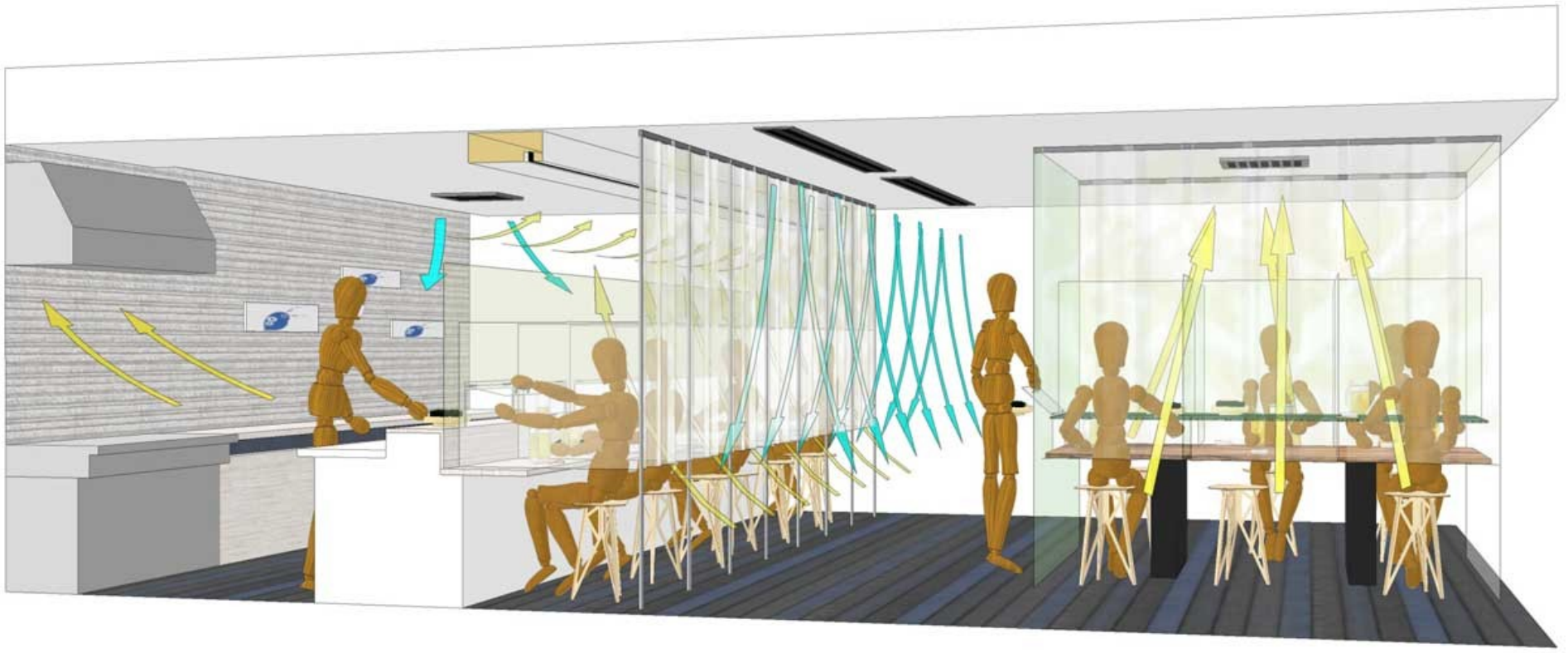


COVID-19 Infection Prevention Solution by Ventilation and Air Conditioning

DAPHNIA Innovation Lab Architect Office

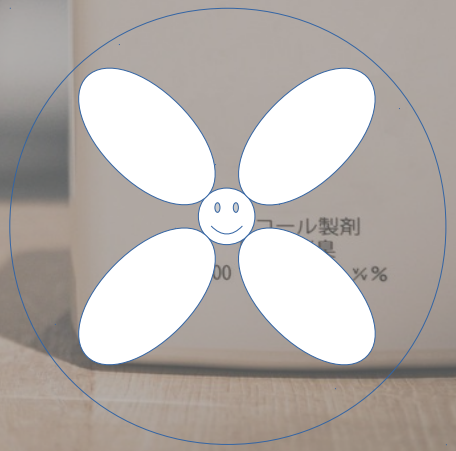
Infection Prevention Solution by Ventilation and Air Conditioning

What is important for infection prevention?

In many countries, realization of effective vaccines is being in hot haste at present.

However, if prevention measures by ventilation and air conditioning are once established, they would be no less effective than vaccines.

While developing vaccines might be a cat-and-mouse game because viruses mutates in multiple types in a short period, measures by ventilation and air conditioning do not depend on the agents or object people and can prevent people from indoor airborne infection eternally.



Infection Prevention Solution by Ventilation and Air Conditioning

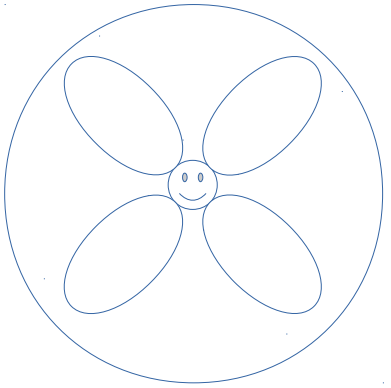
Physical measures generally recommended to prevent airborne infection

