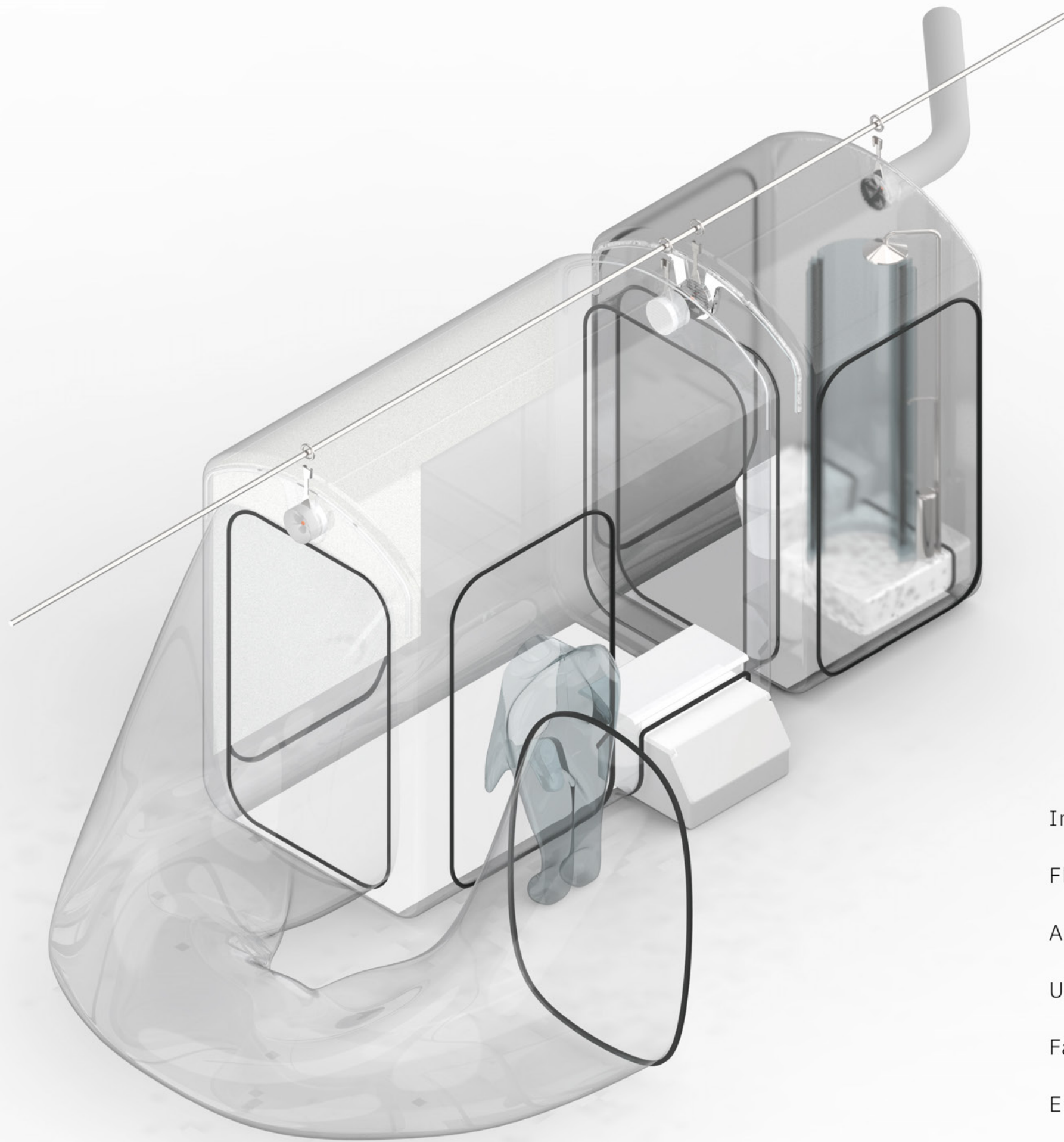




COID  
2146 Team





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## Inspiration: Diving-Bell Spider

COID, or CO-habitat Independent Diving-Bell, a play on words on the name of novel Coronavirus COVID-19, while the removal of V (virus) from the name signifies the essence of this proposed design.

The design concept of COID comes from Diving-Bell Spiders (Binomial Name: *Argyroneta aquatica*), where an oxygen bubble - a diving bell like structure is formed around the spider to allow the spider to have the freedom living in-between land and water.



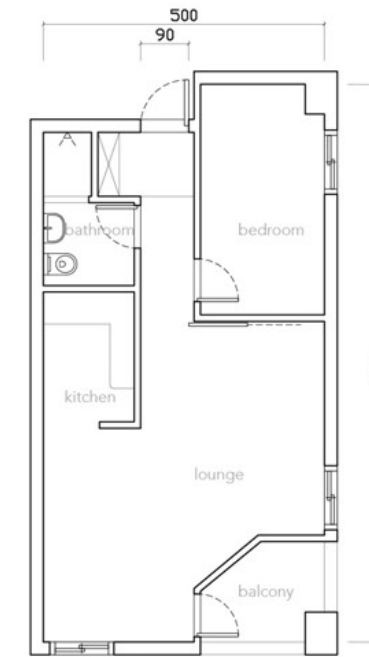
Image credit: copyright Stefan Hetz.

# Flexibility

According to data, the average American area of living space is 67m<sup>2</sup> (global maxima), on the contrary the average Hong Kong living quarters is sized at 14m<sup>2</sup> (global minima). Under such contrast, we decided to base our COID system on the compact and narrow spaces of average Asian social housing as reference, allowing the COID system to be utilized without constraints. The modularity allows the user to modify the COID system according to the user's needs, at the same time it is applicable to all users with different economical and cultural backgrounds, allowing the patient as well as his or her co-habitants to reside with optimal comfort.

