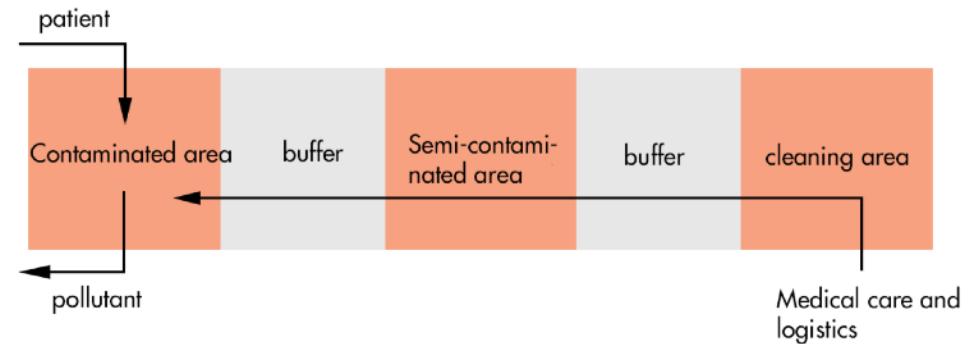
- **Long service life, detachable**

There are a huge number of community hospitals in my country, but more than 70% of them do not have medical isolation conditions, and relevant personnel lack training. This device will be modified for the existing building form, which is convenient and fast while ensuring isolation conditions. It can also be used for isolation and transformation in high-risk areas such as schools and factories.

## Security

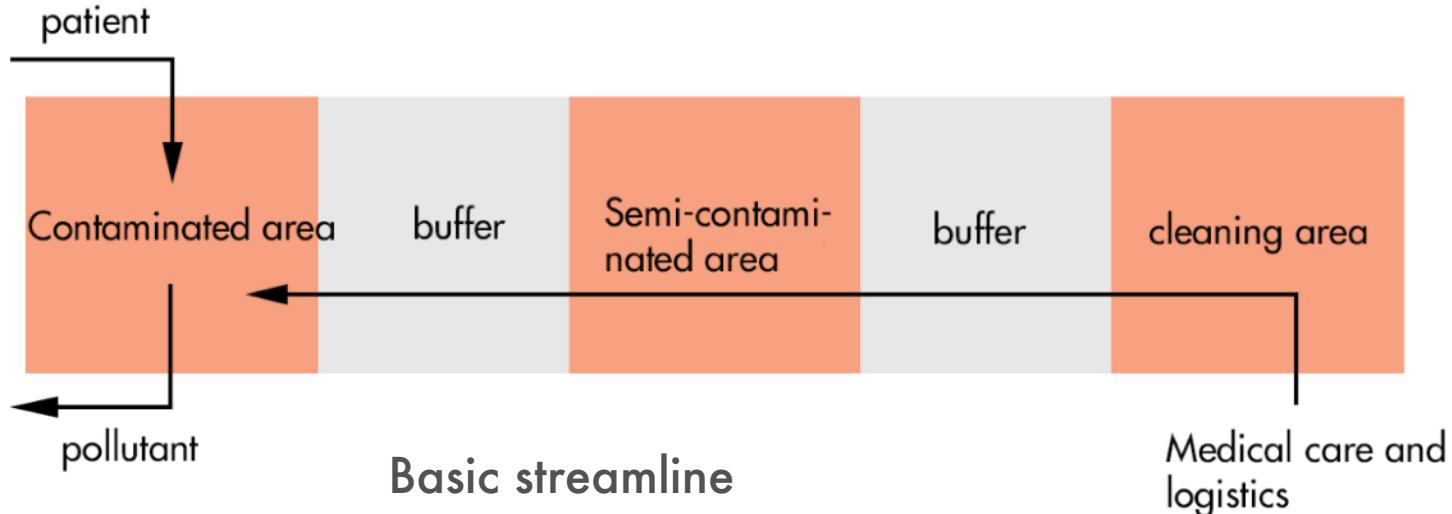


The principle of "three areas and two line" in the medical standard isolation zone



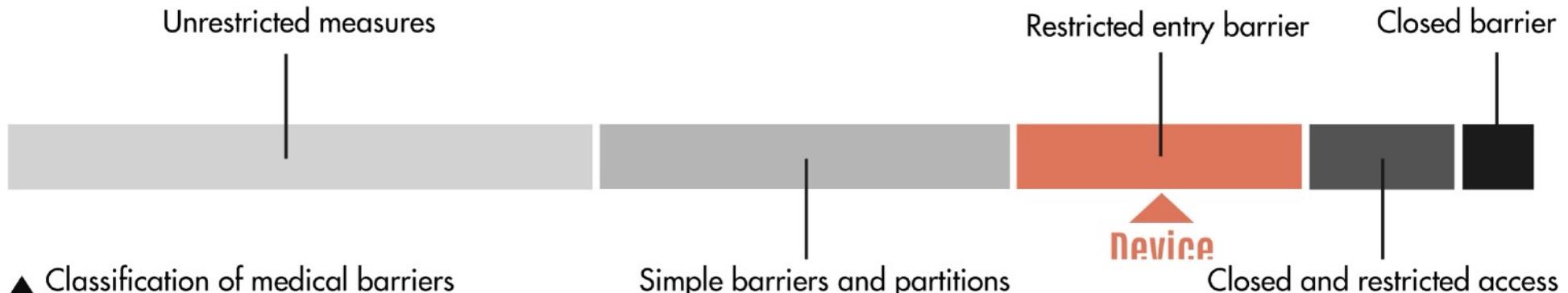
### The principle of "three areas and two line"

- my country's standard medical isolation process: the three-zone principle: "contaminated area, buffer zone, semi-contaminated zone, buffer zone, clean zone"; the two-pass principle :"medical personnel, confirmed patients, and logistics personnel are streamlined (at least: medical personnel) Patient logistics separation)

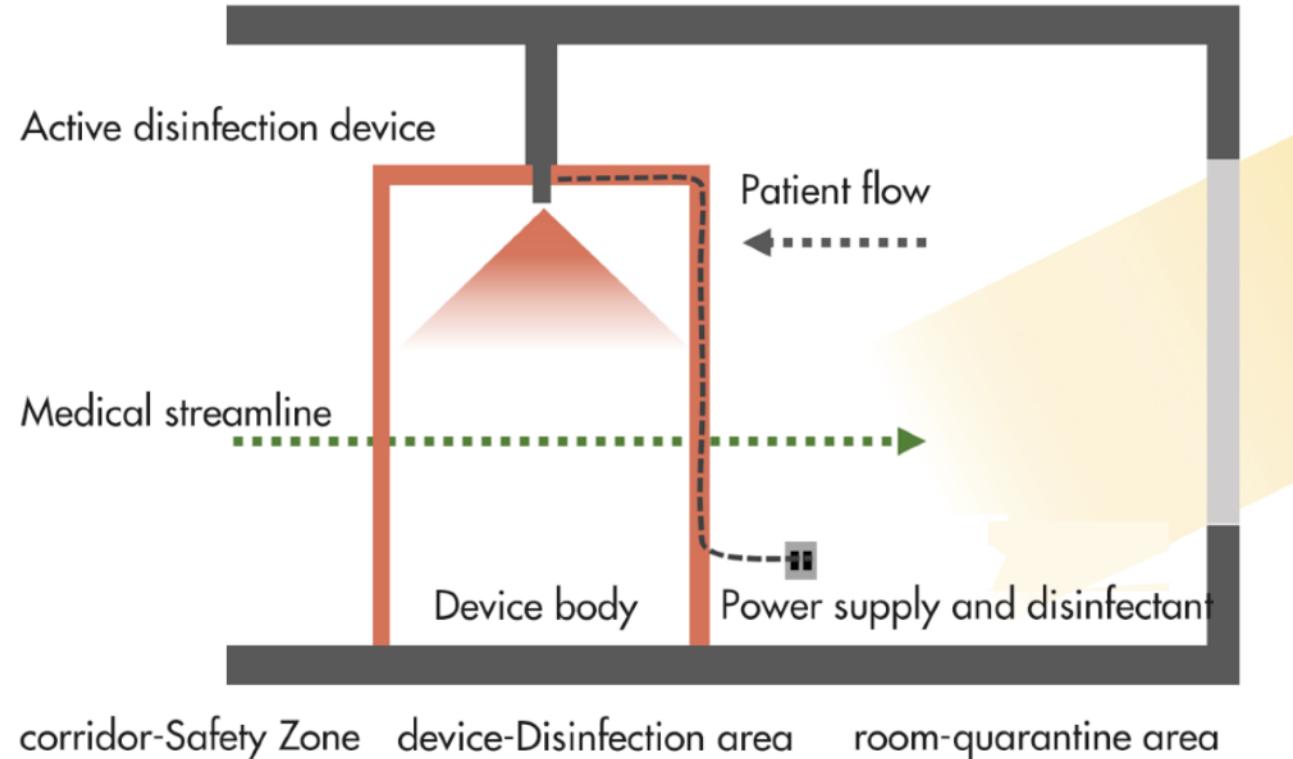
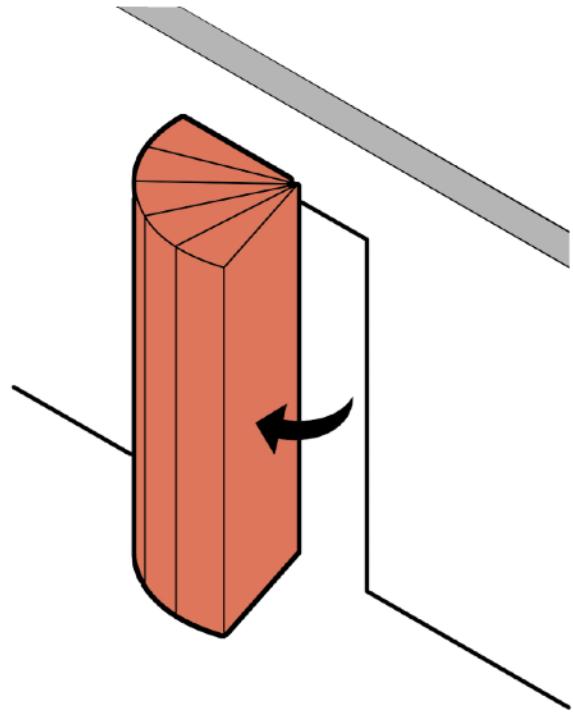


## Degree of isolation

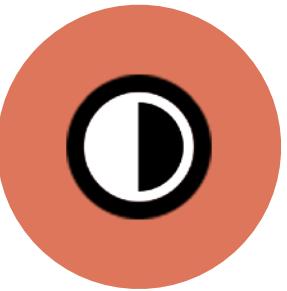
- The spatial layout is the most basic approach to infection control. At the architectural level, it focuses on the medical process and the cleaning level, which is consistent with the current level of prevention and control.
- The degree of isolation of the measure increases to the isolation room, and the level of restriction in the entire spatial organization is shown in the figure below.



## Preliminary ideas



- This device is "one-time assembly, long-term use" and is designed with an integrated folding skeleton-membrane system: it can be folded on the door side when not in use without affecting the use of the building space; it expands rapidly during the epidemic period and quickly forms an isolation zone, a transition zone, and a safety zone. Separate the design of the disinfection device to facilitate the replacement of the medicine



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Part-3 Design And Model

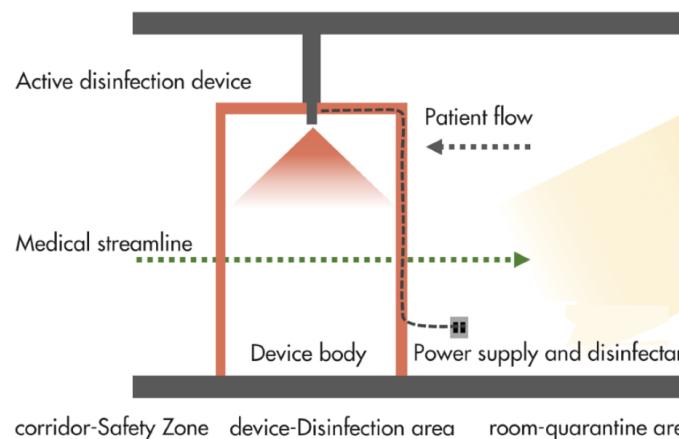
## Response to principles



# Response to principles

## Security

### 1. Three-areas and two-lines principle



## Prototype

## Types



Door frame type



Semicircle type



Ceiling type

## Features

**Installation location:** Leaning on the corridor or on the interior door frame.

**Operation mode:** The device has a built-in folding frame and isolation membrane, and the user only needs to drag the handle on the device to the installation direction of the device to unfold the device for use..

**Usage scenarios:** It has a wide range of use and requires sufficient space around the door frame for installation.

**Installation location:** Leaning on the corridor door frame .

**Operation mode:** The device is equipped with a rotating and folding frame and isolation membrane. Users only need to rotate and fold the frame in a fixed direction to open and close the device for use.

**Usage scenarios:** Medical or residential buildings with wider corridors.

**Installation location:** in the ceiling.

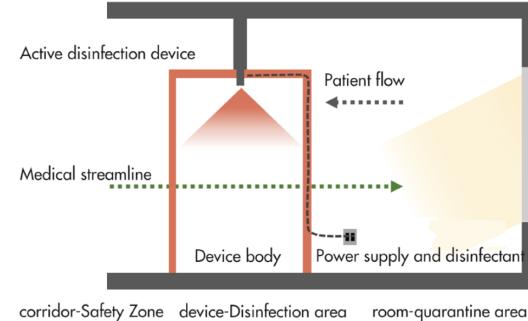
**Operation mode:** The user operates the electromechanical device through the button, and the electromechanical device drives the entire frame to expand in a manner similar to that of an umbrella, and then installs the isolation membrane material on the basis of the frame.