- **Waring respirator masks and face shields**



- **Social Distancing**

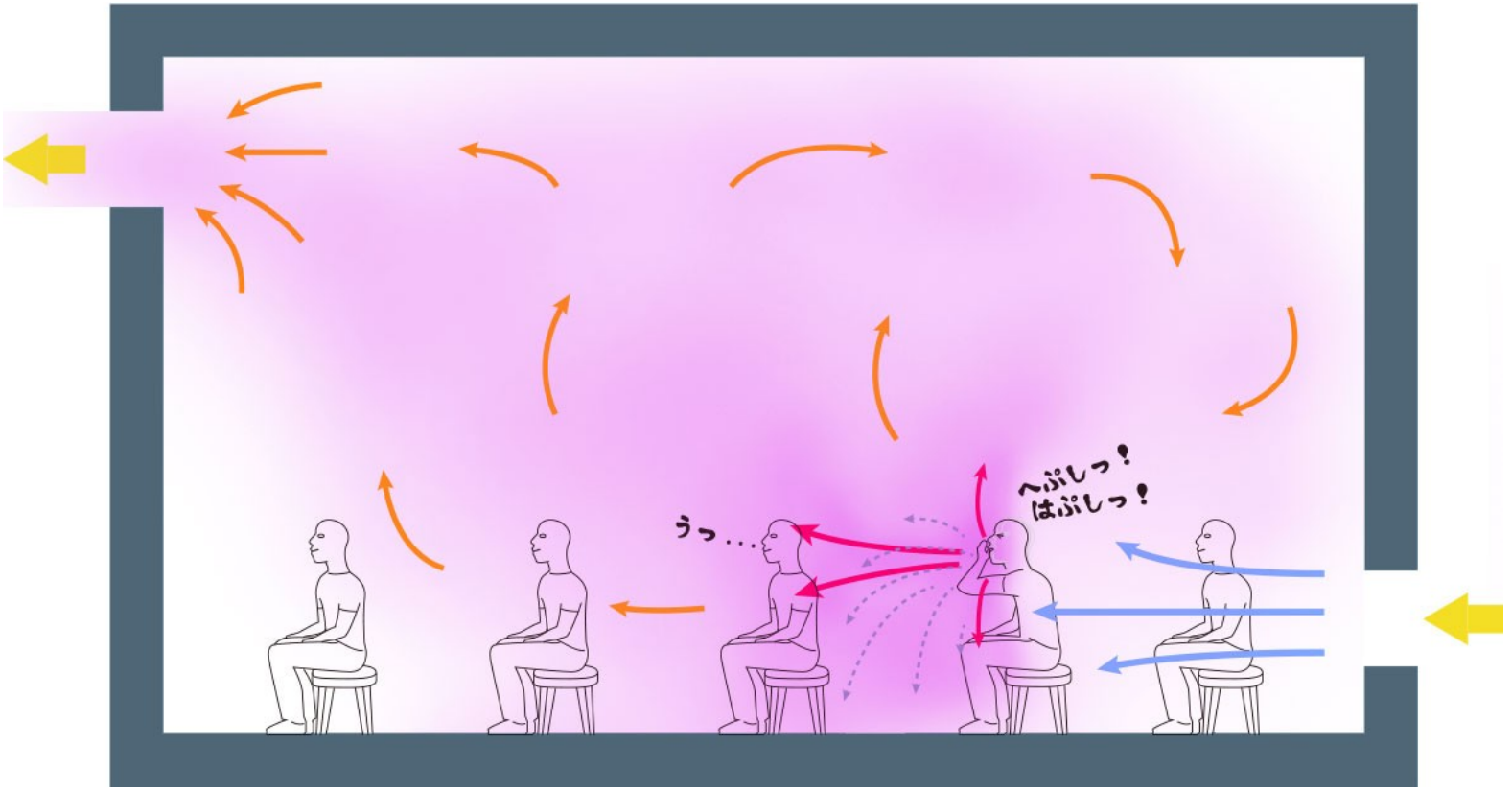
↓this proposal is concerning it!



- **Ventilation**

Infection Prevention Solution by Ventilation and Air Conditioning

Airborne infection can be prevented by ventilation…is it true?



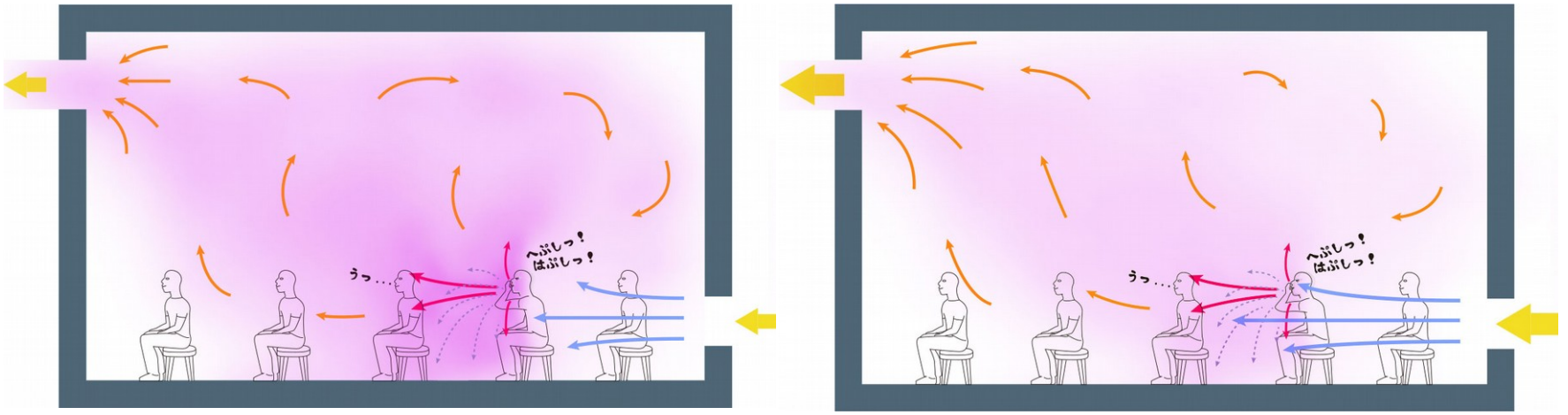
Air and air flow has properties, such as, **diffusion** and **convection**.
It means, basically **exhaled air from infected person scatters** and mixed-up with the interior air.

In other words, even ventilated, you breath in others' exhaled air one another!

Infection Prevention Solution by Ventilation and Air Conditioning

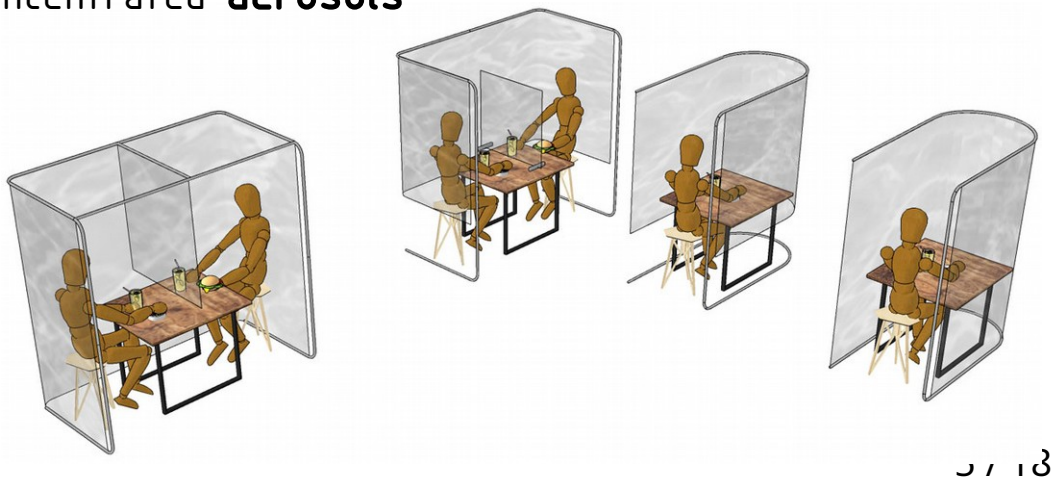
Then what should we do…!?