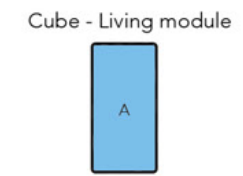


average Asian social housing

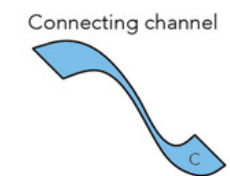


area : 15 square meters  
member : 2-3 people

design



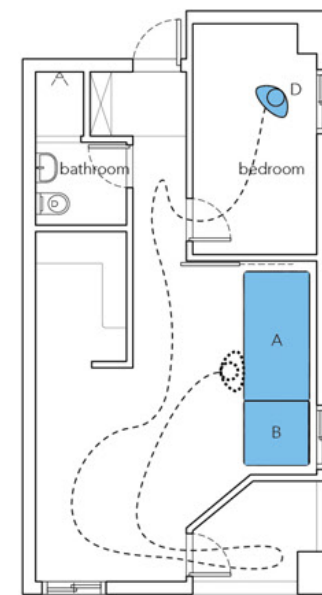
+



■ space for patient

situation : A + B + D

- Readily available bedroom - can be assigned for the patient.
- Readily available bathroom - can be assigned for the patient.



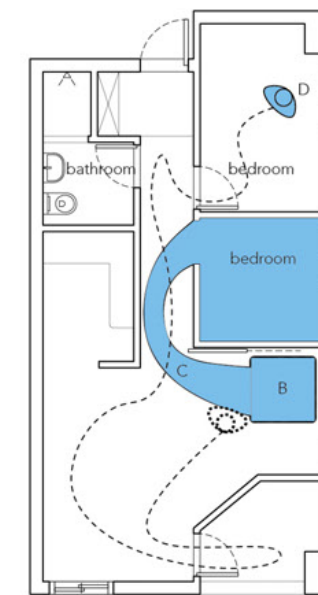
situation : A + C + D

- Readily available bedroom - can be assigned for the patient.
- Readily available bathroom - can be assigned for the patient.



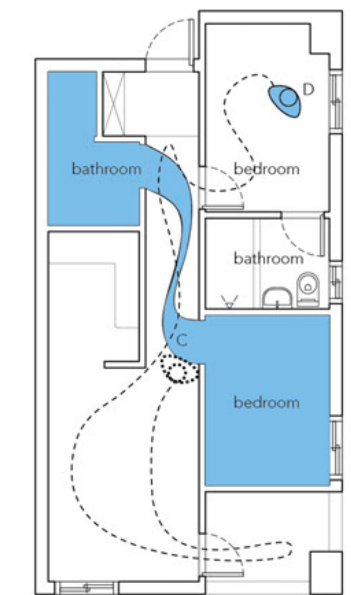
situation : B + C + D

- Readily available bedroom - can be assigned for the patient.
- Readily available bathroom - can be assigned for the patient.