**Usage scenarios:** hotels and dormitory-type buildings with thick ceilings.

## Response to principles

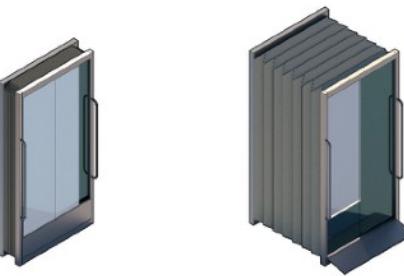
### Security

#### 1. Three-areas and two-lines principle



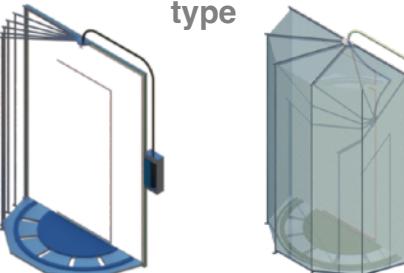
### Prototype

### Types



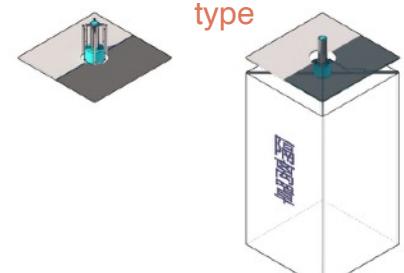
Door frame

### type



Semicircle

### type



Ceiling type

### Advantages

Simple structure

### Disadvantages

Easily damaged

Opening and closing method

Complex structure

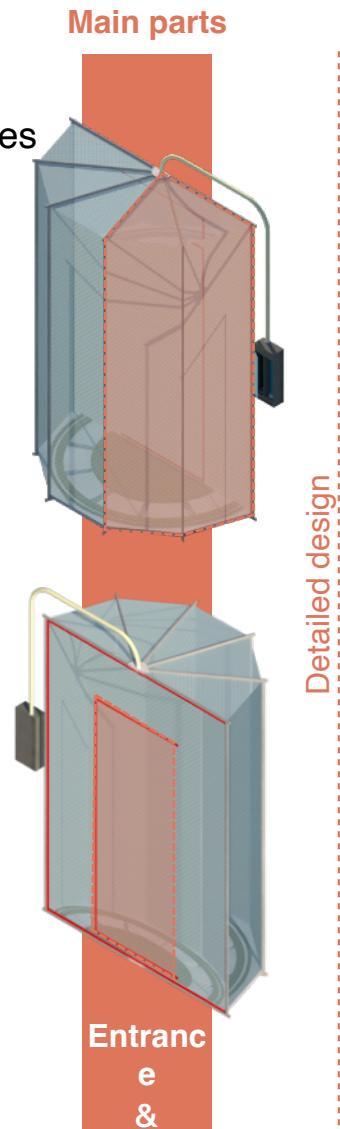
Easy to hide

Poor air tightness

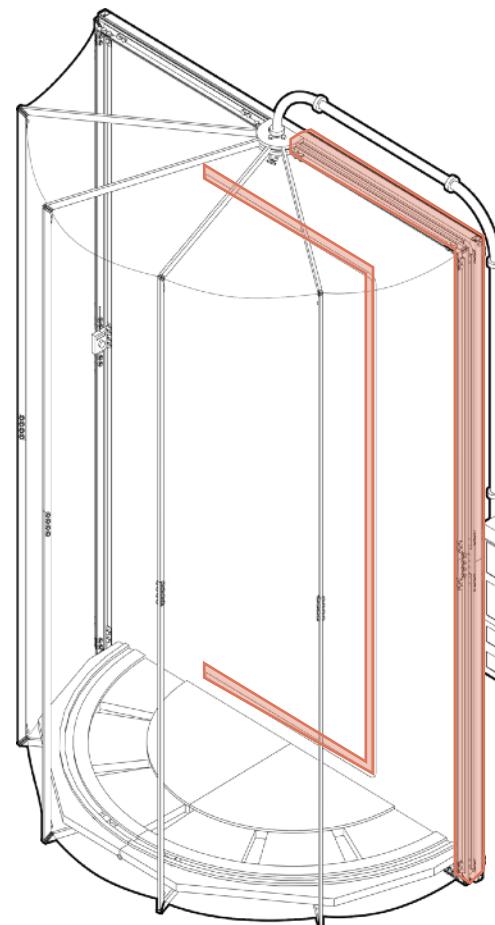
## Response to principles

### Security

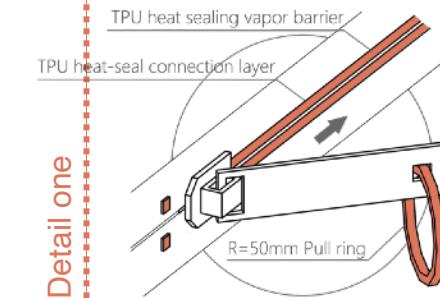
1. Three-areas and two-lines principle
2. Air tightness



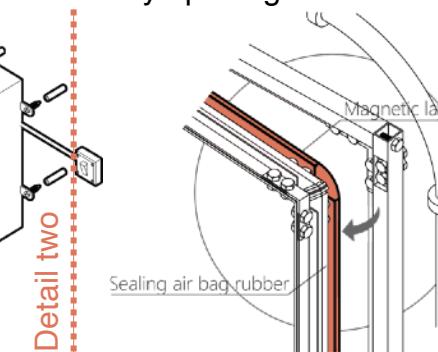
### Specific structure



### Details

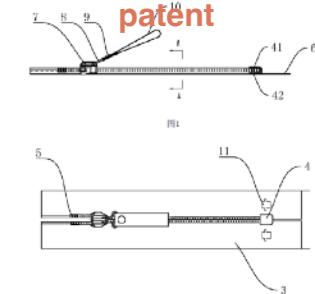


The inner curtain of the device is equipped with a sealed zipper to ensure air tightness and a pull ring is attached for easy opening

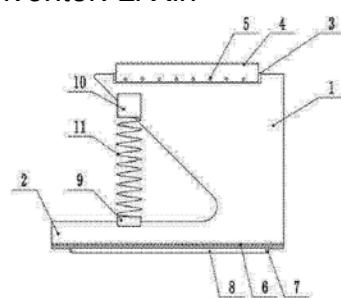


The opening side of the device is equipped with a magnetic door leaf, which is convenient for daily medical staff to enter and exit the switch

### Referenced patent



Application Number: 201921040440.4  
Patentee: Wuxi Hailong Sealing Technology Co., Ltd.  
Inventor: Li Xin



Application Number: 201720635080.7  
Patentee: Anhui Bangrui New Material Technology Co.,Ltd. Inventor: Shi Qianzhong Zhu Ping Liu Aobo

## Response to principles

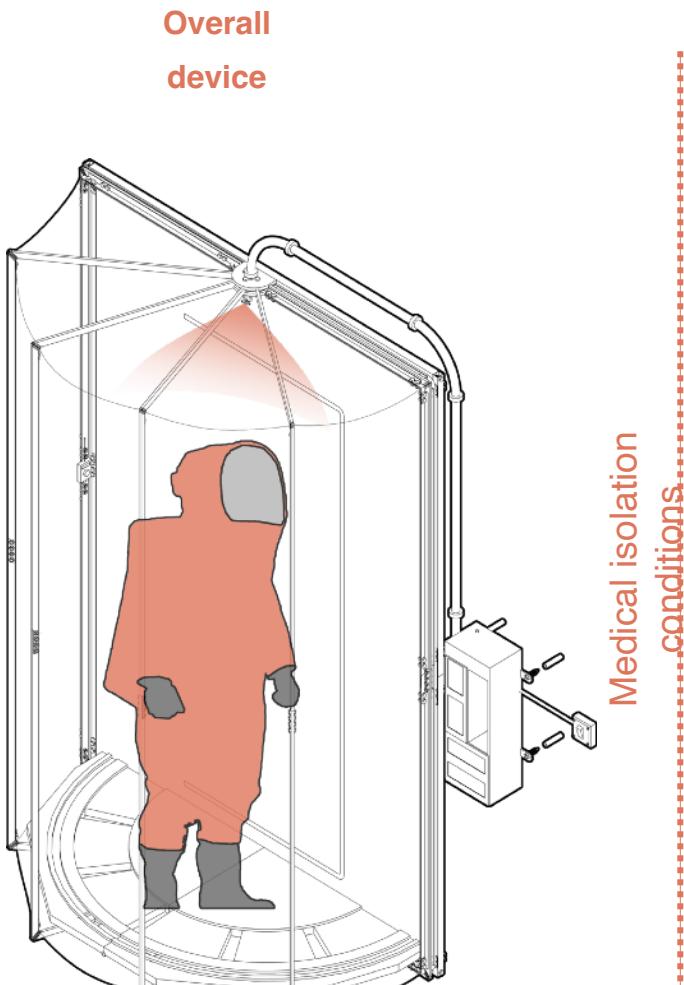
### Security

1. Three-areas and two-lines

principle  
2. Air

tightness  
3.