❶ Securing large ventilation amount to **attenuate** **exhaled air**



Before　　After

❷ **Blocking** **splashes** and highly concentrated **aerosols**



❸ Combining ❶ and ❷

Infection Prevention Solution by Ventilation and Air Conditioning

But, still there are various problems…!!

Problems on the infection prevention measure by ventilation

???

- **Criterion??** What is required ventilation volume?
- **Unable** to secure required ventilation volume!

Impossible…

- **Rain and wind** hit the room when ventilating with window open
- **Energy consumption** for air conditioning would be considerable!

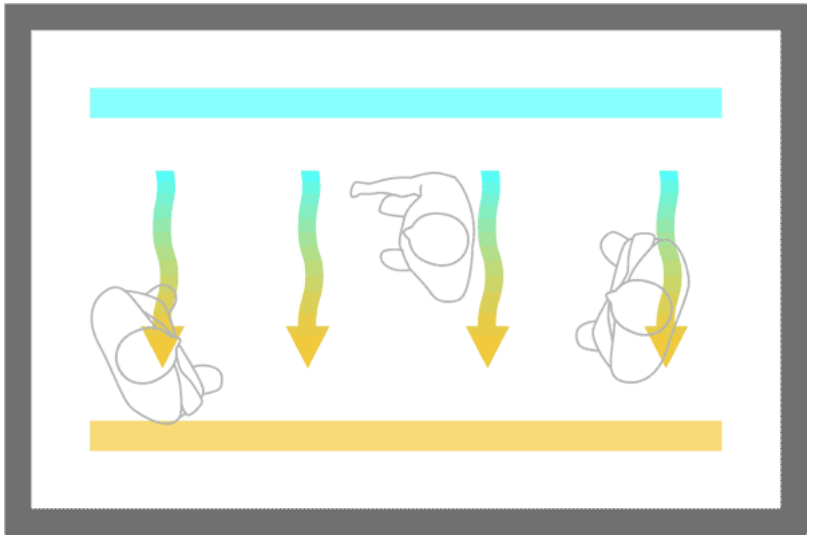
!!

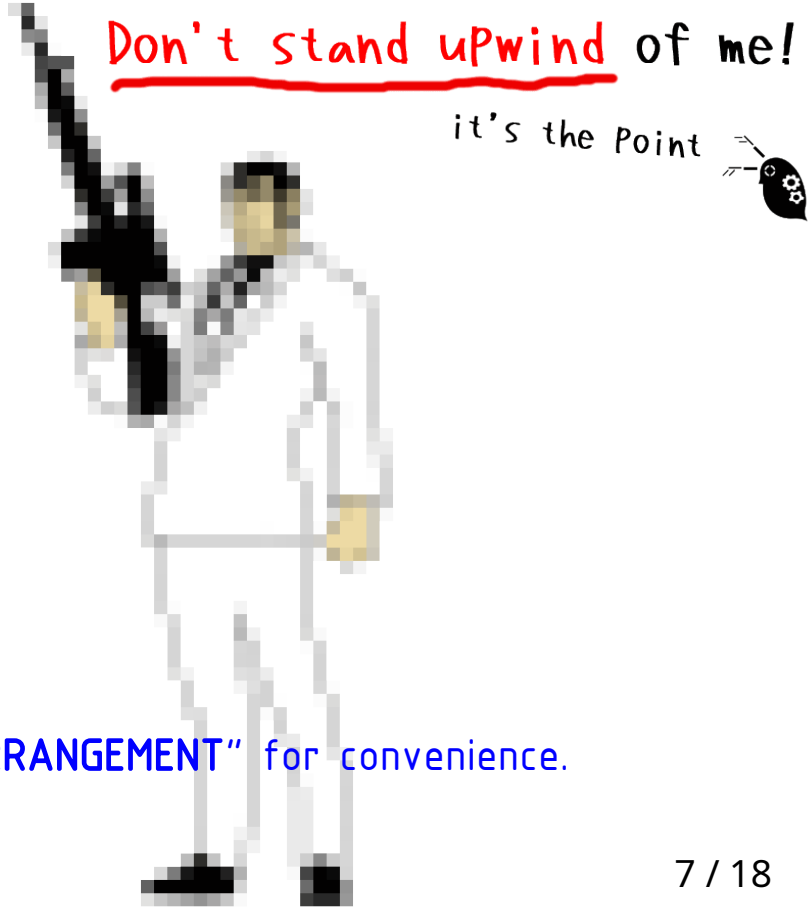
Infection Prevention Solution by Ventilation and Air Conditioning

Eliminate exhaled air without scattering in the room!

Whereas conventional ventilation mingles virus in the room,

ONE-WAY FLOW can avoid cross infection!





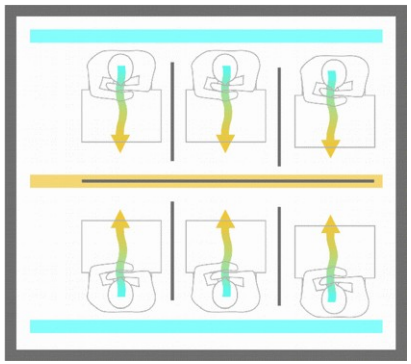
Positioning seats not to be on the leeward of others one another in one-way air flow which eliminates exhaled air without scattering in the room enables air-borne infection.

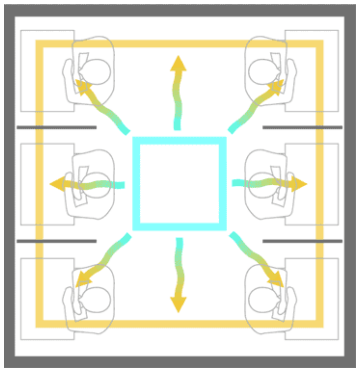
We temporarily refer to this method as"**AIR FLOW ARRANGEMENT**" for convenience.