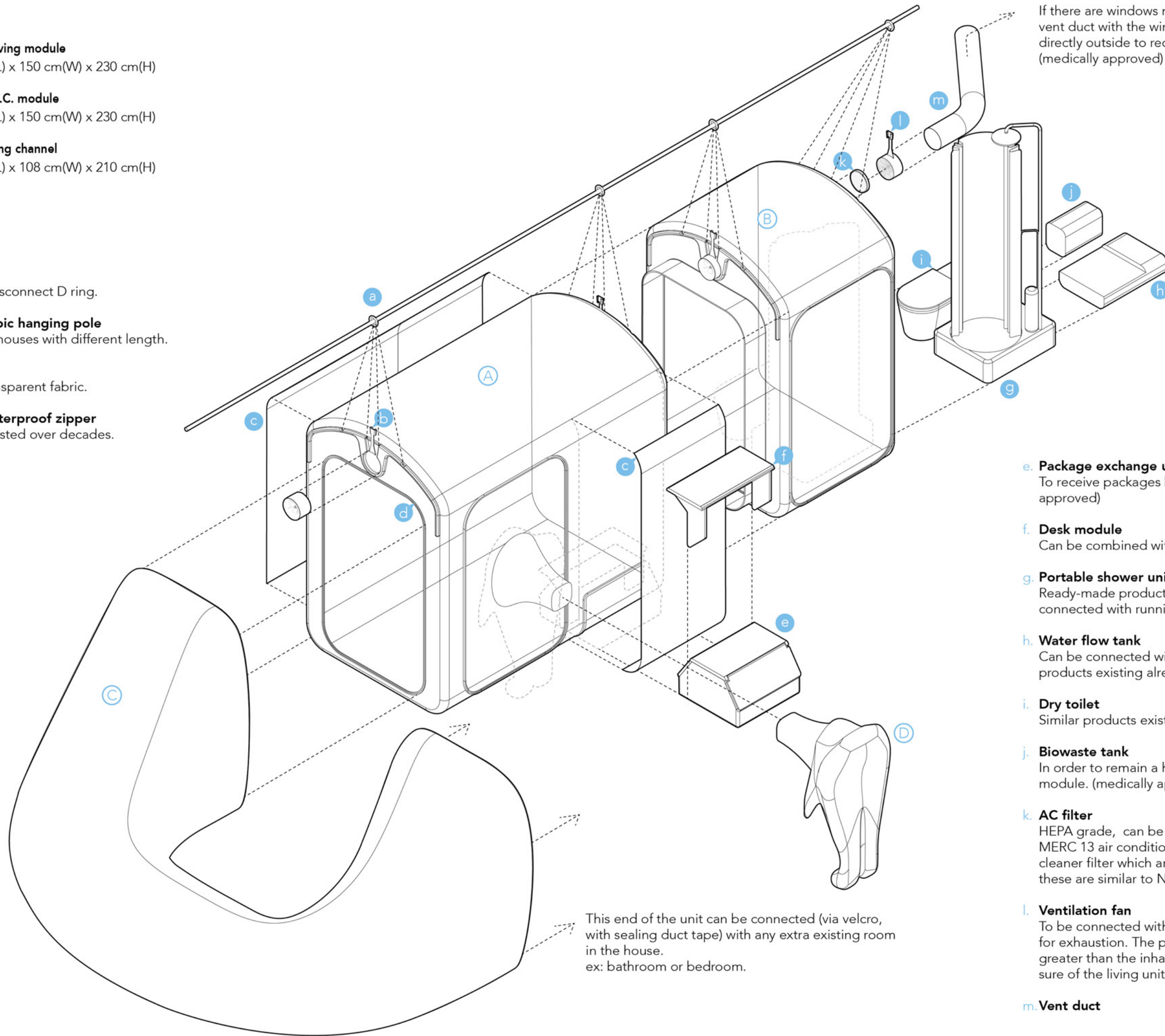
situation : C + D

- Readily available bedroom - can be assigned for the patient.
- Readily available bathroom - can be assigned for the patient.



- A. Cube - Living module**  
240 cm(L) x 150 cm(W) x 230 cm(H)
- B. Cube - W.C. module**  
120 cm(L) x 150 cm(W) x 230 cm(H)
- C. Connecting channel**  
600 cm(L) x 108 cm(W) x 210 cm(H)
- D. CO-suit**

- a. D Ring**  
Quick disconnect D ring.
- b. Telescopic hanging pole**  
To fit in houses with different length.
- c. Curtain**  
Half-transparent fabric.
- d. YKK waterproof zipper**  
Being tested over decades.



If there are windows nearby, people can connect the vent duct with the window to exhaust the waste air directly outside to reduce the risk indoor. (medically approved)

- e. Package exchange unit**  
To receive packages but mainly for food. (medically approved)
- f. Desk module**  
Can be combined with the package exchange unit.
- g. Portable shower unit**  
Ready-made products in the market already, can be connected with running water.
- h. Water flow tank**  
Can be connected with the draining system, similar products existing already.
- i. Dry toilet**  
Similar products existing already.
- j. Biowaste tank**  
In order to remain a hygiene environment in the module. (medically approved)
- k. AC filter**  
HEPA grade, can be made improvised by using MERC 13 air conditioning unit or HEPA vacuum cleaner filter which are common in the market, and these are similar to N95 grade. (medically approved)
- l. Ventilation fan**  
To be connected with AC filter, one for inlet and one for exhaustion. The pressure of exhaustion is slightly greater than the inhaling to remain negative pressure of the living unit.
- m. Vent duct**

This end of the unit can be connected (via velcro, with sealing duct tape) with any extra existing room in the house.  
ex: bathroom or bedroom.