Disinfection



Overall  
device



Radiation  
disinfection



Ventilation  
disinfection



Disinfection

Advantages and disadvantages

The cost is too high / Good effect

Device

Disinfecta

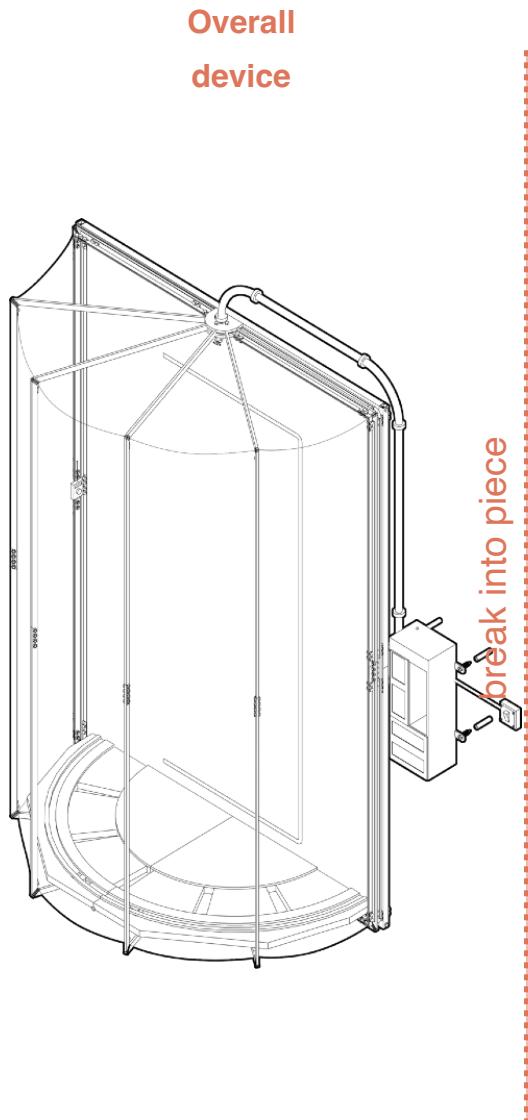
Chemical  
disinfection

= Disinfecti  
on spray 98% / 10min

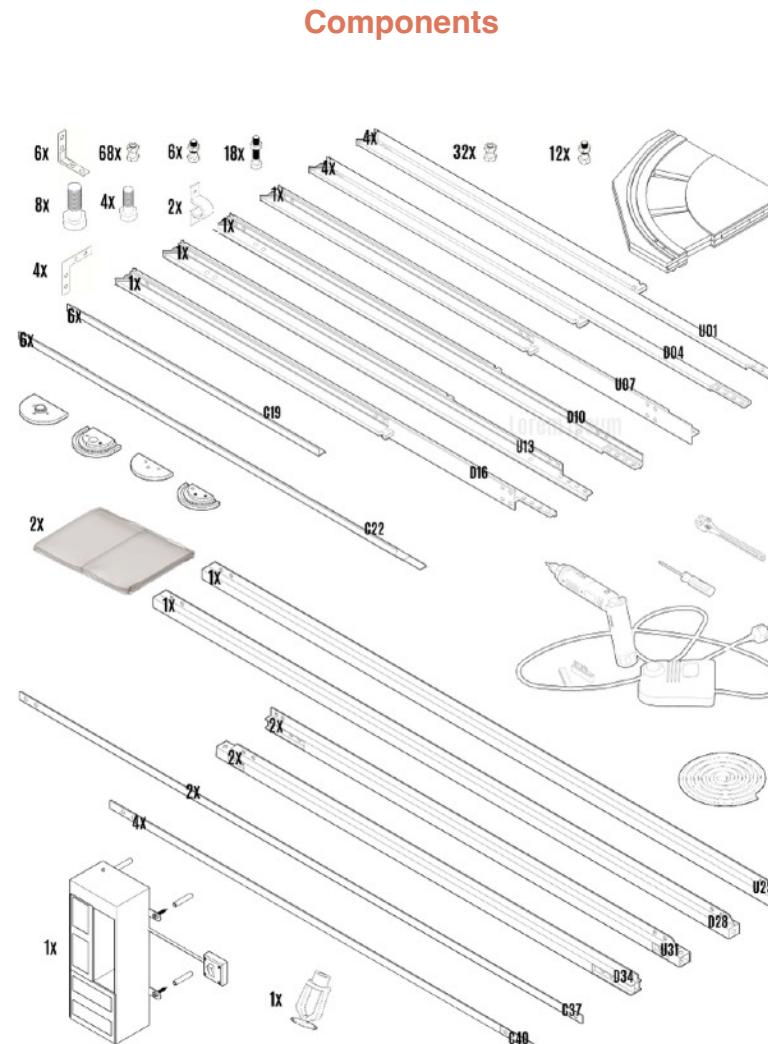
## Response to principles

### Portability

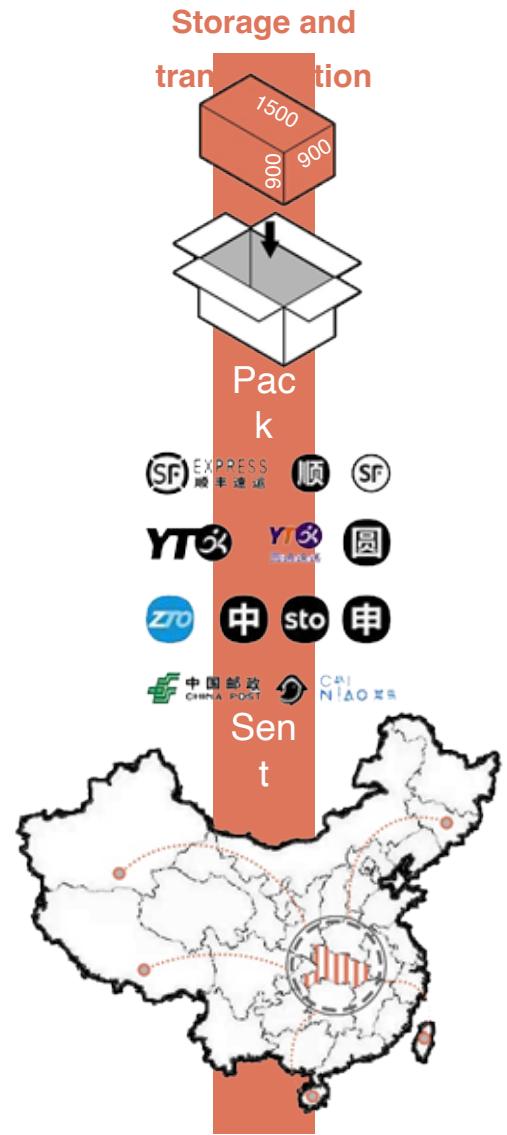
1. Convenience of storage and transportation