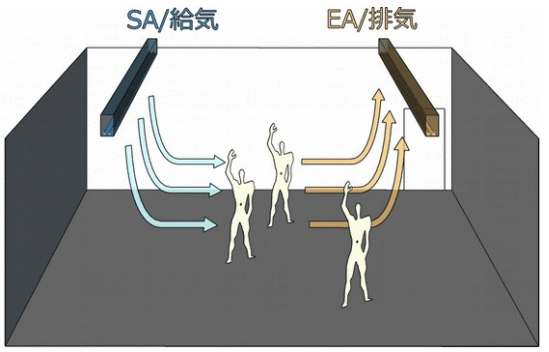
Infection Prevention Solution by Ventilation and Air Conditioning

VARIOUS TYPES OF ONE-WAY FLOW

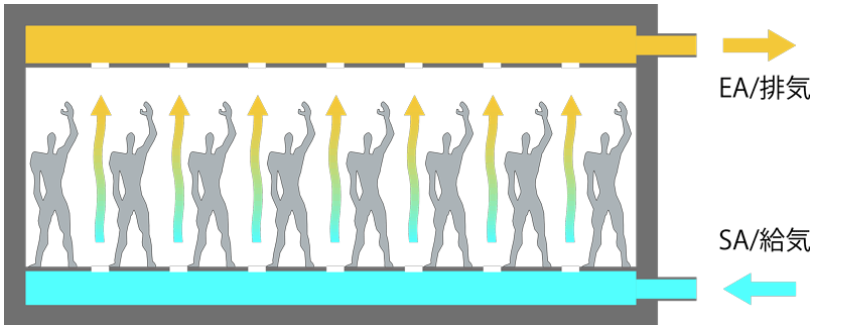
One-way air flow can be arranged in various ways including, vertical direction, horizontal direction, oblique direction, radiant direction and bent direction.



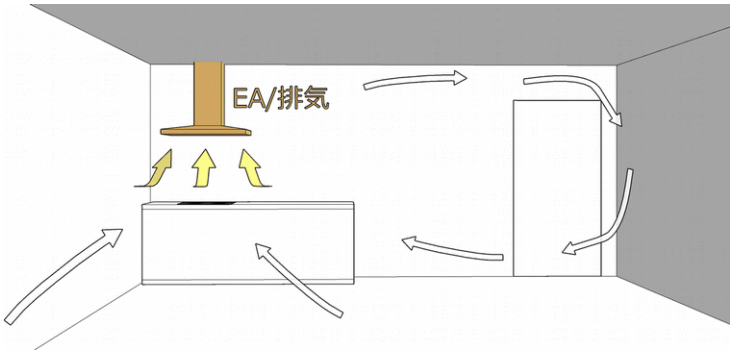




Displacement ventilation system and local exhaust system are also types of one-way air flow system



server rooms / operation rooms (displacement ventilation system)

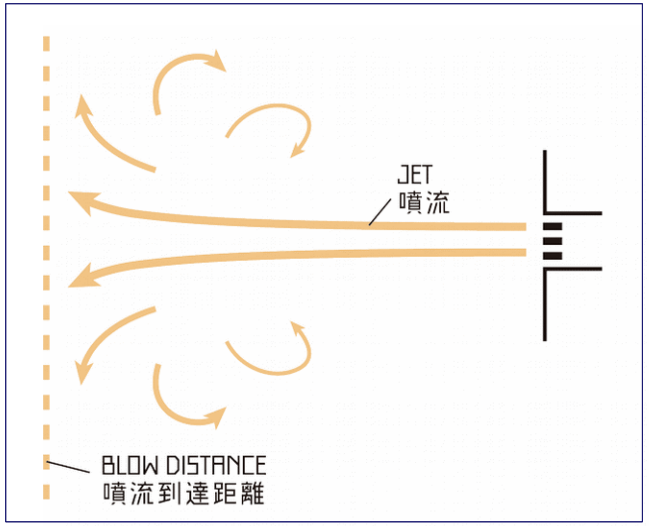


kitchen (local exhaust system)

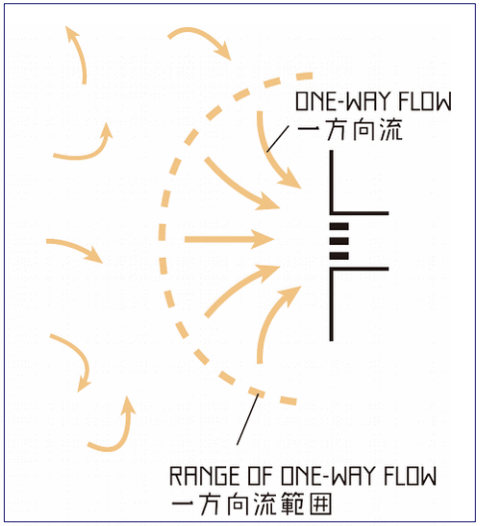
Infection Prevention Solution by Ventilation and Air Conditioning

FORMING ONE-WAY FLOW

Point: Character of outlet air flow and inlet air flow are different!