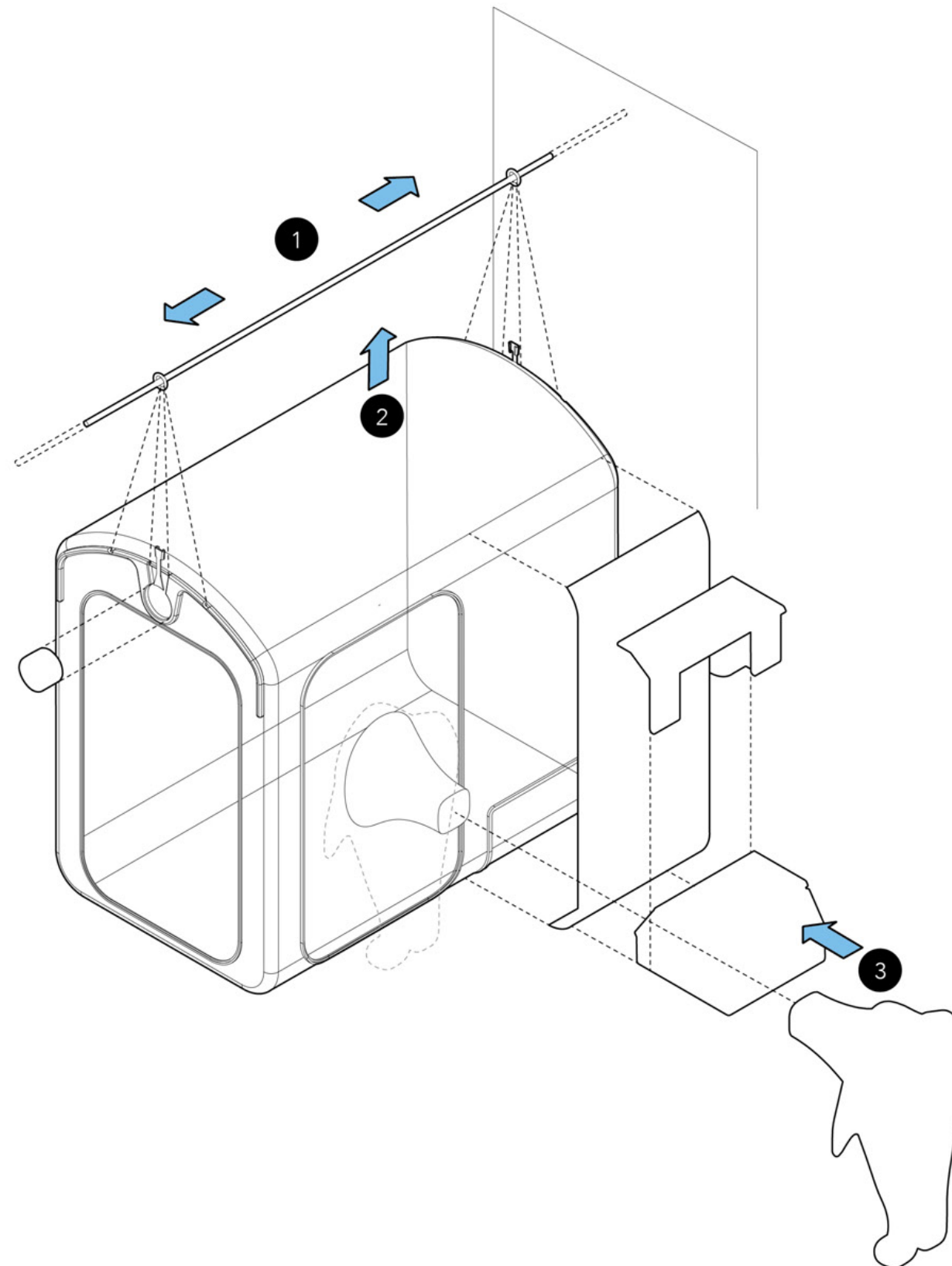


## Easy assembly, easy fitting

The COID system is supported by one telescopic hanging pole - with a range of 5m, the simplicity of this hanging beam allows the modular space to be columnless, freeing up the limited space for the user.

Stemming from the observations of minimal needs of living space per person, this module measures 240cm x 150cm with a height of 230cm, allowing the user to have adequate space for resting while remaining to be flexible for other use. The module can be extended in the horizontal direction, linking to another unit of module.

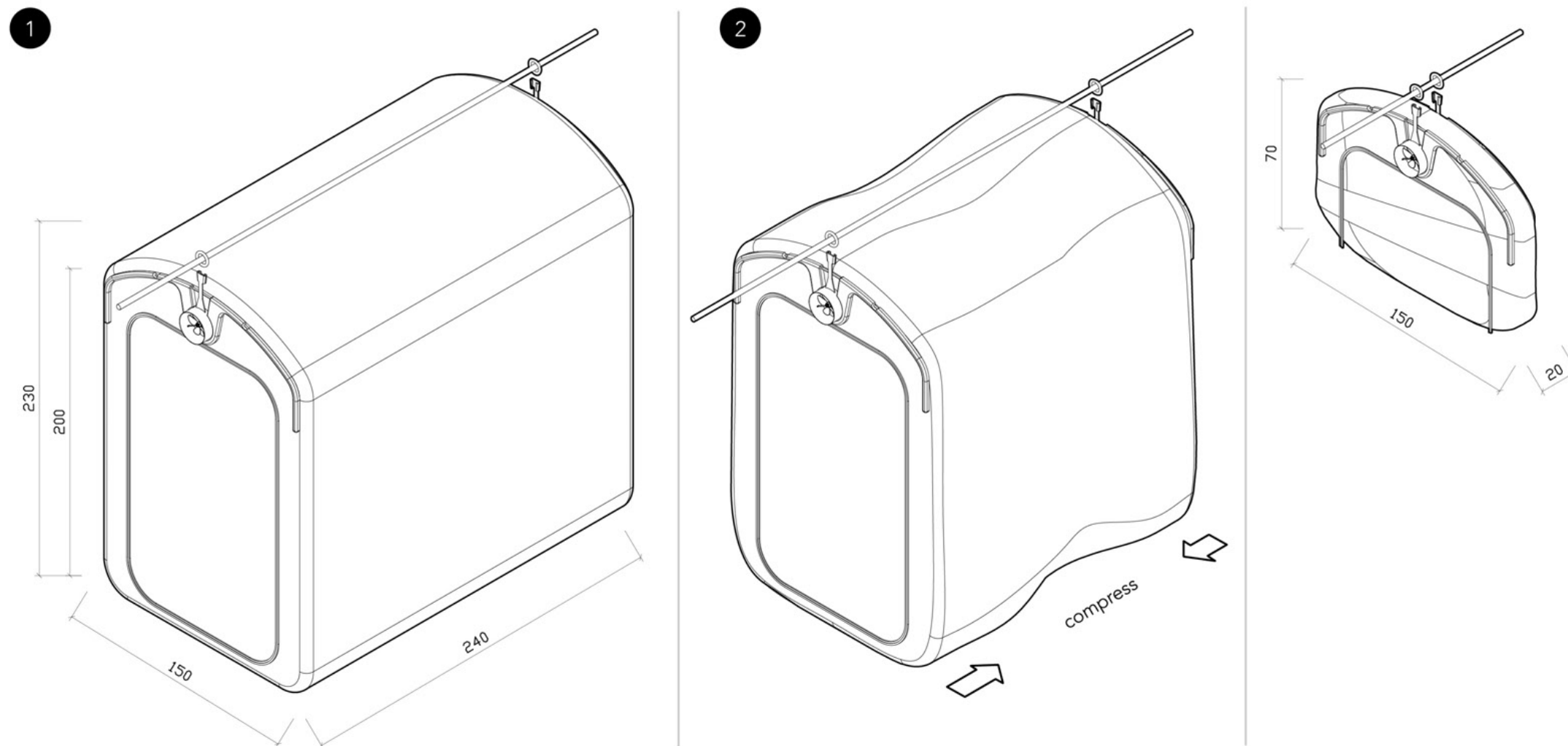
- 1 Adjusting the telescopic hanging pole until it's supported by walls.
- 2 Using D Rings to hang the Cube onto the telescopic hanging pole.
- 3 Mount attachments to the Cube or to other units.