break into piece



Express logistics

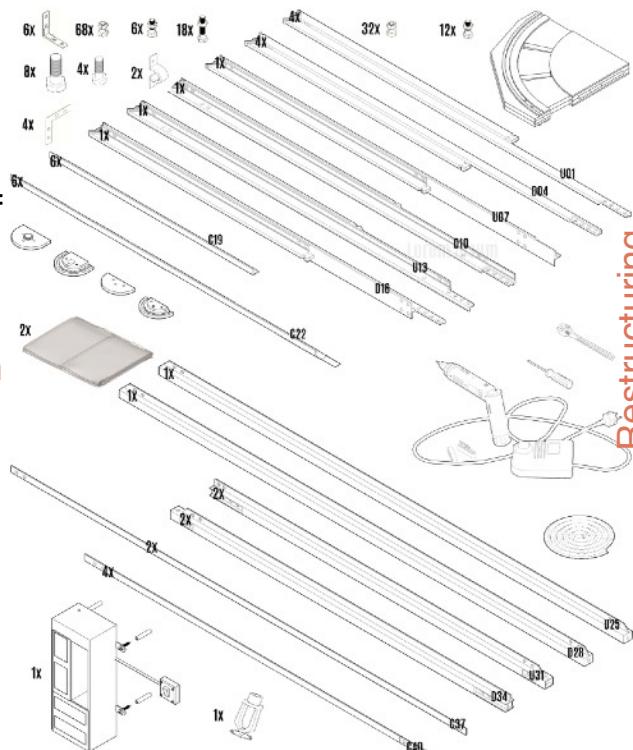


## Response to principles

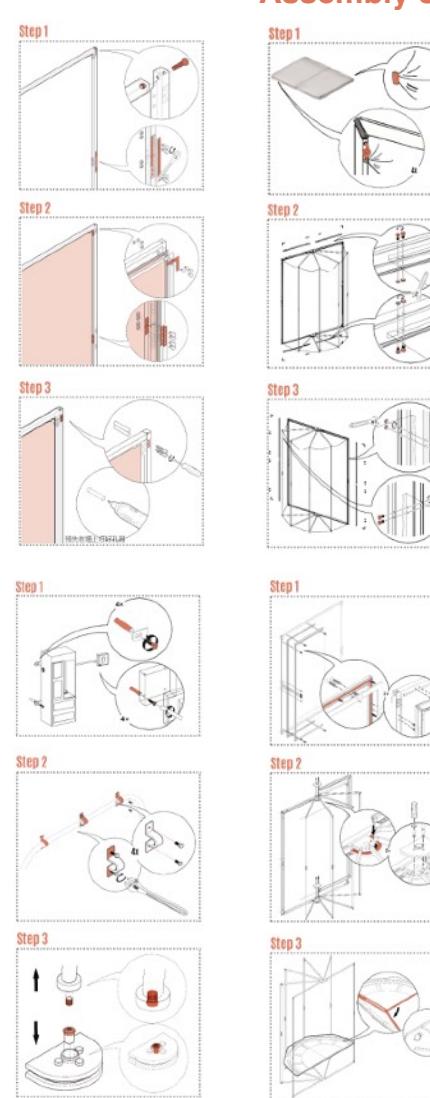
## Portability

1. Convenience of storage and transportation
  2. Fast installation

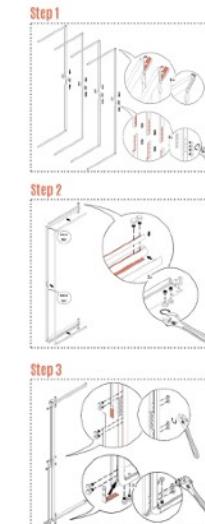
# Components



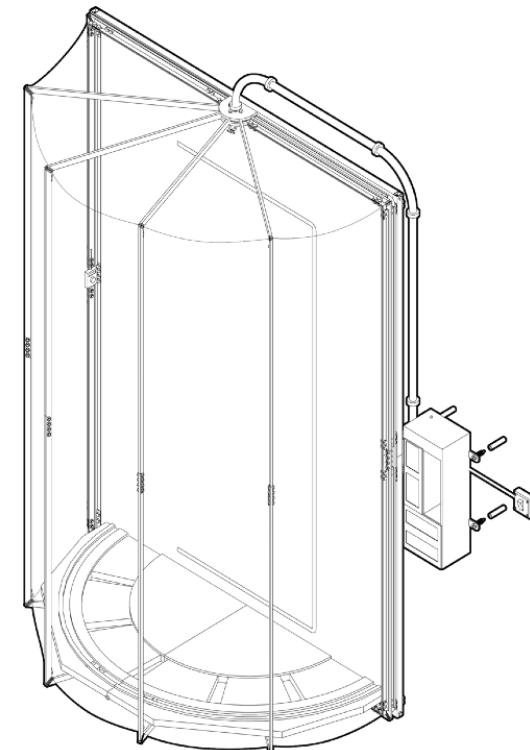
Restructuring



## Assembly steps

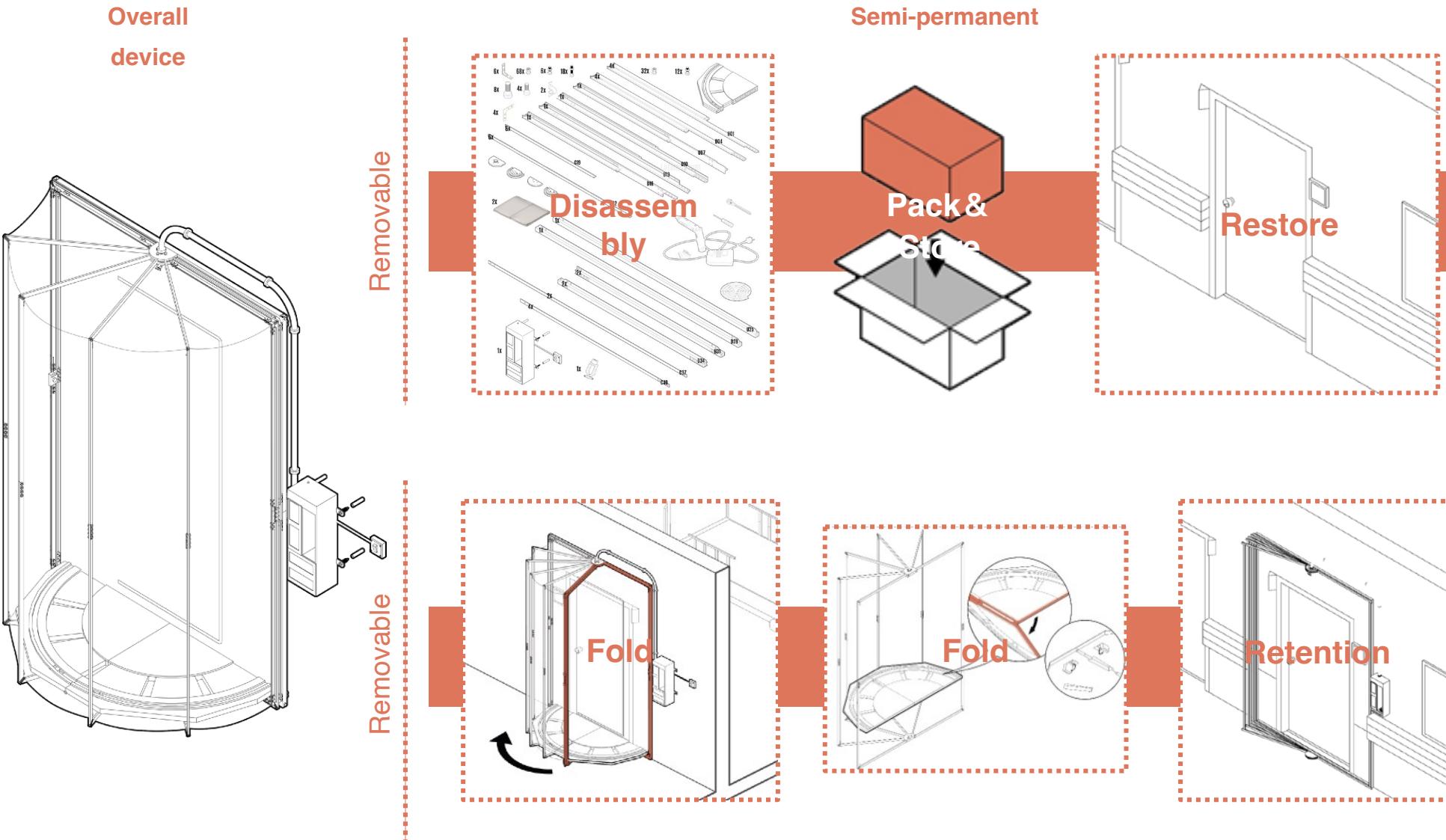


## Reappear

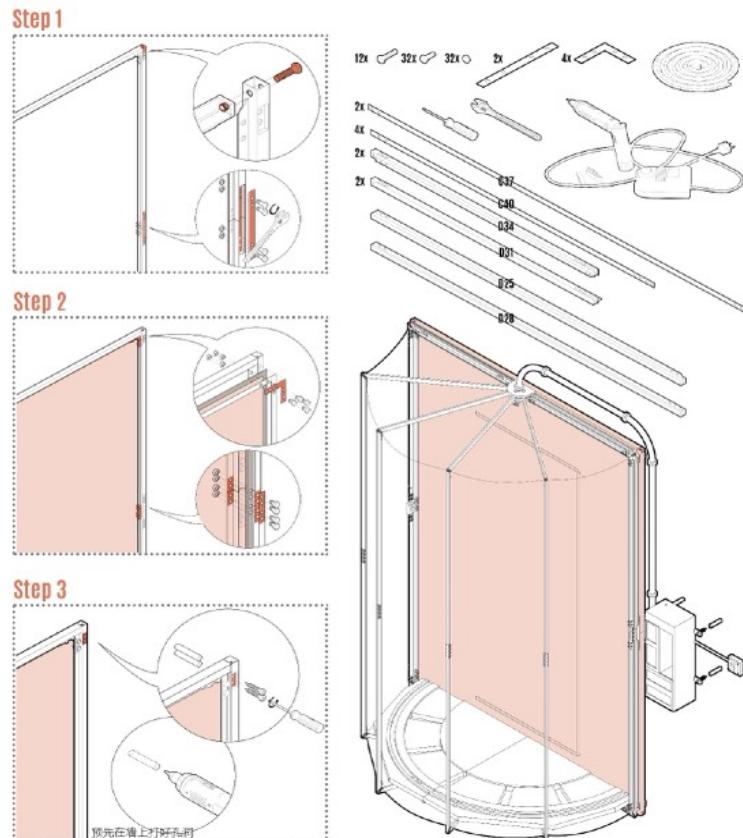


## Overall device

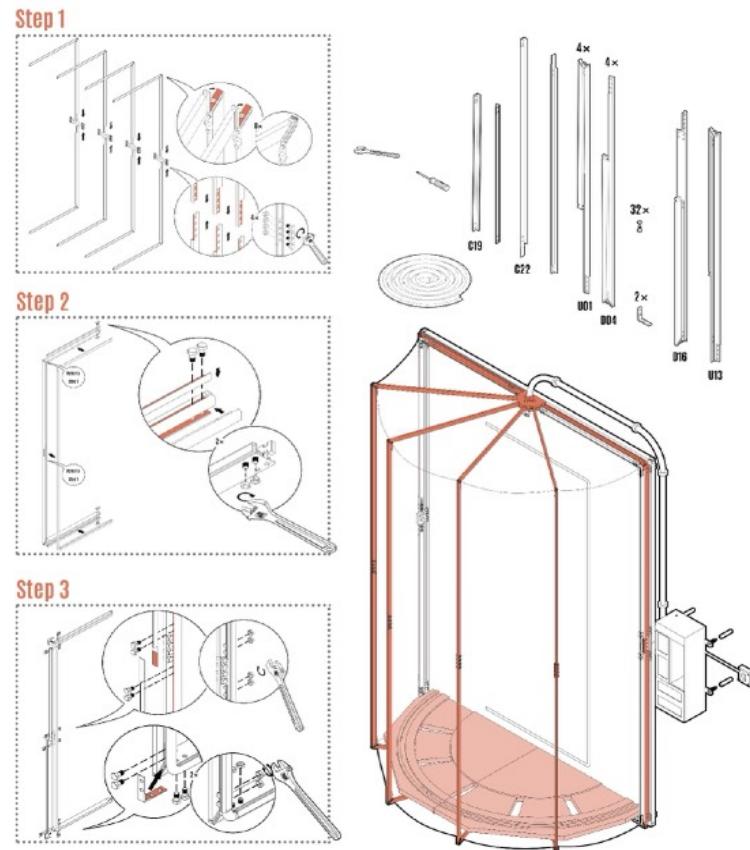
## Response to principles



# Use process

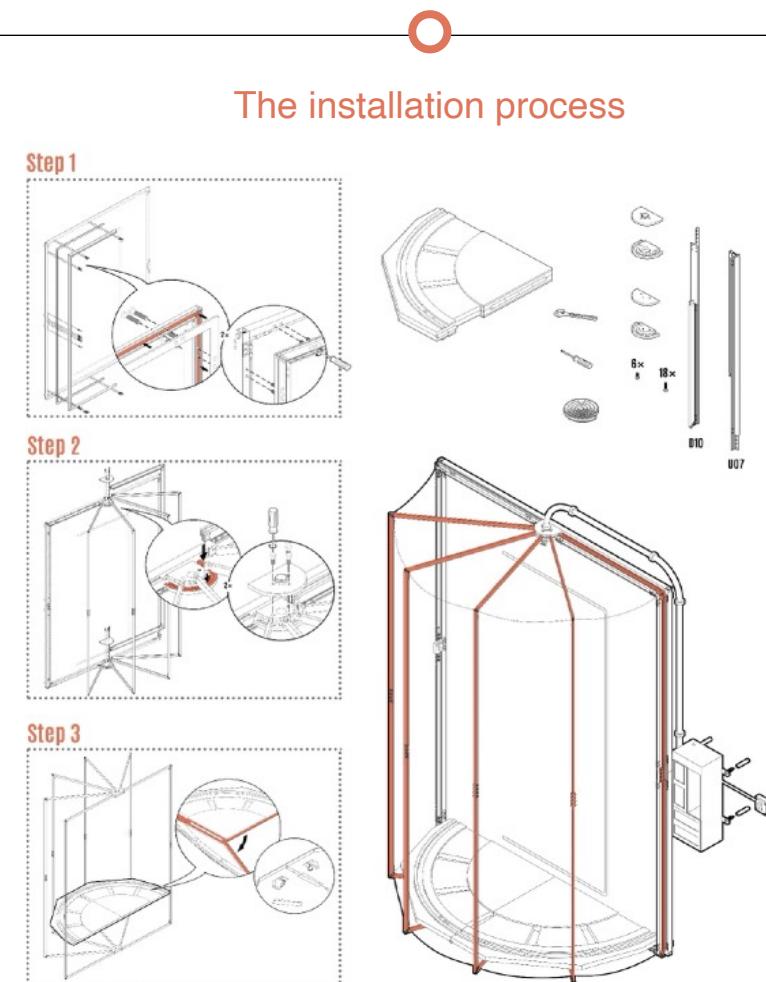


## Door frame part



## Skeleton part

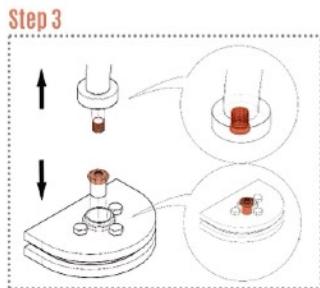
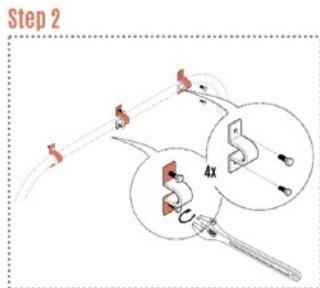
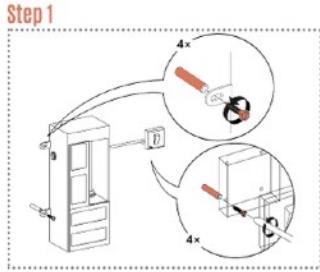
01



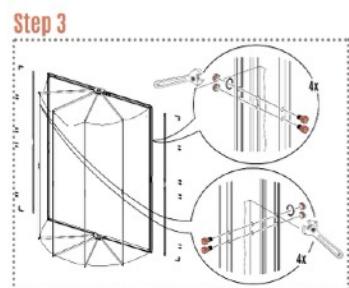
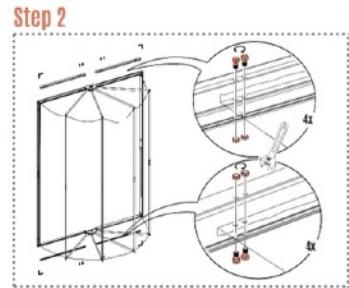
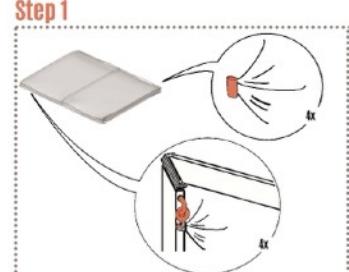
## Skeleton part