AIR OUTLET 吹出口



AIR INLET 吸込口

OUTLET air flow ⇒ range of affection : large / **diffuses polluted air**

INLET air flow ⇒ range of affection : small / **eliminates polluted air**

→ **Combine those** to form **one-way air flow**

Infection Prevention Solution by Ventilation and Air Conditioning

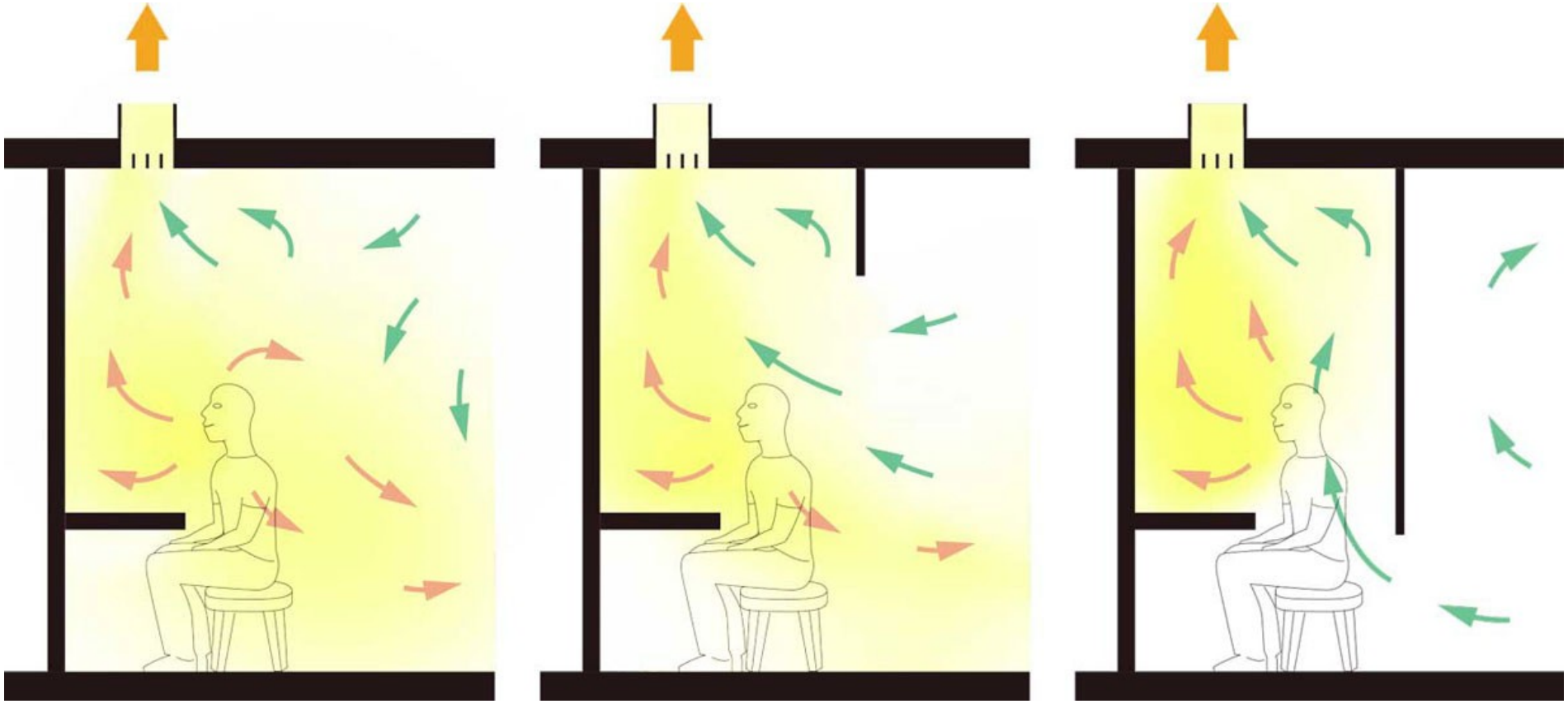
CONSTITUENTS OF THE PREVENTION MEASURE

We propose planning by combining ventilation, shielding and AIR FLOW ARRANGEMENT according to the condition

Prevention Measure	Object Agent State
● Ventilation (dilution)	Aerosol
● Shielding	Splash / Aerosol in high density
● AIR FLOW ARRANGEMENT	Aerosol

Infection Prevention Solution by Ventilation and Air Conditioning

FORMING OF BOOTH



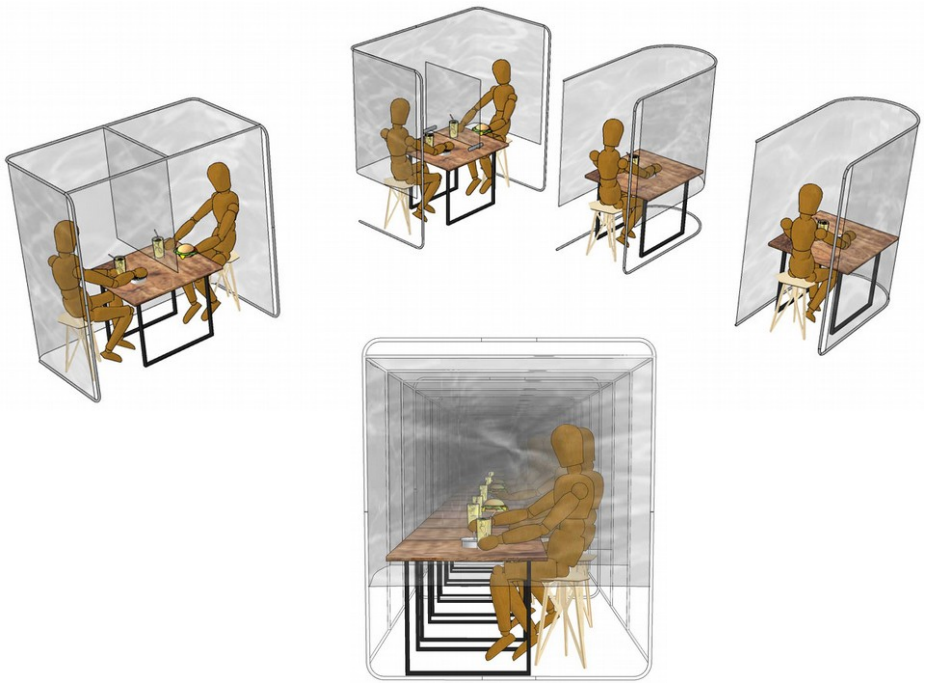
FORMING BOOTHS REALIZES LOCAL EXHAUST SYSTEM

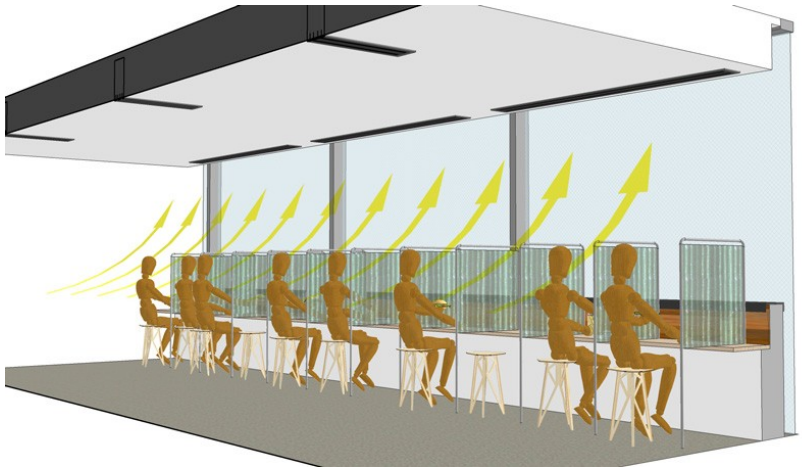
The more closed the booth, the more likely exhaled breath will not leak out.