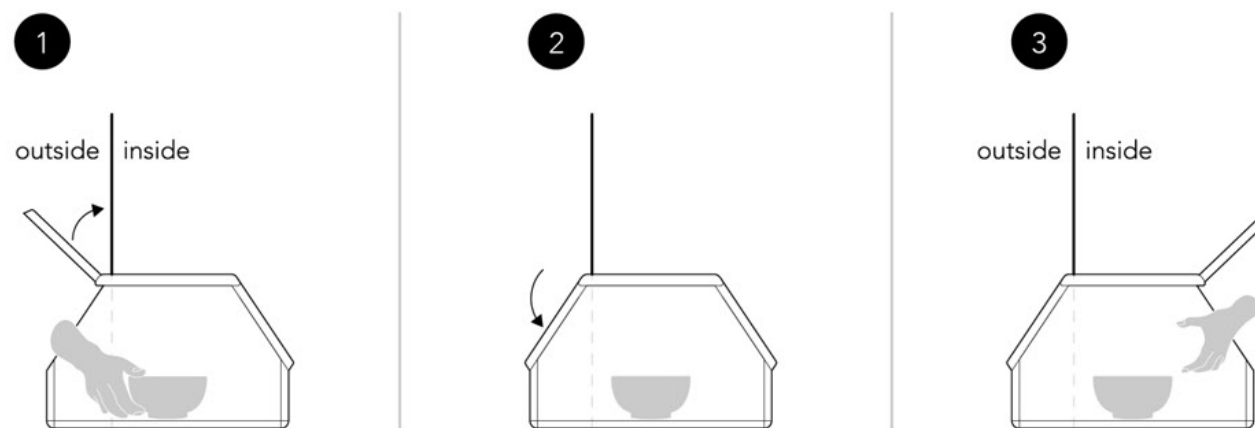
## Compactibility

With the flexibility and lightweight of the COID system, it can be folded and stored in a relatively small volume.



## Package exchange unit

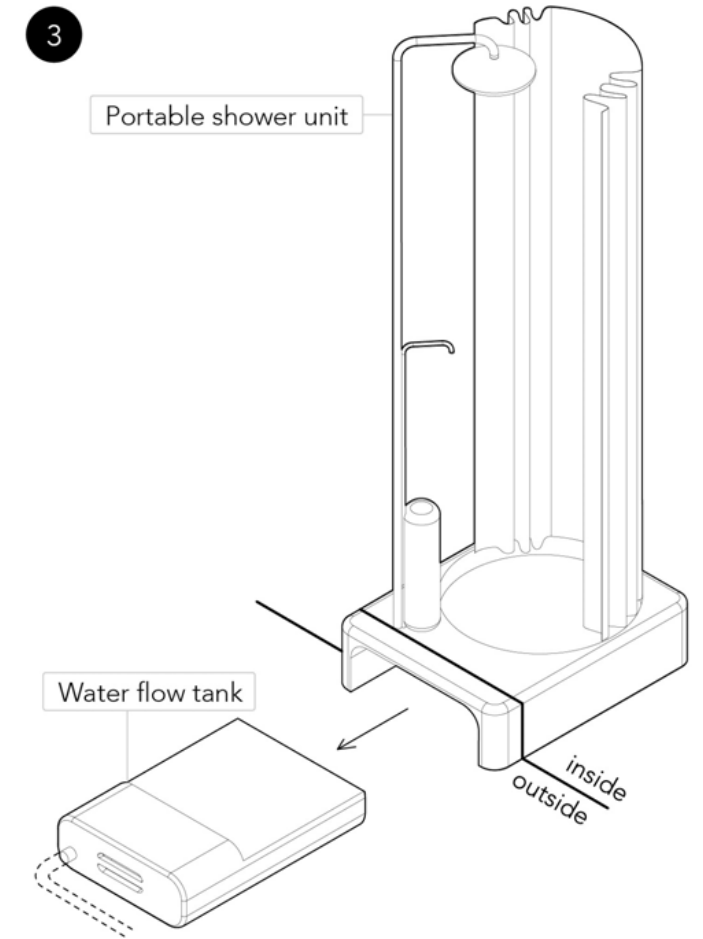
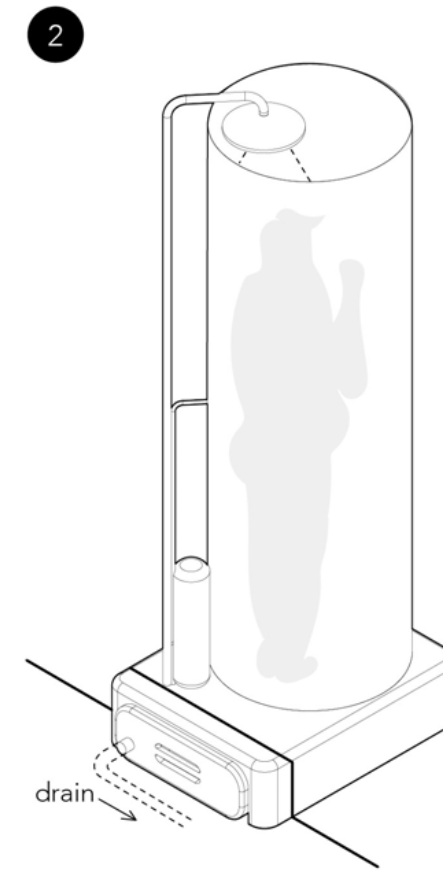
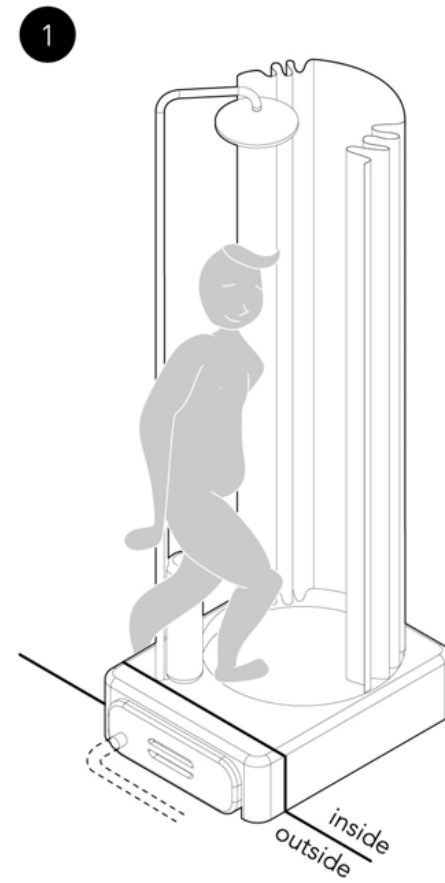
The simple and secured design of the package exchange unit allows the caretaker to provide essentials needs from the outside to the quarantined inside of the COID system.