02

## Use process

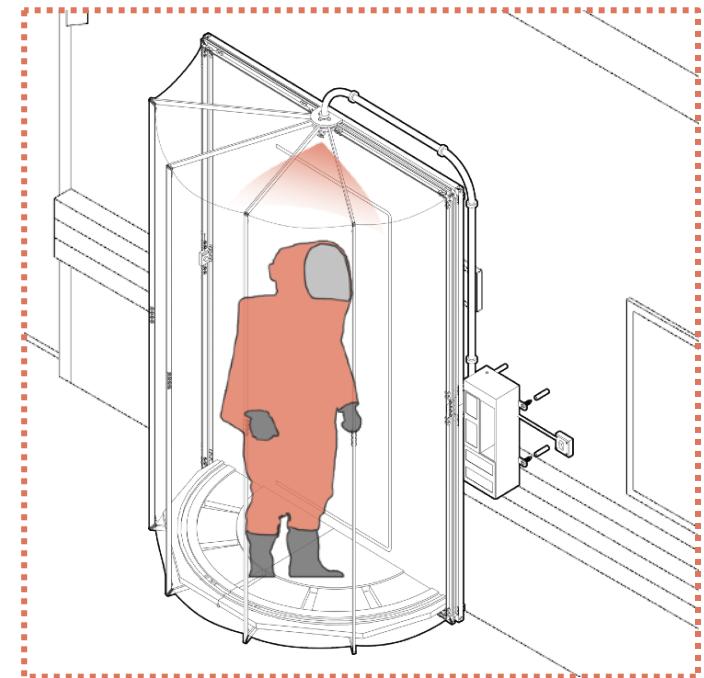


Disinfection device  
part



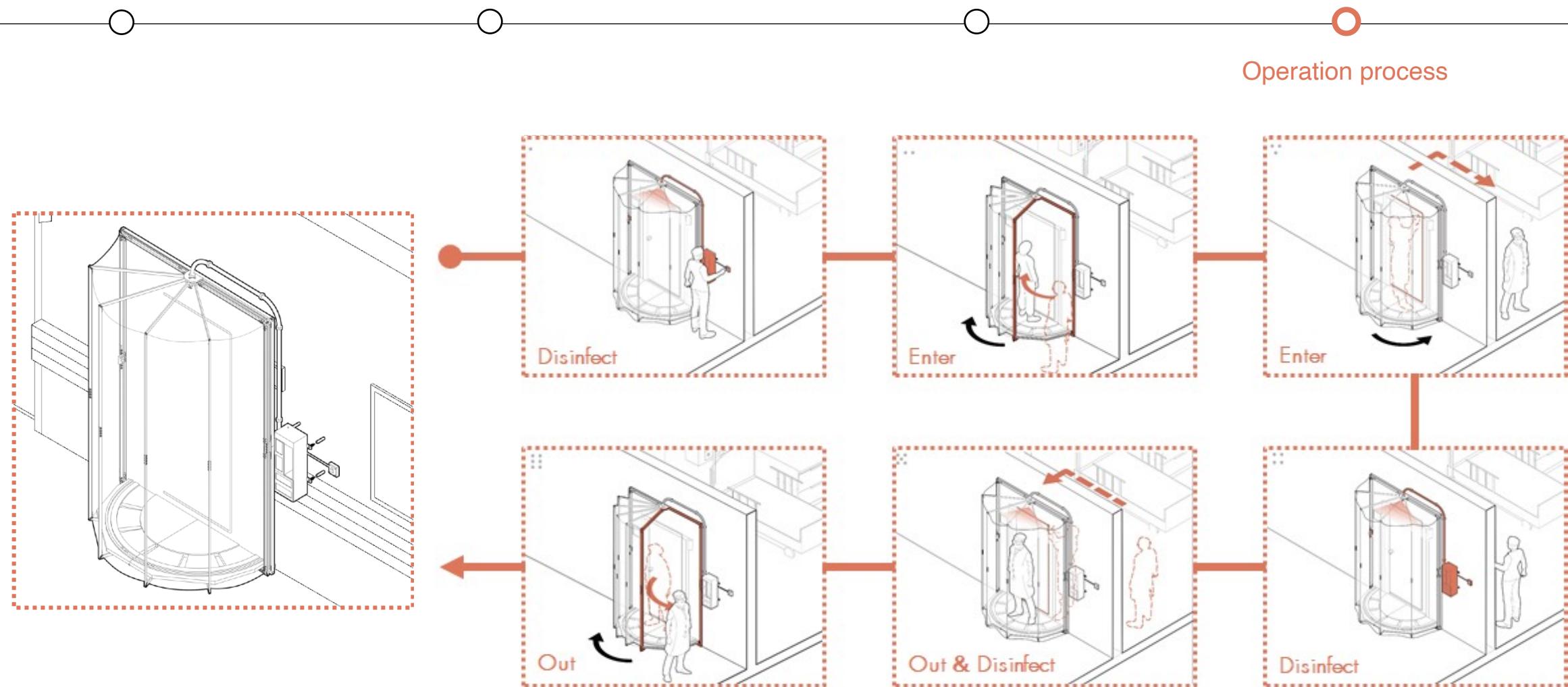
Membrane part

The installation process

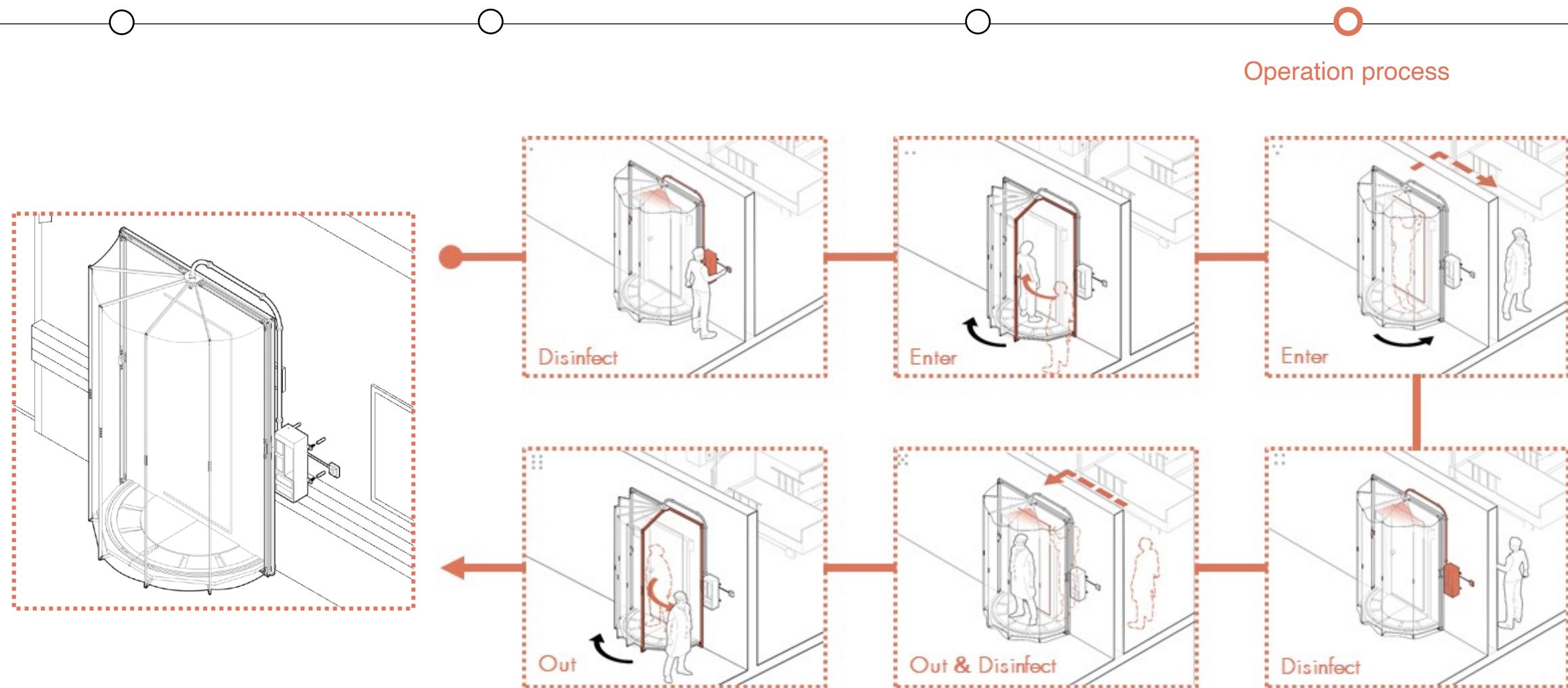


Put into use

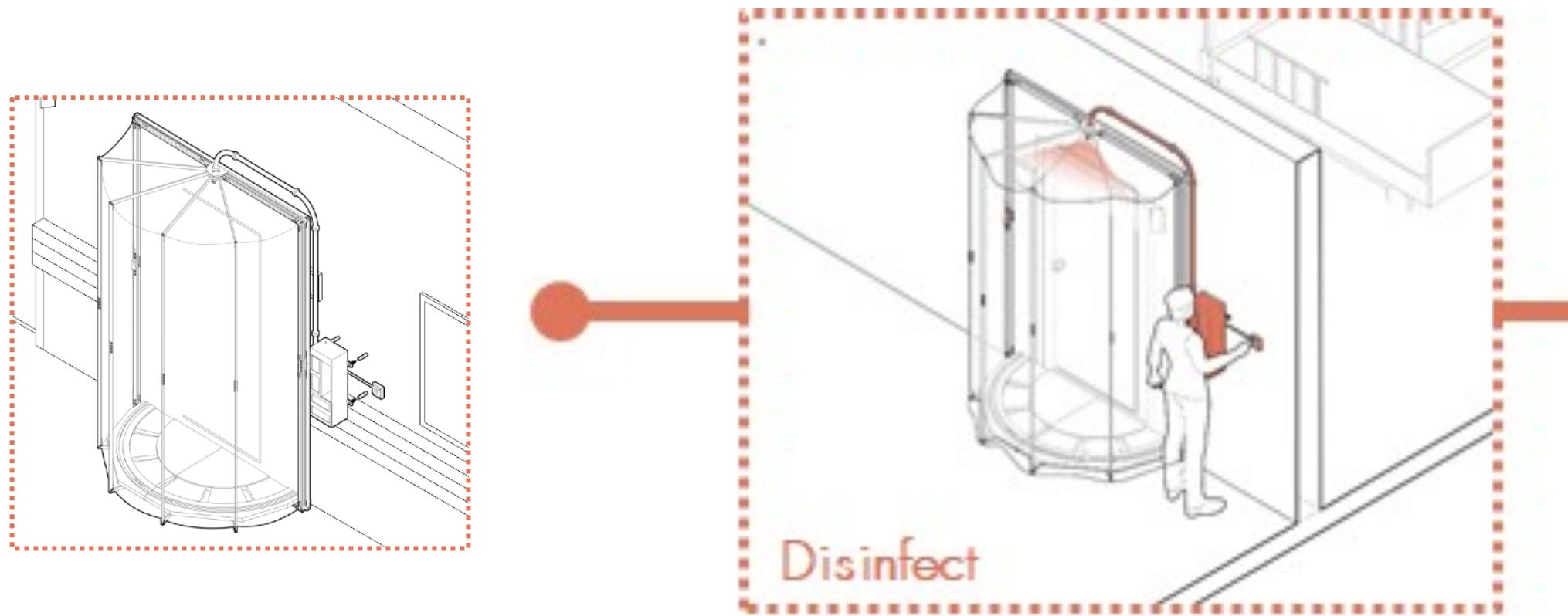
## Use process



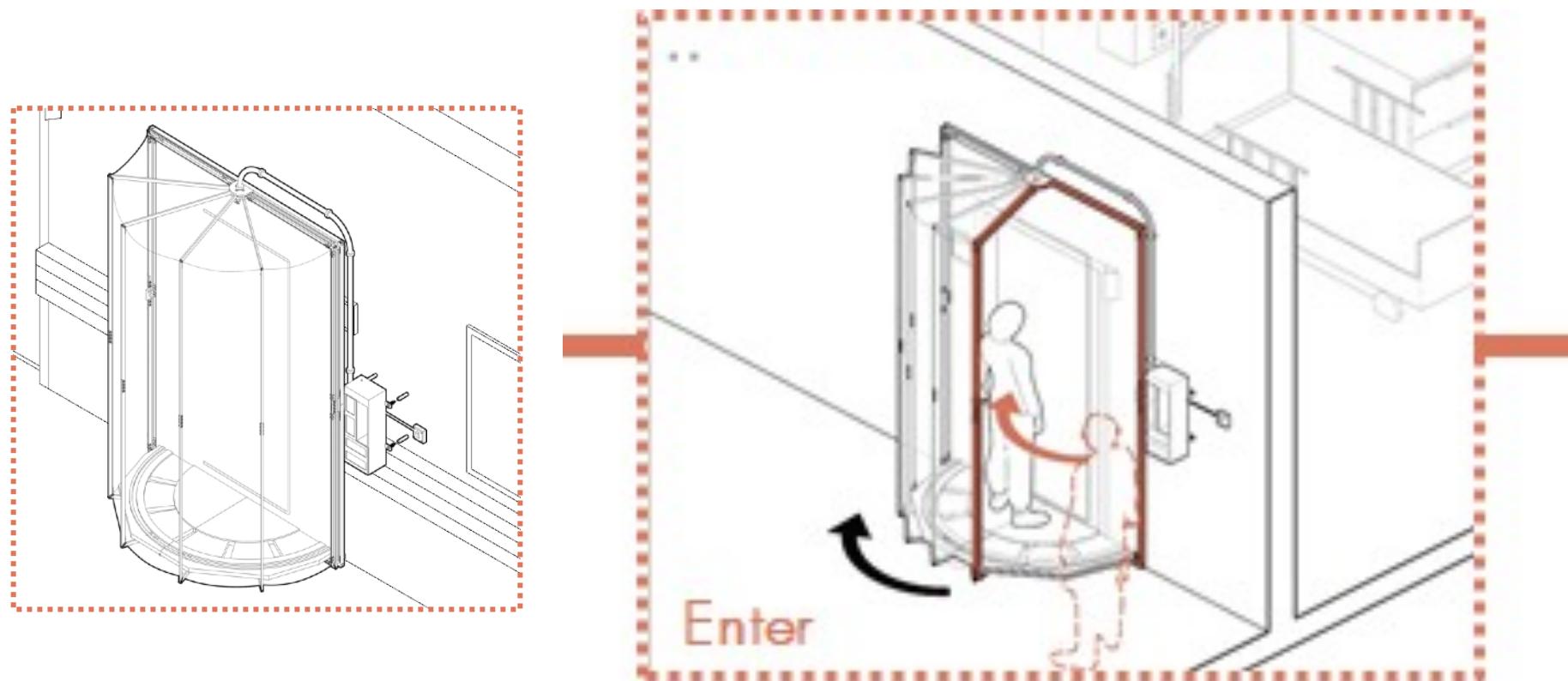
## Use process



## Use process

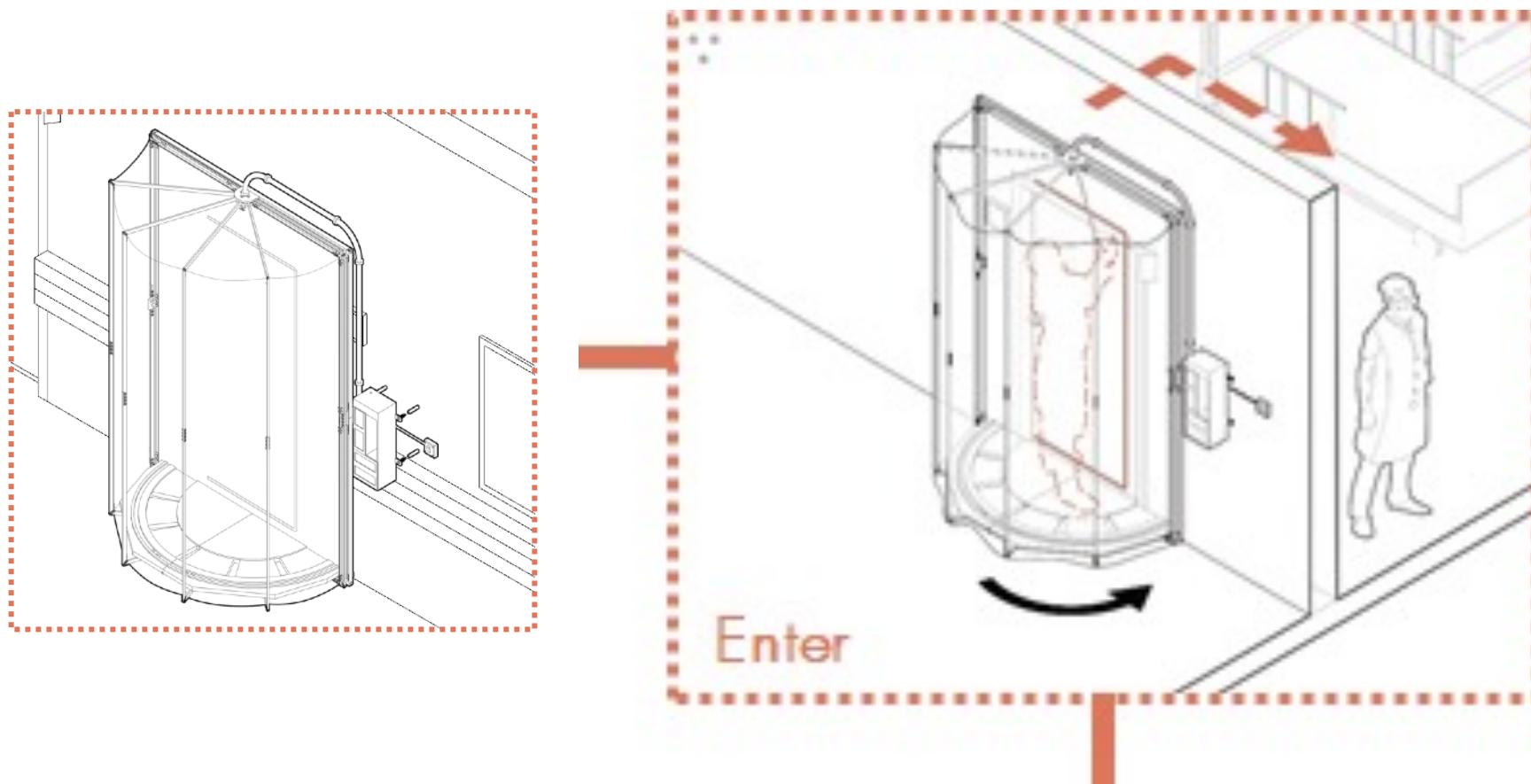