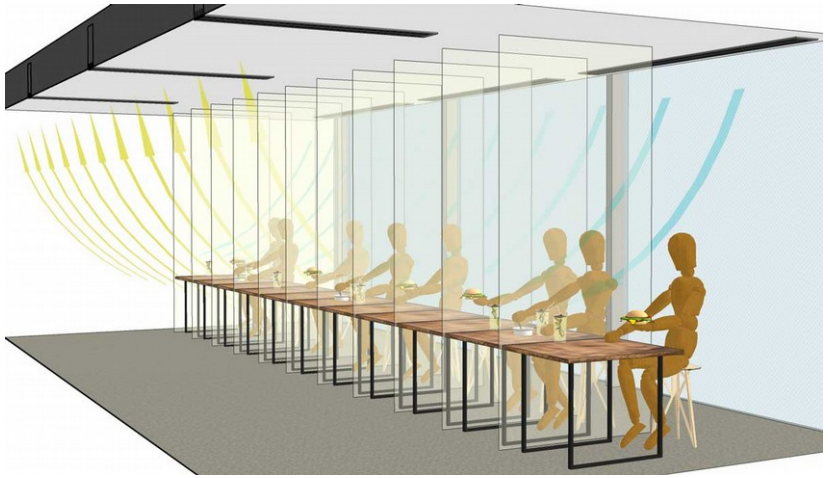
Infection Prevention Solution by Ventilation and Air Conditioning