## Sanitation

### Taking shower in the COID system

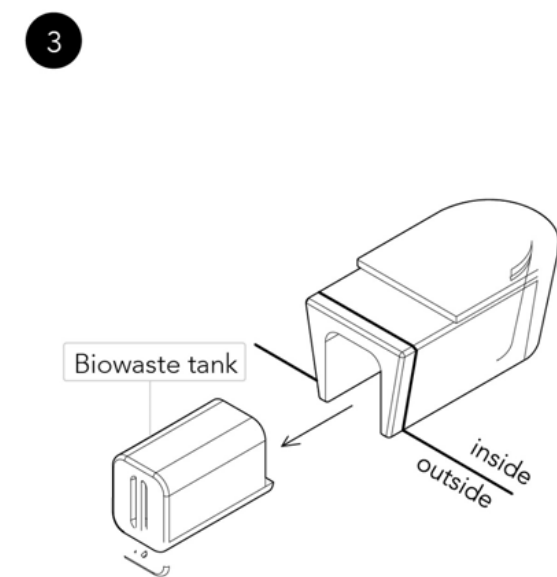
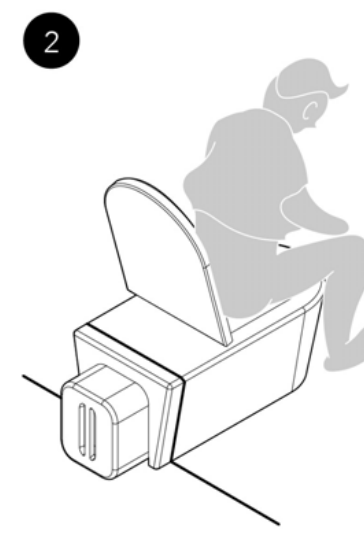
The water is supplied by a showering unit, which can be connected with a running water system outside the pod or simply using the water tank of the showering unit. A lower faucet can be used for utility purposes. Reclaimed water then flows into a recycle tank, which can be pulled away and safely discharged from the outside of the pod, alternatively waste water can be connected to the draining system of the house.



## Toilet

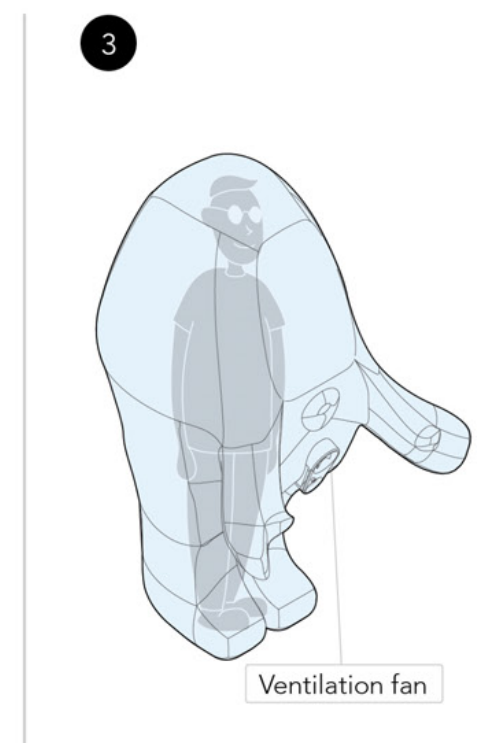
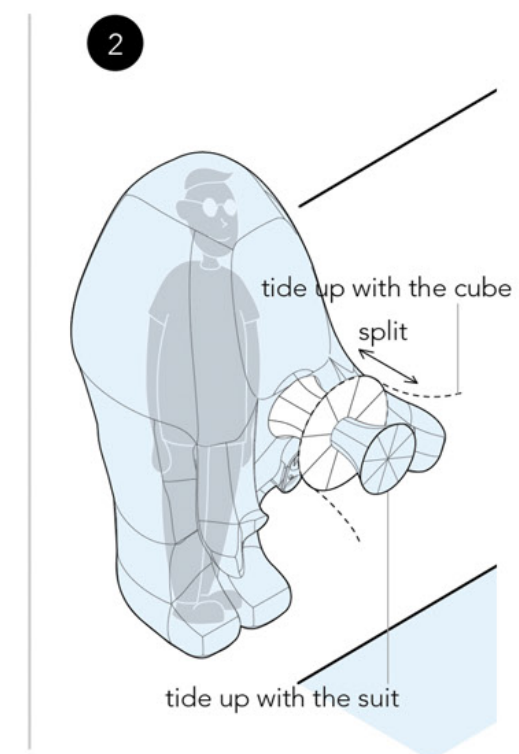
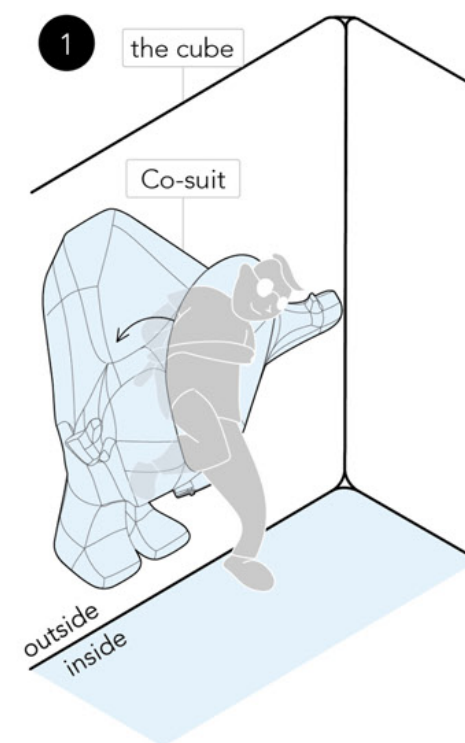
### in the COID system

A Dry toilet is installed in the COID system which has an individual biowaste tank. The biowaste tank is then removed from outside of the pod with proper and secured procedure.