## Use process



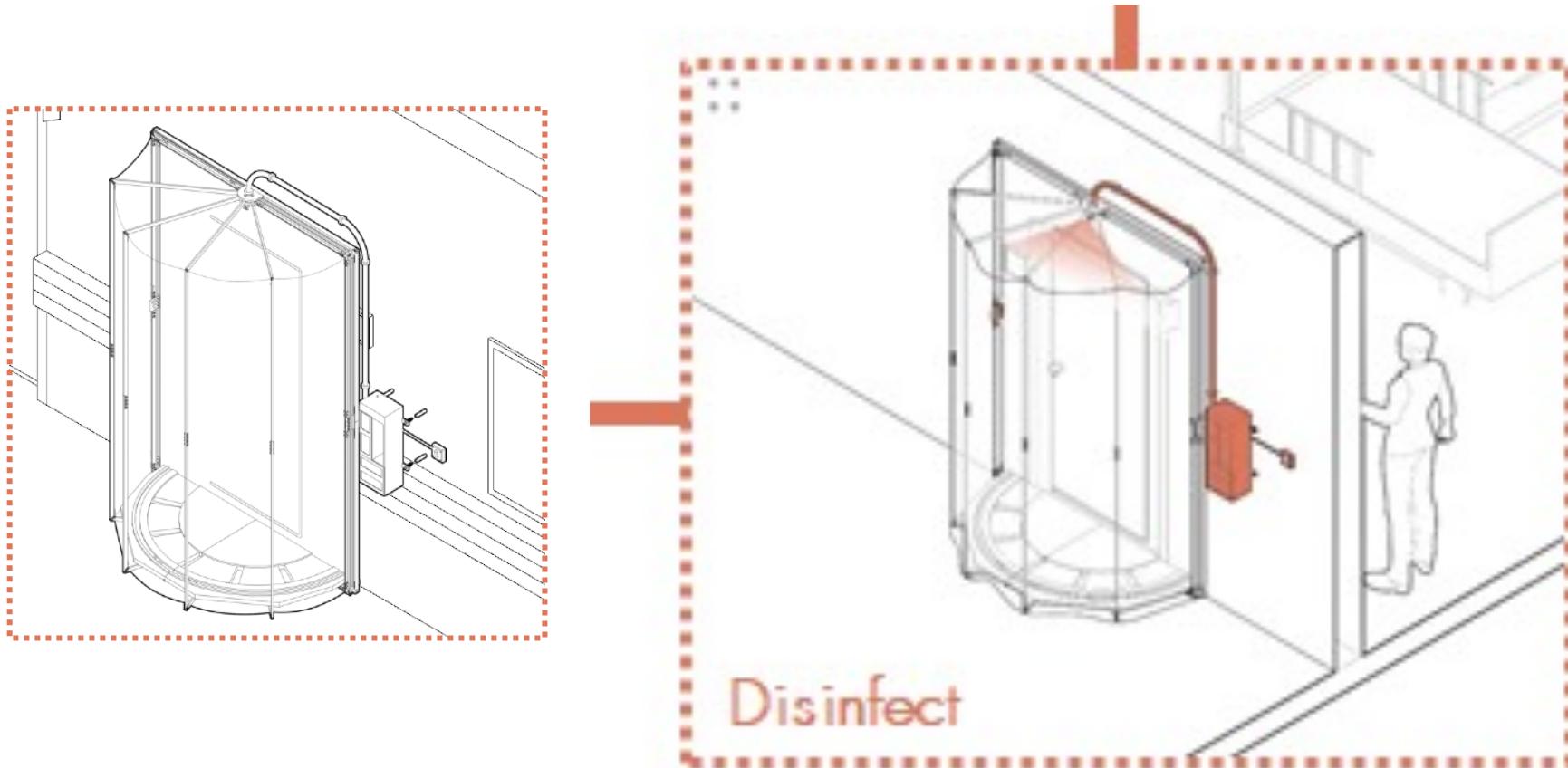
Operation process

## Use process



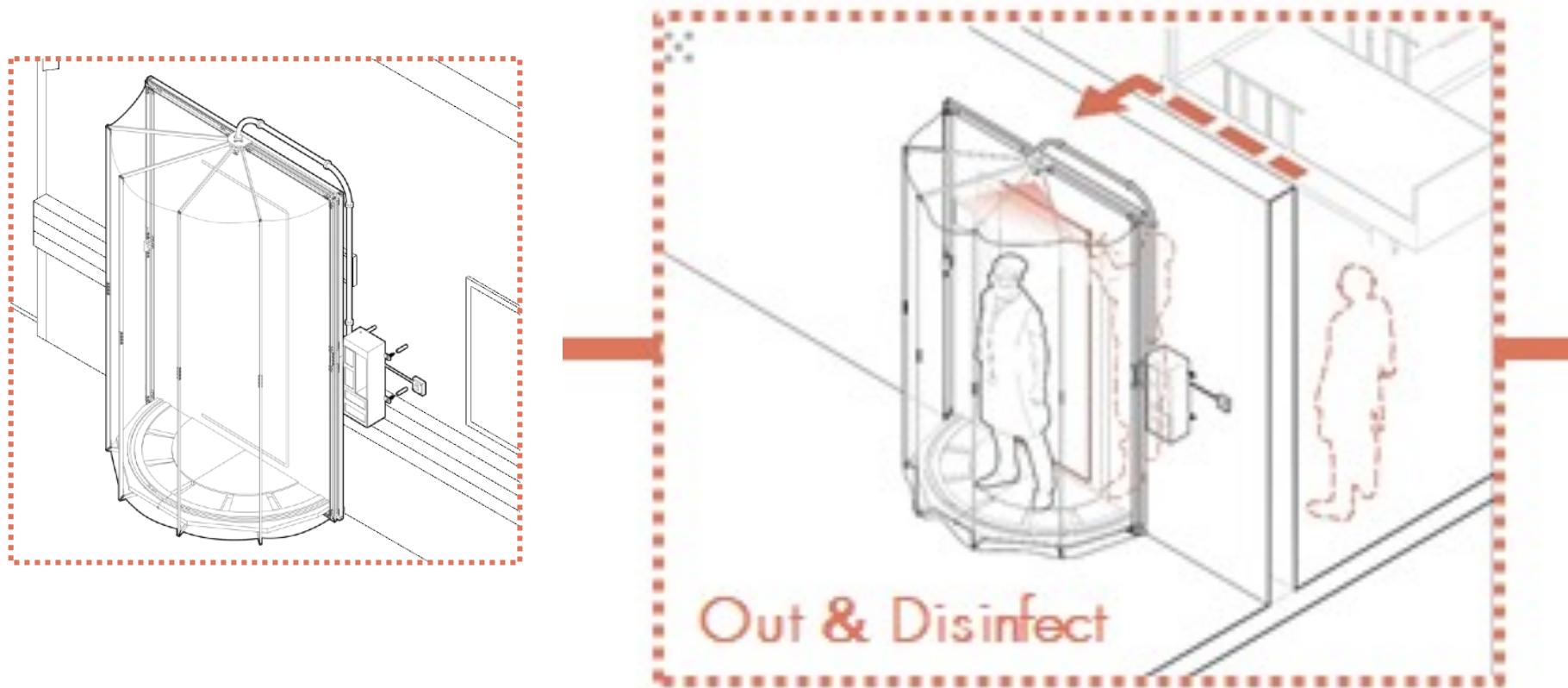
Operation process

Use process



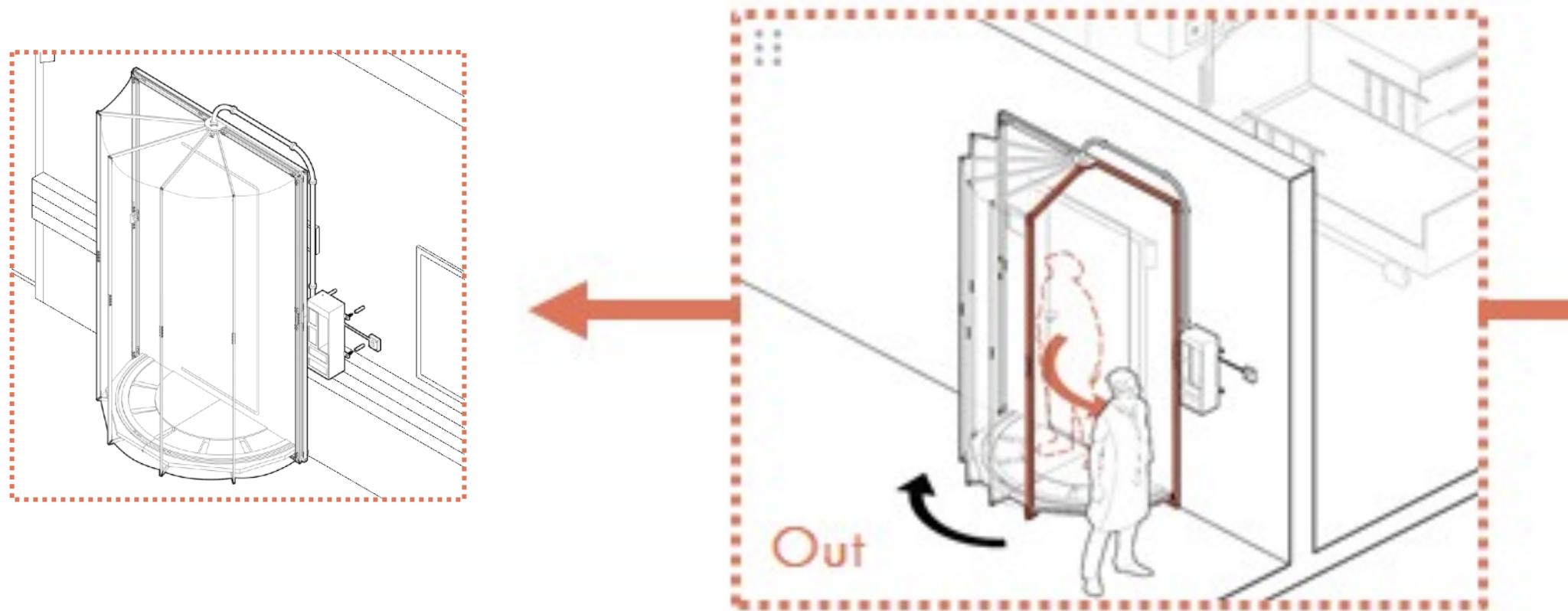
Operation process

## Use process



Operation process

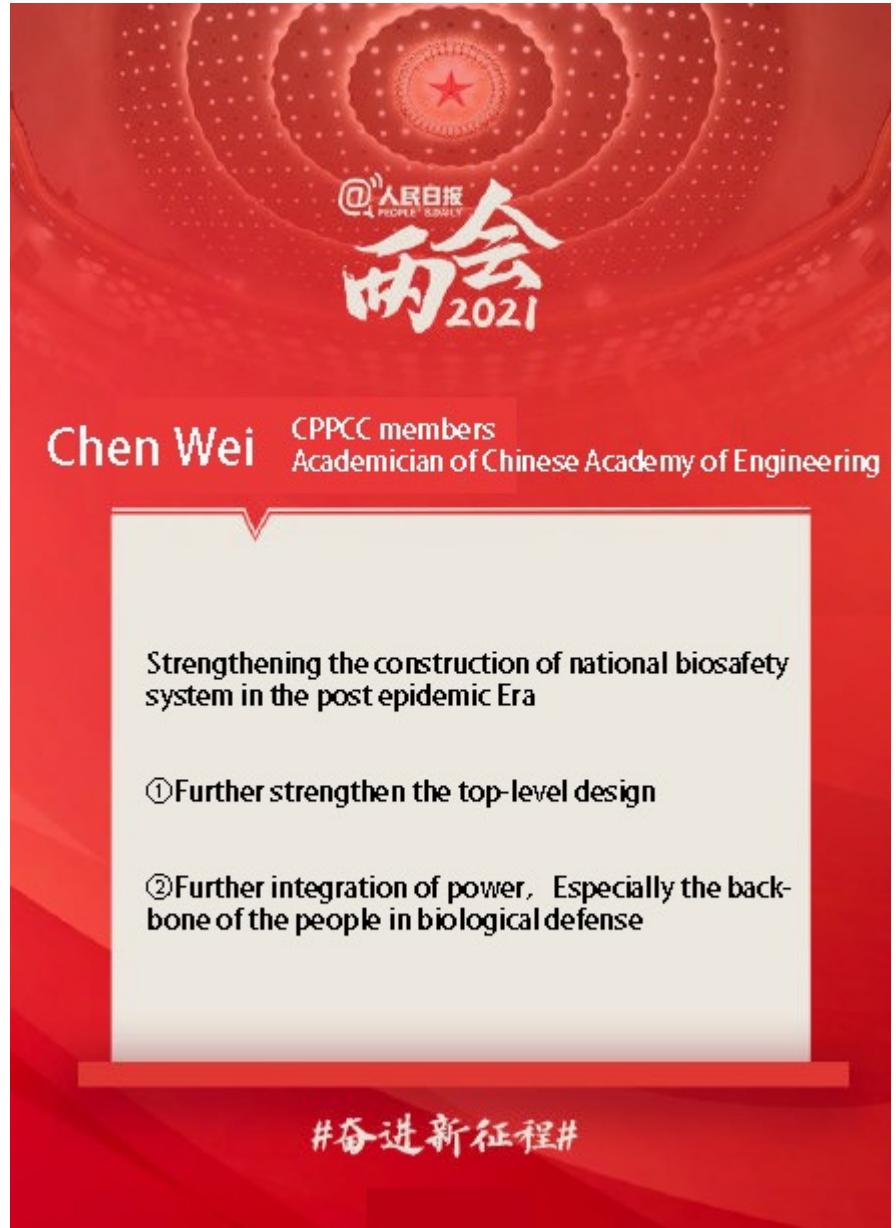
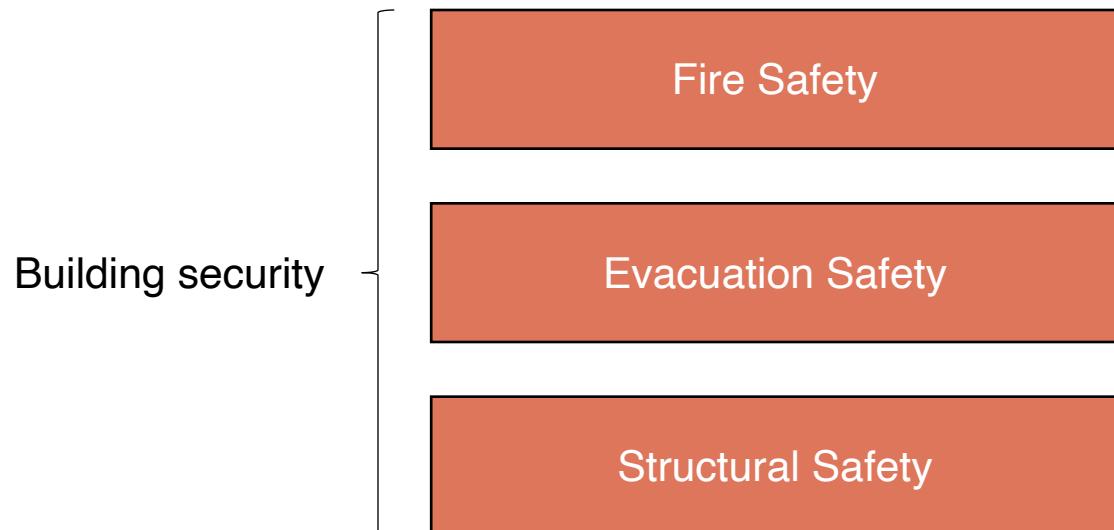
## Use process