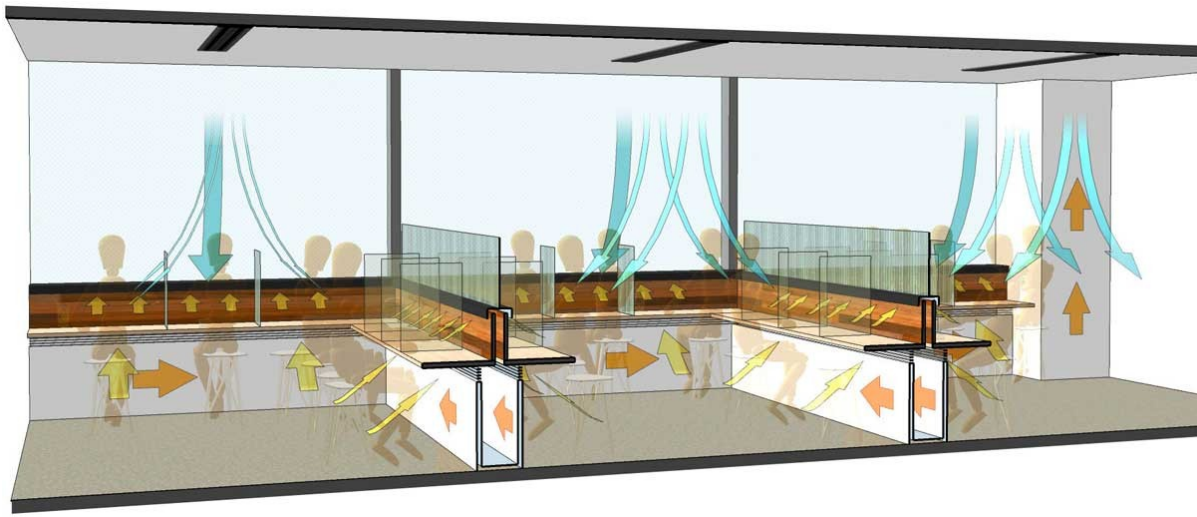
APPLICATION EXAMPLES

- COFFEE SHOPS
  / FAST FOOD RESTAURANTS





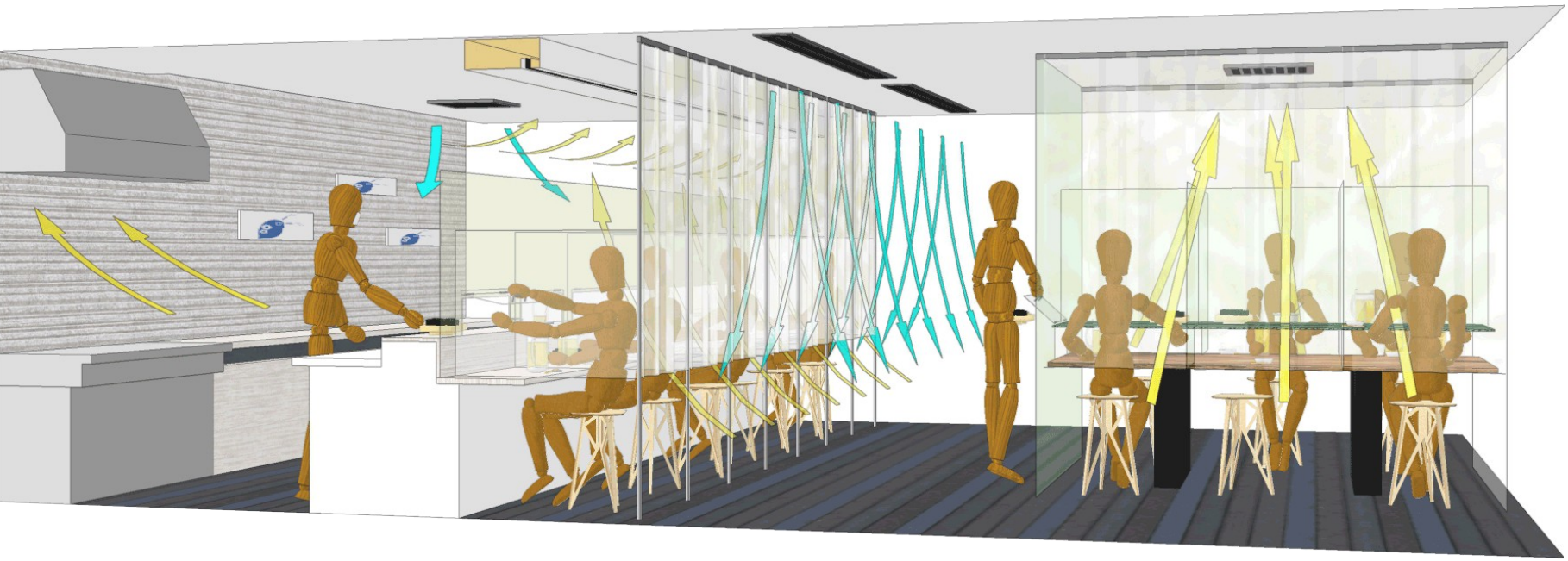




Infection Prevention by HVAC

APPLICATION EXAMPLES

● RESTAURANTS AND BARS



Infection Prevention Solution by Ventilation and Air Conditioning

APPLICATION EXAMPLES

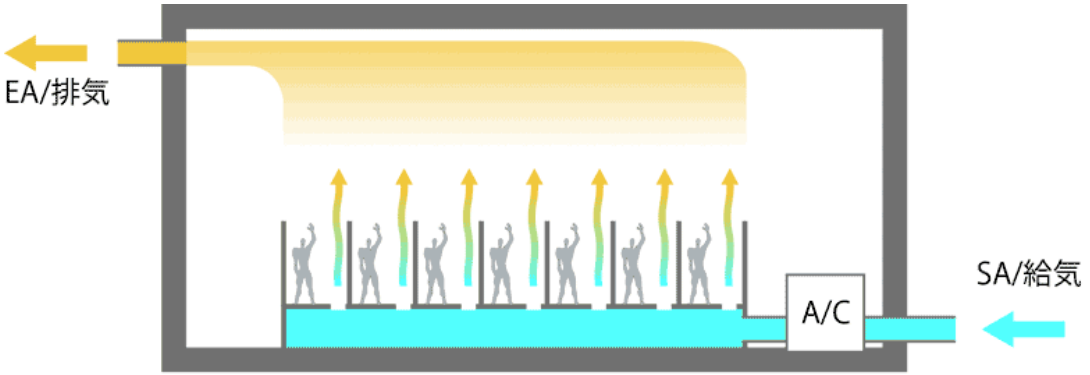
● OFFICES

Constitution :

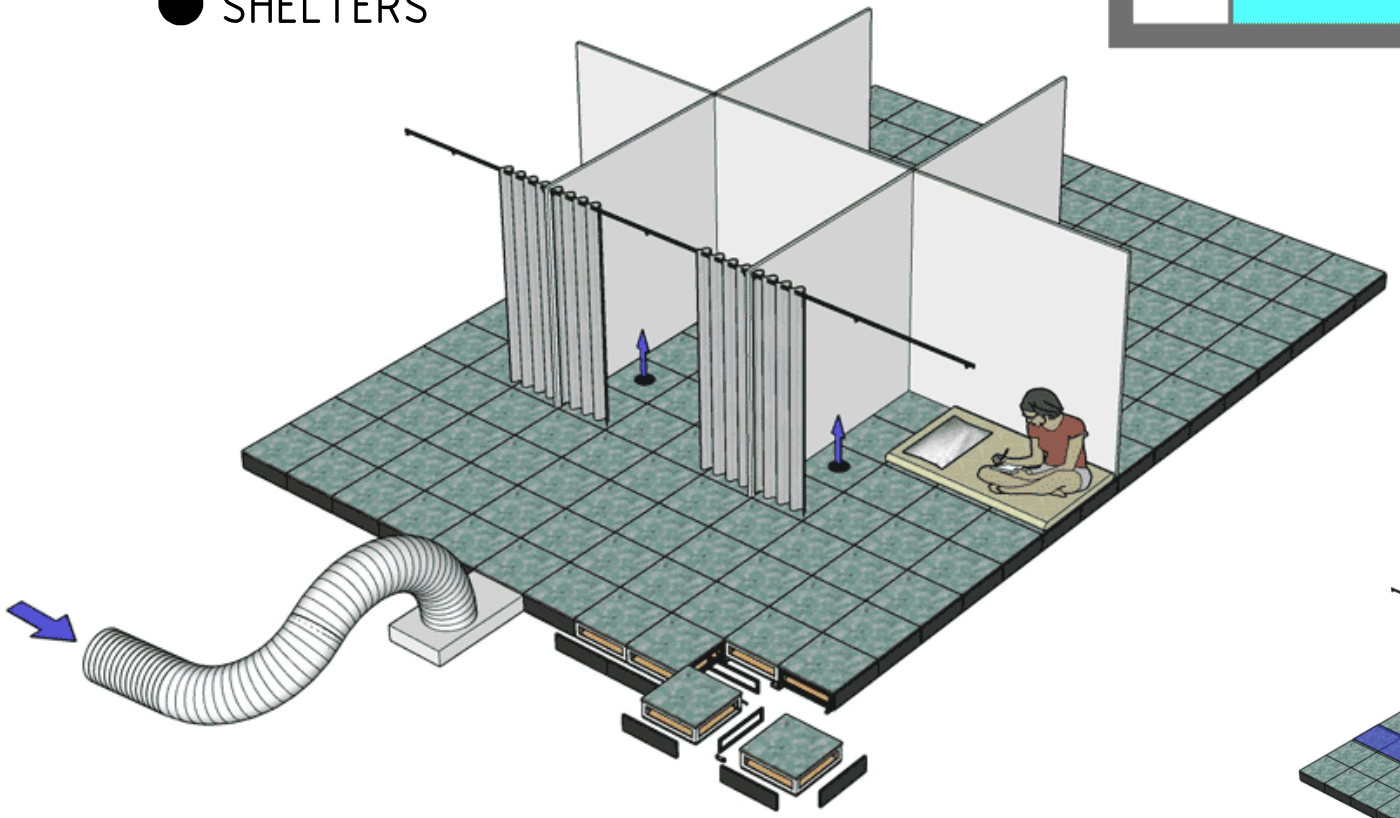
Shielding (forming booth) + One-way flow