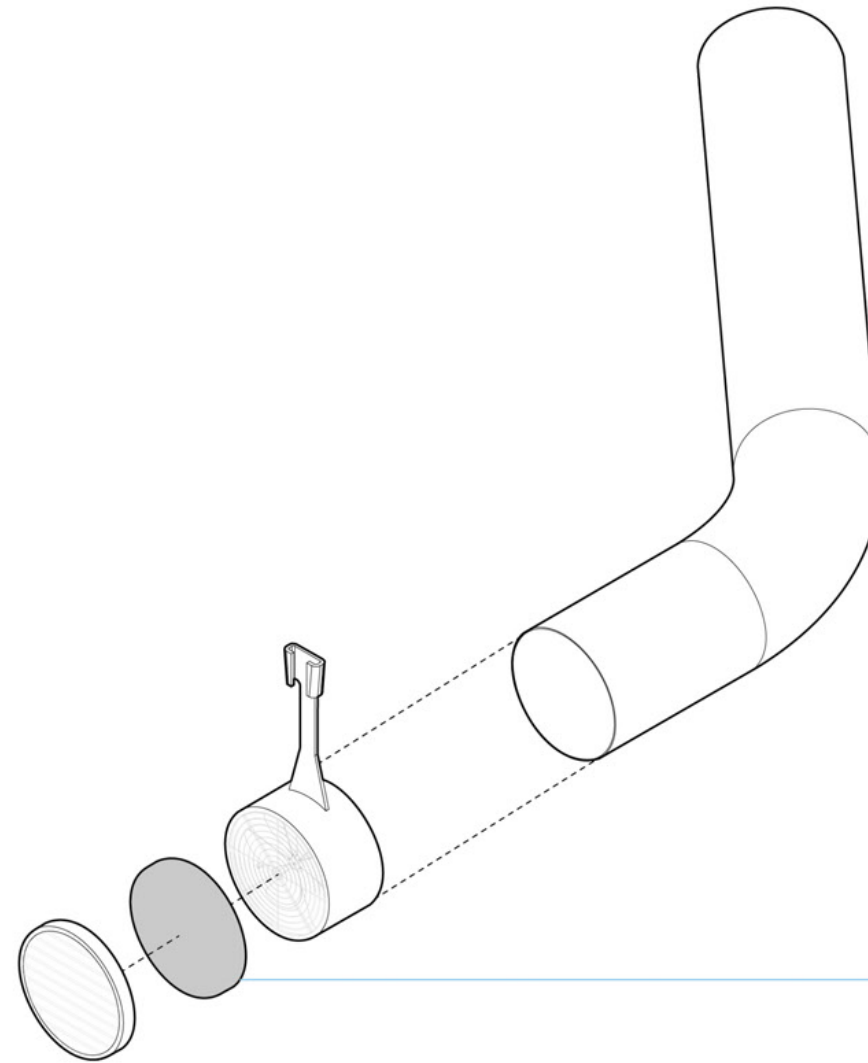
# CO-suit

CO-suit is a wearable suit that is separable from the principle system. Derived from the Diving-Bell Spider, the CO-suit enables the patient to roam while preventing any build up of anxiety due to social isolation. The CO-suit utilizes a sphincter like double docking system to secure the air tightness between the living module and the suit. CO-suit is equipped with modified MERV13 or HEPA filtered micro-fan, enabling a well ventilated air tight suit for the wearer. (These filters are readily available and in abundance from hardware stores.) The distinctive design of the CO-suit differentiates itself from HAZMAT suit where the CO-suit provides the user more space between the suit and the body, granting the user additional flexibility and comfort. With the added flexibility the patient is able to carry through daily tasks almost without hindrance.



# Ventilation

Ventilation unit of the COID system is the smallest yet the most essential component of the whole system. While medical grade filtering materials are short in supply due to high demand, the industrial air filtering materials - MERV 13 (designed for AC units) and HEPA filter (designed for vacuum cleaners) are approved by our medical consultant with viral filtration rate close to N95 grade. (Filters particle size:  $\mu\text{m}$  1.0 - 0.3). According to medical consultation; these filtration materials should be replaced frequently - once a month.





# Privacy

Though the module itself is transparent aiming to improve social interactions, however privacy of the quarantined is not forgotten, an integrated curtain is included in the system which can cover all modules ensuring the user's privacy.





COVID Budget sheet  
suggested version

Total cost: USD 811.73

Price of Material in single set (suggested version)						
Material	Content	Unit price(USD)	Quantity	Unit	Amount(USD)	Weight
<b>Main component</b>						
0.25mm TPU(clear)	Structure of A	4.03	22	m <sup>2</sup>	88.77	8kg
0.25mm TPU(matte)	Structure of B and Curtain	4.03	28	m <sup>2</sup>	112.98	8kg
0.1mm TPU(clear)	Structure of C and Co-suit	2.39	45	m <sup>2</sup>	107.43	3kg
2cm Velcro		0.34	4.5	m	1.51	
Waterproof zipper		3.36	24	m	80.70	
Ø8mmGF rod	Structural support	0.76	6	m	4.54	
Telescopic hanging pole	5M(Default)	7.06	1	pcs	7.06	
Ø15cmVent duct	Exhaust gas	0.61	3.6	m	2.18	
Inflatable fan	For D	16.81	1	pcs	16.81	
Exhaust fan	15cm*15cm	10.09	4	pcs	40.35	
MERV filter	15cm*15cm	2.69	4	pcs	10.76	
Exchange unit	68cm*50cm*40cm (Table included)	27.57	1	pcs	27.57	
Nylon thread	1mm	0.02	3.6	m	0.06	
<b>Attachments</b>						
Water flow tank	50cm*50cm*10cm	6.72	1	pcs	6.72	
portable shower unit	80cm*80cm*220cm	28.58	1	pcs	28.58	
Dry toilet	50cm*50cm*45cm	20.17	1	pcs	20.17	
Biowaste tank	30cm*30cm*20cm	13.45	1	pcs	13.45	
<b>Labor</b>						
Manufacture	Handmade (one person)	10.09	24	hrs	242.09	
			<b>*Total</b>		<b>811.73</b>	<b>20kg</b>