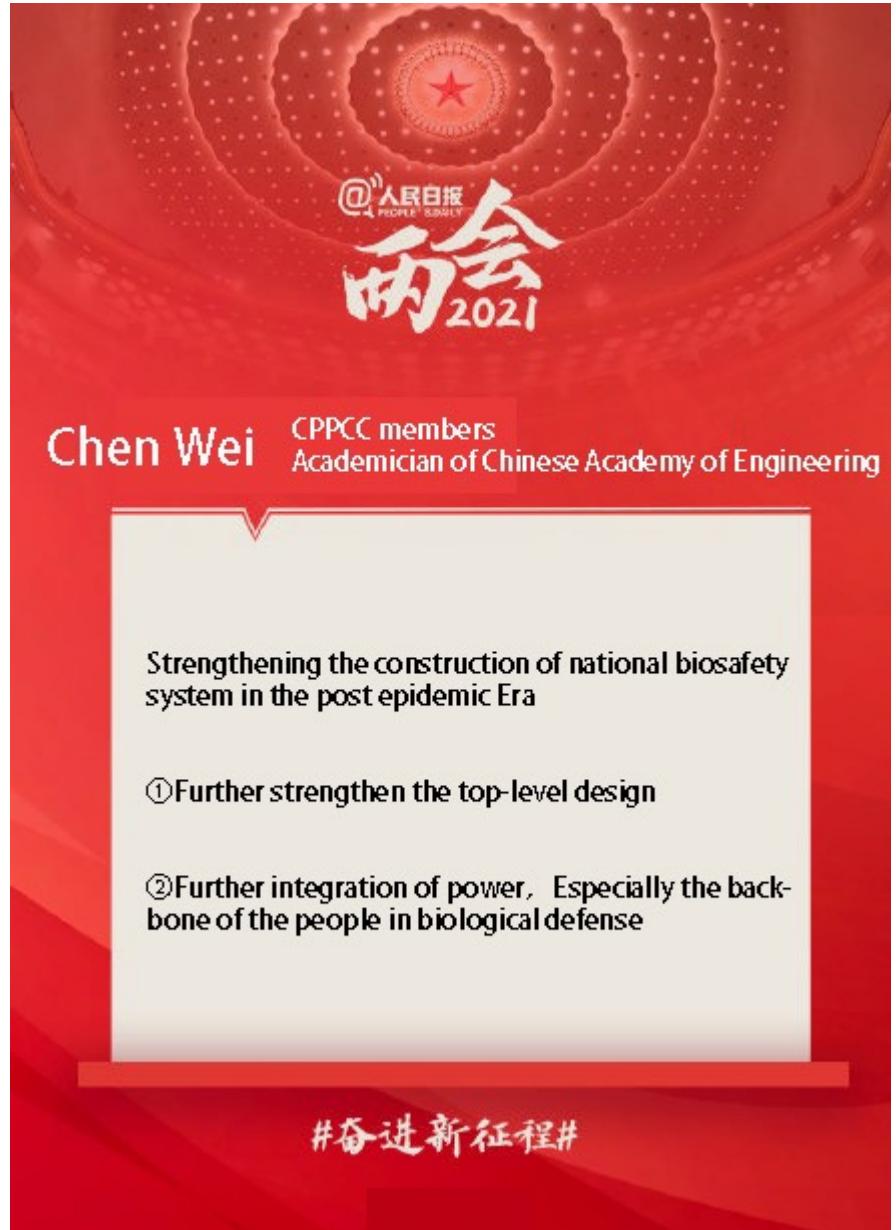
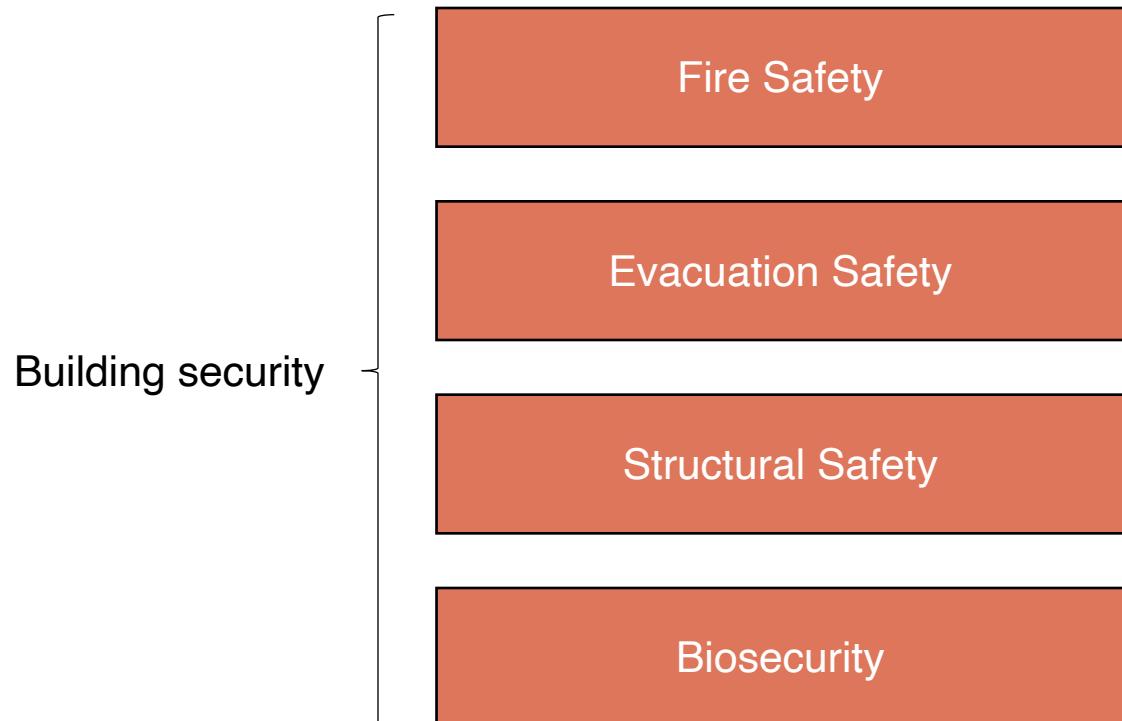




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Part-4 Future Outlook





## Reconstruction of existing buildings

Clinic



Between Consultation area and Inpatient Ward

Community Hospital



Between corridor and Inpatient Ward like a Mini disinfection room

School



Between classroom and corridor

Home



Between the living room and other rooms like bedroom

## Industrialization

Component classification



Mechanized production



Express delivery

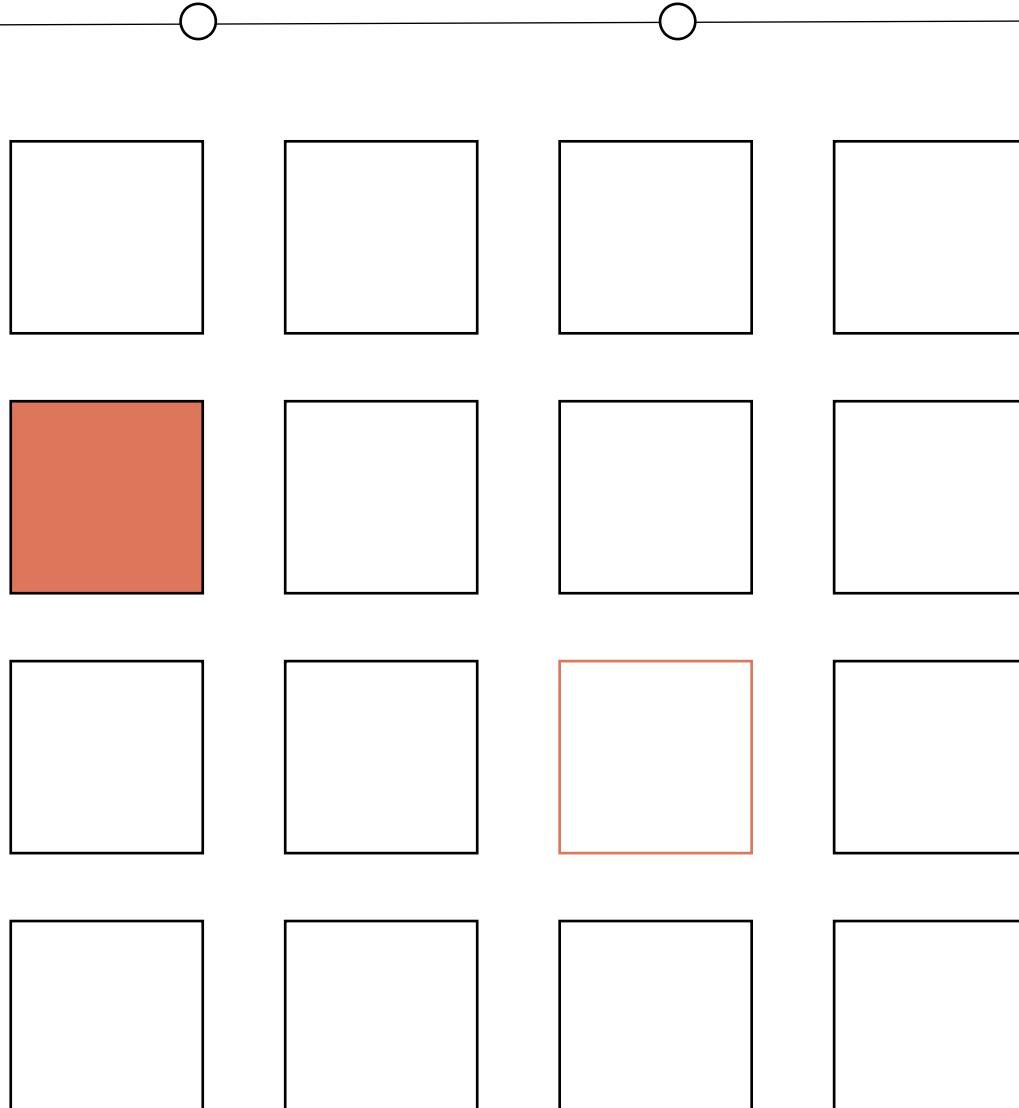


Field assembly



## Umbrella– A new anti-epidemic reaction system

Area equipped with device  Hospital



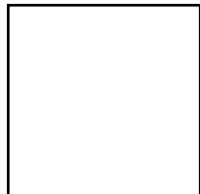
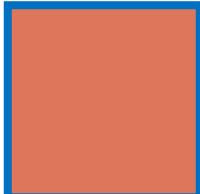
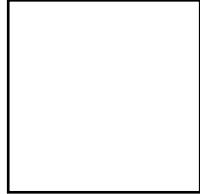
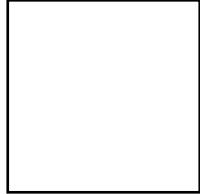
City: collection of people and space equipped with Umbrella

## Umbrella– A new anti-epidemic reaction system

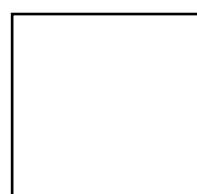
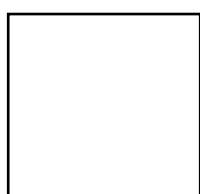
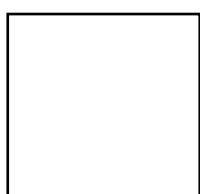
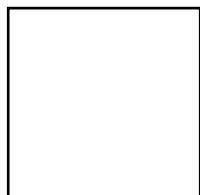
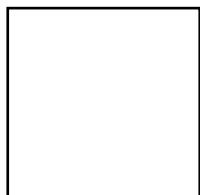
Area equipped with device  Hospital