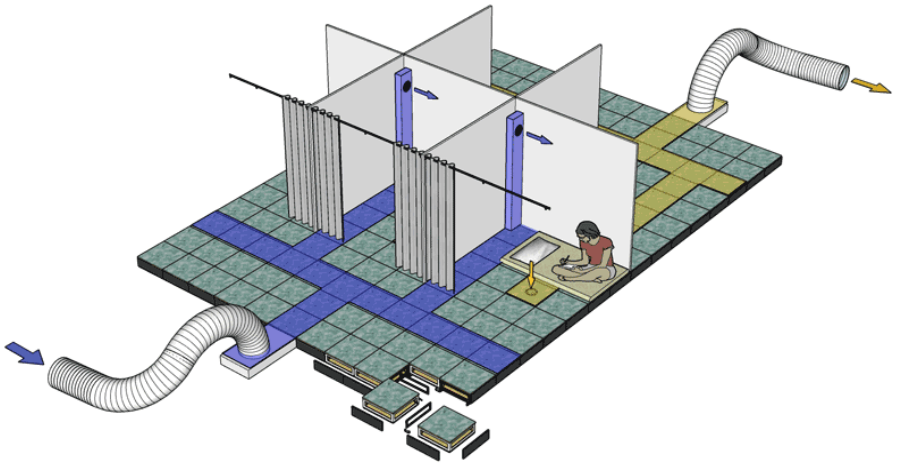
Infection Prevention by HVAC

APPLICATION EXAMPLES



● SHELTERS





～ **Raised Floor System** enabling compatibility of **ventilation, air conditioning** and **infection prevention** ～

Infection Prevention Solution by Ventilation and Air Conditioning

IMPLEMENTATION PROCEDURE (PLANING PHASE)

- PLANING / DESIGNING SCHEME

  - ✓ Utilize existing interior finish and building service equipment as much as possible rather than demolition or alteration
  - ✓ Understand nature of air flow and predict its behavior
  - ✓ Try to arrange air flow to prevent infection
  - ✓ Secure enough tolerance on air volume, velocity, etc. to cover unexpected condition variation.

- PROVING

Computational Fluid Dynamics + 3D Scanner

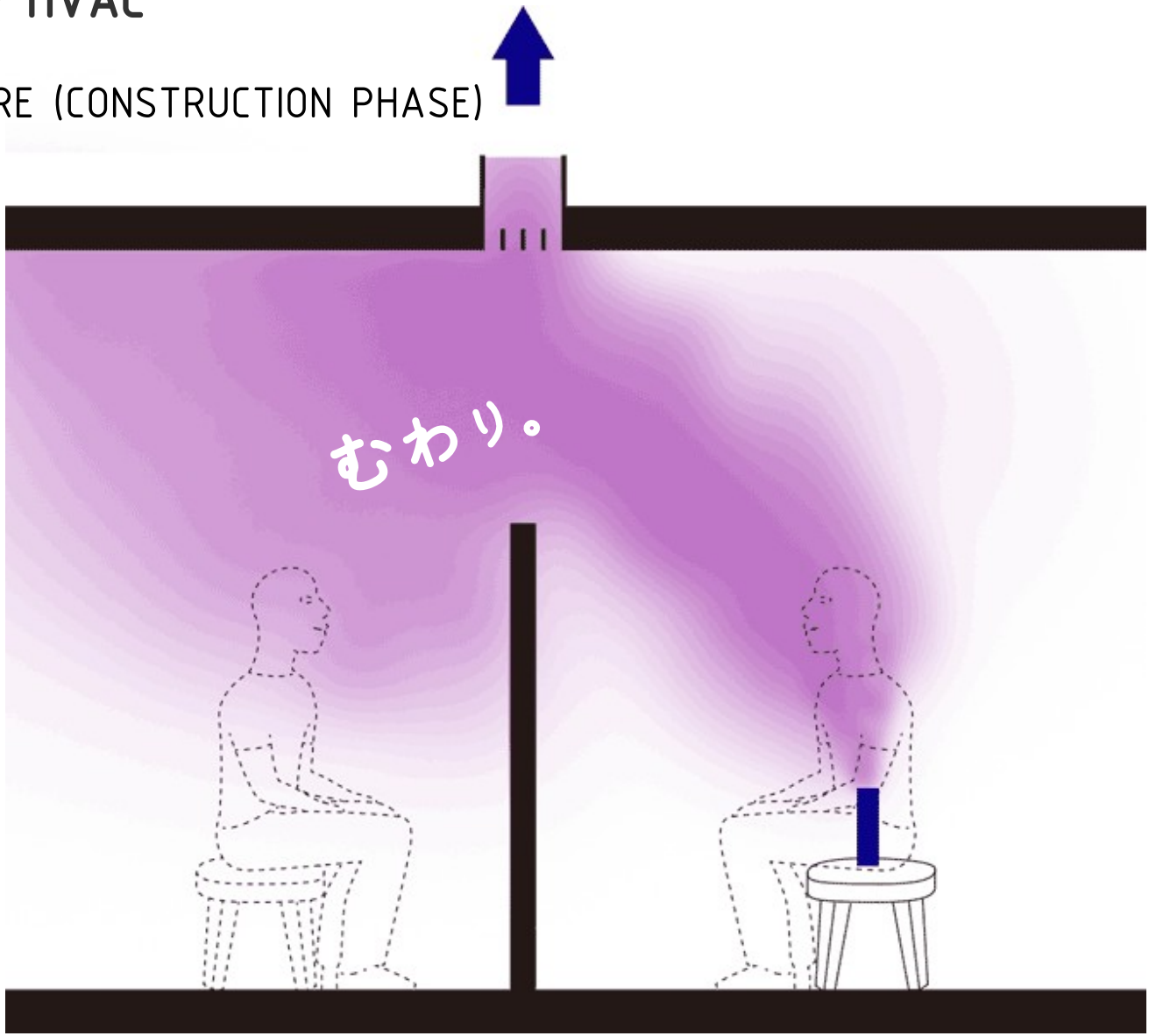
It depends on cost reduction of CFD.
It is not indispensable, but it enables
proving effectiveness of the plan/design easily
before construction.

Quoted : https://youtu.be/XA7FMoNAK9M

Infection Prevention by HVAC

IMPLEMENTATION PROCEDURE (CONSTRUCTION PHASE)

- TESTING



Tracing the air flow using evaporators, etc.

Infection Prevention Solution by Ventilation and Air Conditioning

SERVICES

We provide technical services. For requests and qestions, please feel free to contact us.

- Designing, consulting and Implementation

- Supporting partners and professionals

  We provide technical consulting, designing and design supporting for engineers and architects.
  Training sessions are also available.

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Web Site: www.mijinko.biz

In our web site, various technical information is available. Though most part of English pages are in preparation at present,
We are trying to update them soon. In the cases of urgent, we would support you one by one.