\*Based on current prices in Taiwan



COVID Budget sheet  
lower-end version

Total cost: USD 564.53

Price of Material in single set (low-end version)						
Material	Content	Unit price(USD)	Quantity	Unit	Amount(USD)	Weight
<b>Main component</b>						
0.28mm PVC(clear)	Structure of A	0.92	22	m <sup>2</sup>	20.34	8kg
0.28mm PVC(matte)	Structure of B and Curtain	0.92	28	m <sup>2</sup>	25.89	8kg
0.05mm PVC(clear)	Structure of C and Co-suit	0.35	45	m <sup>2</sup>	15.74	3kg
2cm Velcro		0.34	4.5	m	1.51	
Waterproof zipper		3.36	24	m	80.70	
Ø8mmGF rod	Structural support	0.76	6	m	4.54	
Telescopic hanging pole	5M(Default)	7.06	1	pcs	7.06	
Ø15cmVent duct	Exhaust gas	0.61	3.6	m	2.18	
Inflatable fan	For D	16.81	1	pcs	16.81	
Exhaust fan	15cm*15cm	10.09	4	pcs	40.35	
MERV filter	15cm*15cm	2.69	4	pcs	10.76	
Exchange unit	68cm*50cm*40cm (Table included)	27.57	1	pcs	27.57	
Nylon thread	1mm	0.02	3.6	m	0.06	
<b>Attachments</b>						
Water flow tank	50cm*50cm*10cm	6.72	1	pcs	6.72	
portable shower unit	80cm*80cm*220cm	28.58	1	pcs	28.58	
Dry toilet	50cm*50cm*45cm	20.17	1	pcs	20.17	
Biowaste tank	30cm*30cm*20cm	13.45	1	pcs	13.45	
<b>Labor</b>						
Manufacture	Handmade (one person)	10.09	24	hrs	242.09	
			<b>*Total</b>		<b>564.53</b>	<b>20kg</b>

\*Based on current prices in Taiwan

# Medical Consultant

Dr. Jim Chen is the CEO of the YongLin Healthcare foundation. YongLin Healthcare foundation is the leading foundation in the biomedical industry in Taiwan, Dr. Jim Chen is the primary consultant between the fields of biomedical industry and practical medicine. We were honored to have our design assisted and approved by him in regard to its professionalism.

## Chi-Hung Chen, MD

Sleep Clinic

Specialty/Practice areas:

- General internal medicine, pulmonary disease
- Sleep disorder: sleep apnea syndrome, sleep related disease.

Languages Spoken:

- English
- Japanese
- Chinese

- Board Certification: Internal Medicine, Pulmonary and critical care medicine, Sleep Medicine, Lung cancer.

- Visiting staff: Pulmonary Medicine Department, Taipei Medical University Hospital (2003)

- Clinical Fellow: Department of Pulmonary Medicine, Taipei Veterans General Hospital (2003)

- Clinical Fellow: Department of Pulmonary Medicine, Taipei Medical College Hospital (2002)

- Chief Resident: Department of Internal Medicine, Taipei Medical College Hospital (2002)

- Residency: Department of Internal Medicine, Taipei Medical College Hospital (1999)

- Internship: Taipei Medical College Hospital (1998)

- Medical Education: School of Medicine, Taipei Medical College (1999)

Aministrative appointments

Attending Physician, Internal Medicine and Pulmonary Medicine Department of Taipei Medical University Hospital

# Epilogue

All members experienced the 14 days self-quarantine period, varying from residential home to negative pressure isolation ward, it was clearly understood that the impact and severity of COVID-19 was both physical and psychological. Therefore, we looked for a solution which provides the isolation that is medically sound, yet at the same time gives the patient a way of living with minimal deviation from one's original life.

Through cross disciplinary discussions and professional medical consultation, a mockup model for the COID system in 1:1 scale was put together for us to observe and contemplate the effect of the COID design in a real person scenario, attempting to move beyond the imaginative and limitations of 3D renderings.

Considering the urgency, we believe the practicality of the COID design is what is needed now. With the IDA competition we aim to further advance the development of the COID system, and eventually actualizing it to help ones who are in need.



2146T

# Credit

## 2146T introduction

### **Chih Kang Hsu**

architecture designer/ photographer

Glasgow school of art, MFA pre student / CYCU architecture BA

### **Li Cheng Chen**

architecture designer

Bergen school of architecture MR 1 student / CYCU architecture BA

### **Shing Huang**

architecture designer/ industrial designer

Royal College of Art, Design Product MA / CYCU architecture BA

### **Elsa Hsiao**

industrial / graphic designer

University of Arts London Graphic Branding & Identity MA / THU industrial design BA

### **special thanks to**

Dr. Jim Chen, Dr. Bowen Liao, M.T. Li, Chu-Chao Chen and Chyong-Huey Sheu (Parents of Li Cheng Chen), Anping Chang, Lo-Jung Fang, Fred Huang, Liao Huey Ching, Ming Chiang Shi.