Beginning: sheltered in place



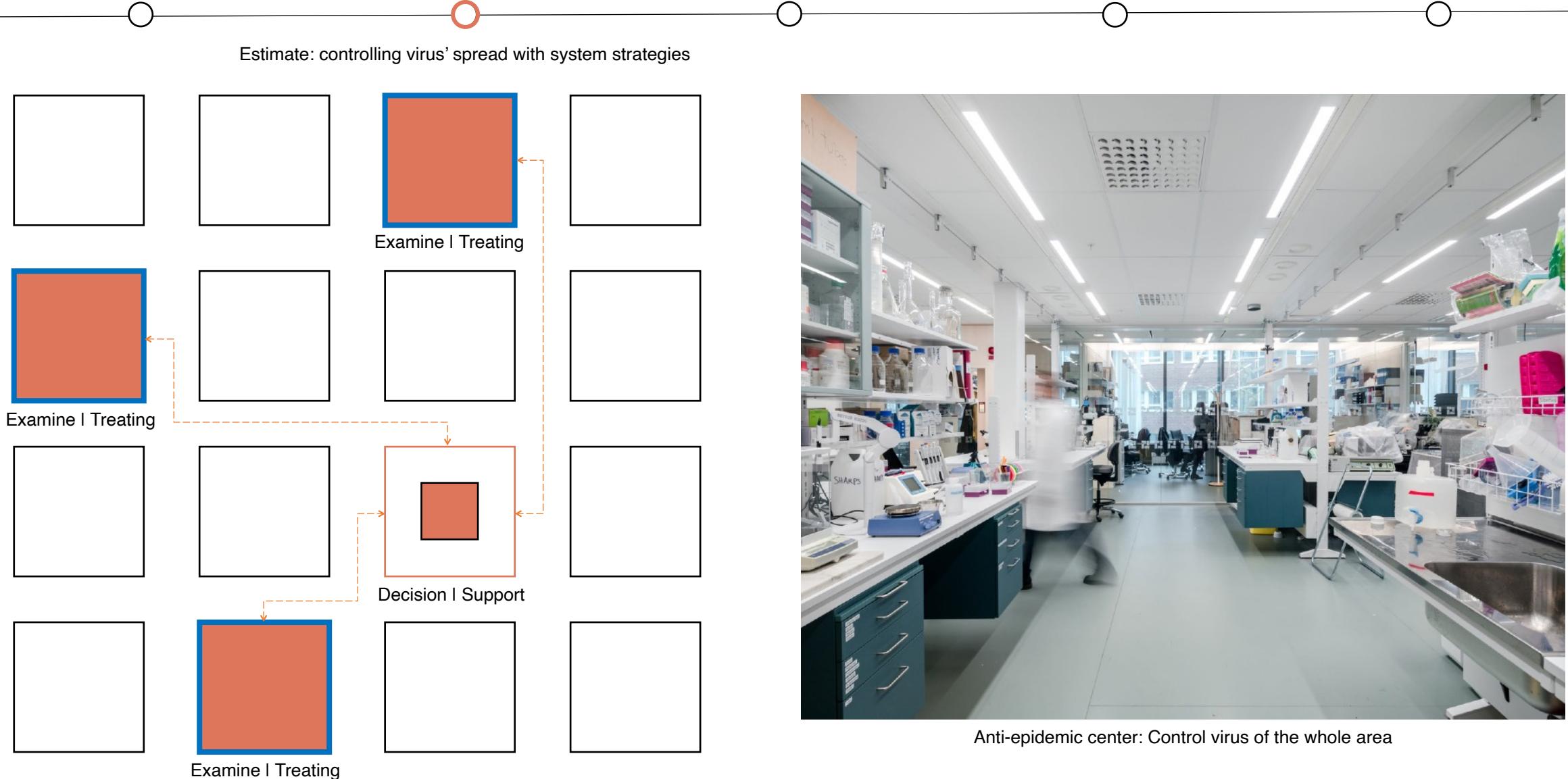
Examine / Treating



School Infirmary: potential patients are tested and sheltered in place

## Umbrella– A new anti-epidemic reaction system

Area equipped with device  Hospital

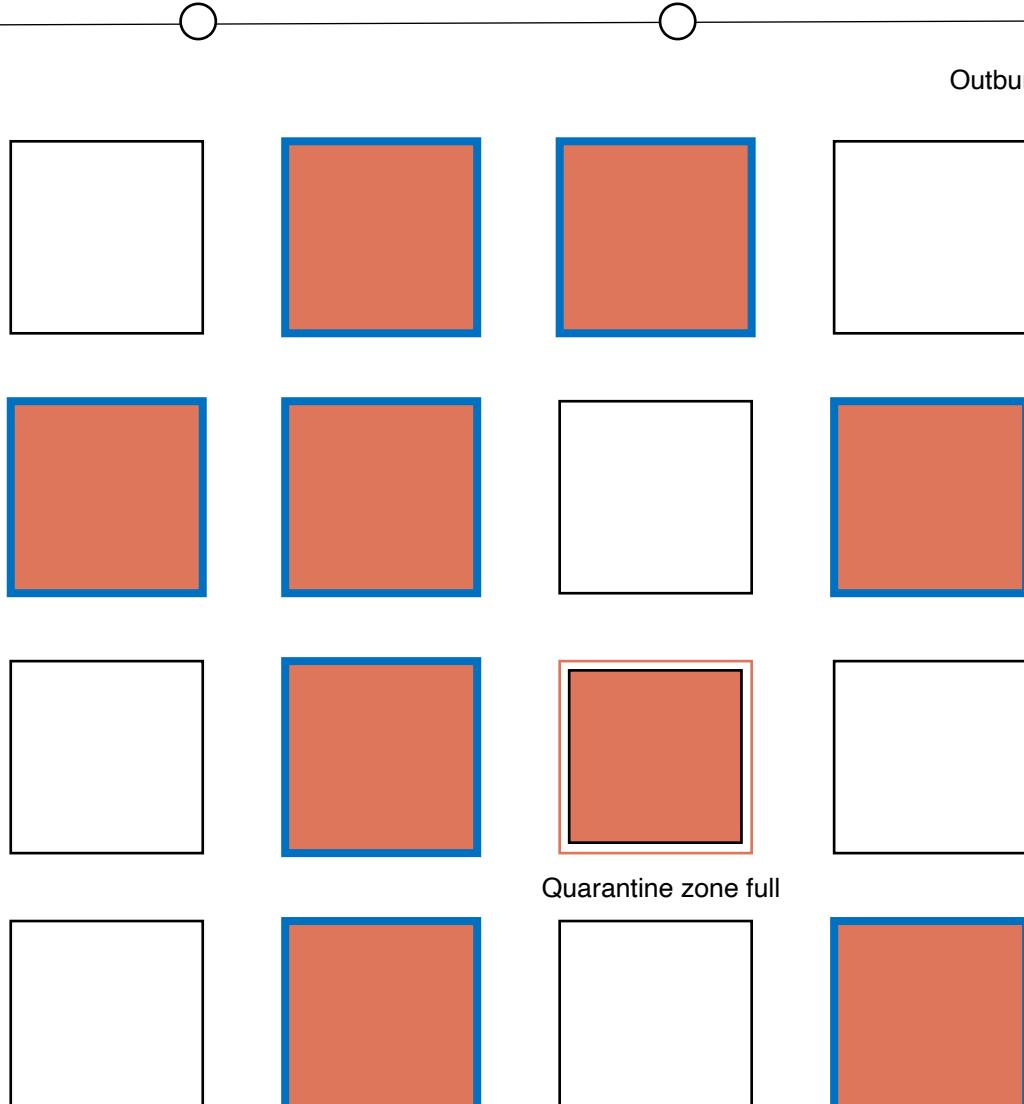


## Fangcan – A kind of temporary hospital g

Area

Hospital

Infected Area

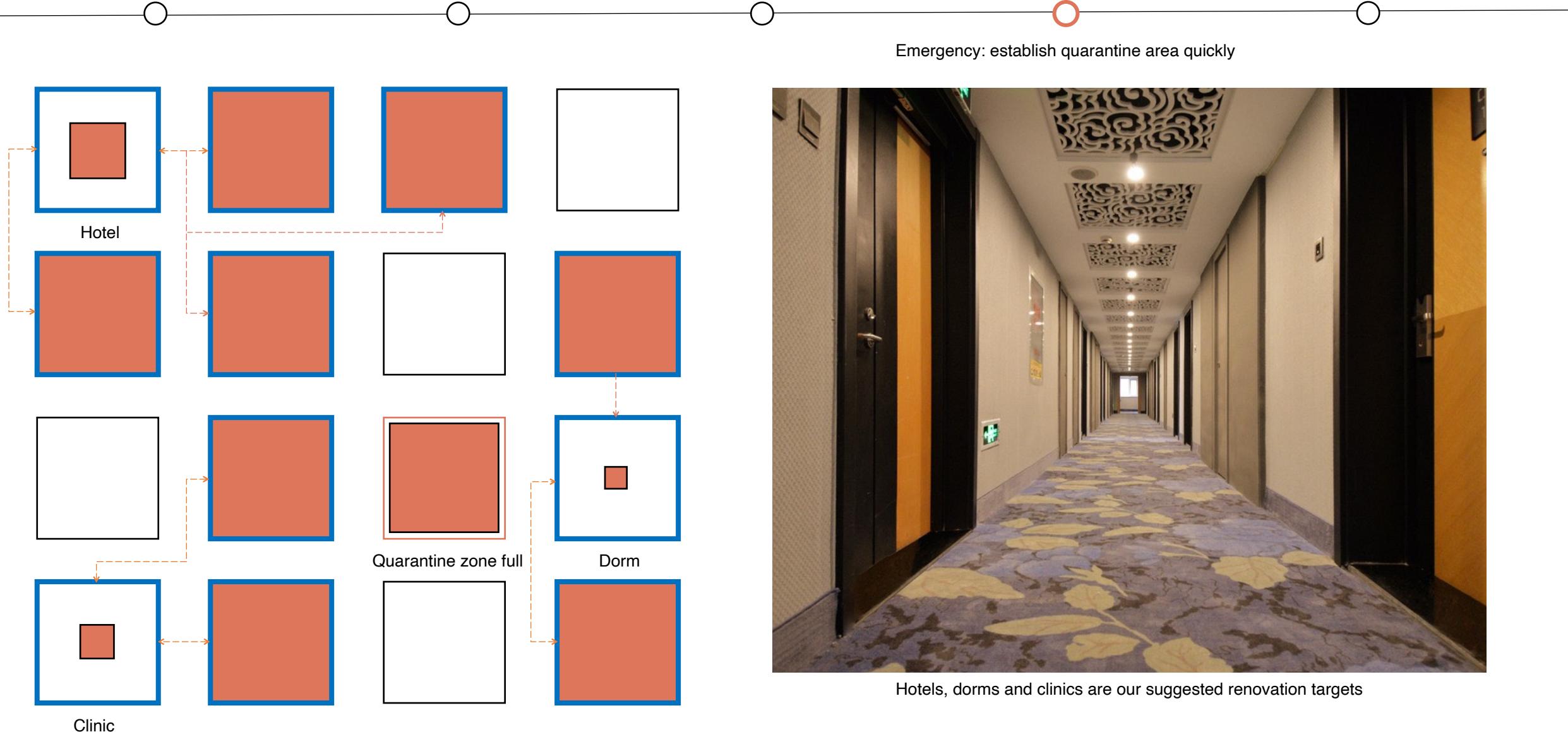


# Fangcan – A kind of temporary hospital

Area

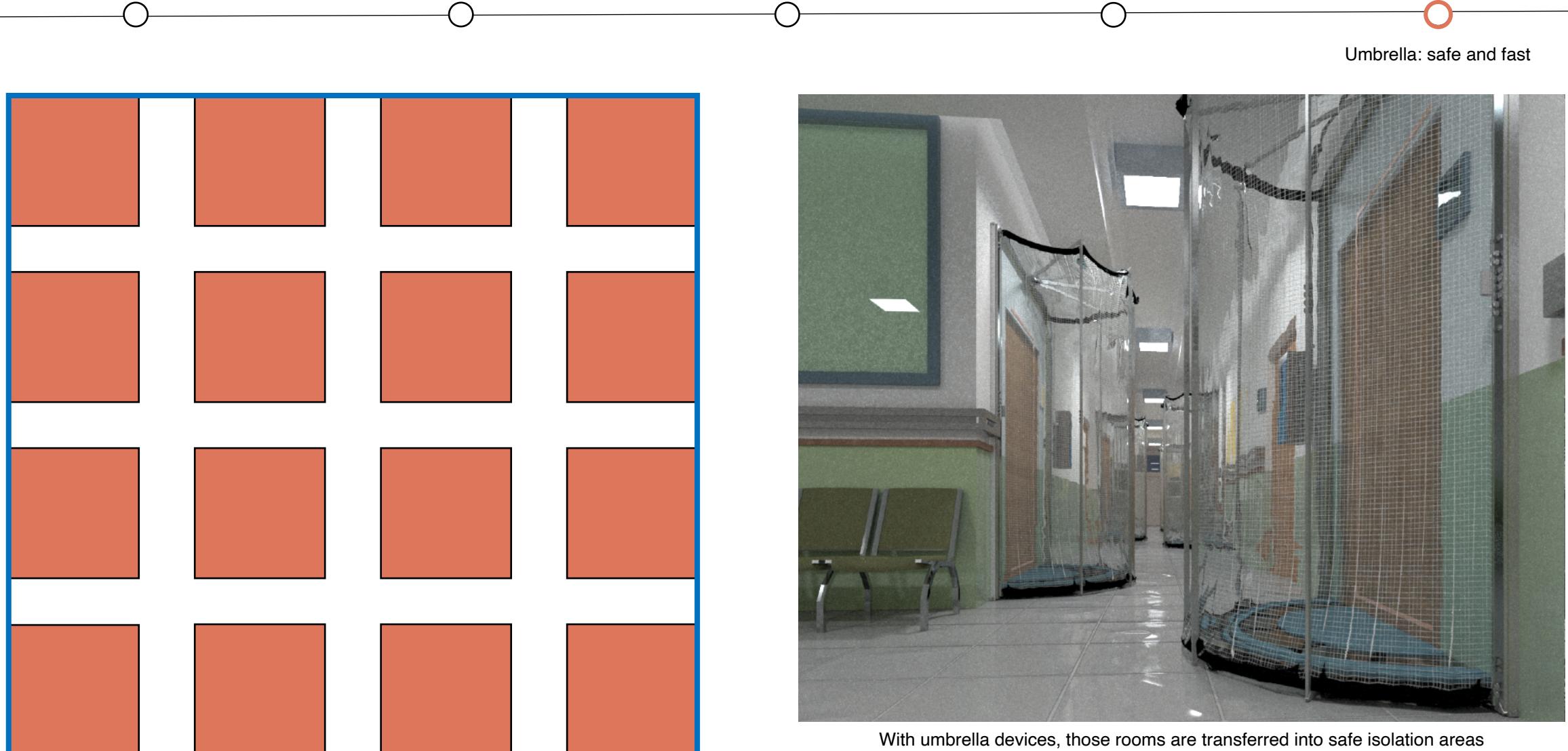
Hospital

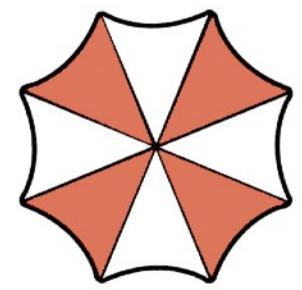
Infected Area

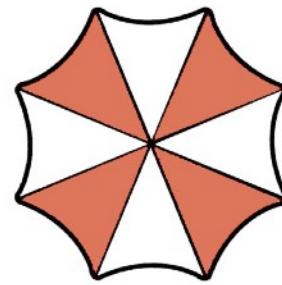


# Fangcan – A kind of temporary hospital

□ Fangcang ■ Patients







U M B R E L L A

Safe Celerity Simple