



# SPARCX

Game Changing Isolation Technology

**Designed & Manufactured  
by: The Biofactory**

# LATAR BELAKANG MASALAH

Infrastruktur penting di RS (mis: ICU dan ruang operasi)  
**TIDAK SESUAI** untuk penyakit berikut:

## Endemi saat ini:

Tuberculosis  
Influenza  
Ebola  
Swine Flu

## Pandemi saat ini:

COVID-19 &  
Variants

## Pandemi:

Monkeypox?  
Disease X?

# OPSI YANG TERSEDIA SAAT INI

## Opsi 1: Struktur/bangunan eksternal yang tetap (*fixed*)

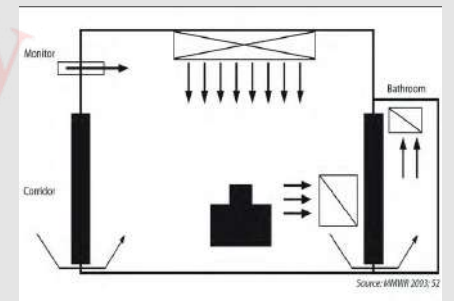
Ruang isolasi, bahkan ruang ICU berupa kontainer sudah tersedia di pasaran. Namun ada beberapa keterbatasan:

- Ruang operasi eksternal sangat sulit, dilihat dari sisi settingan awal dan perawatannya.
- Karena lokasinya di luar area RS (bahkan bisa sangat jauh), maka ini memerlukan re-alokasi seluruh teknisi dan petugas medis yang terlibat.
- Sumber daya yang ada tidak termanfaatkan sepenuhnya.
- Mahal



## Opsi 2: Renovasi

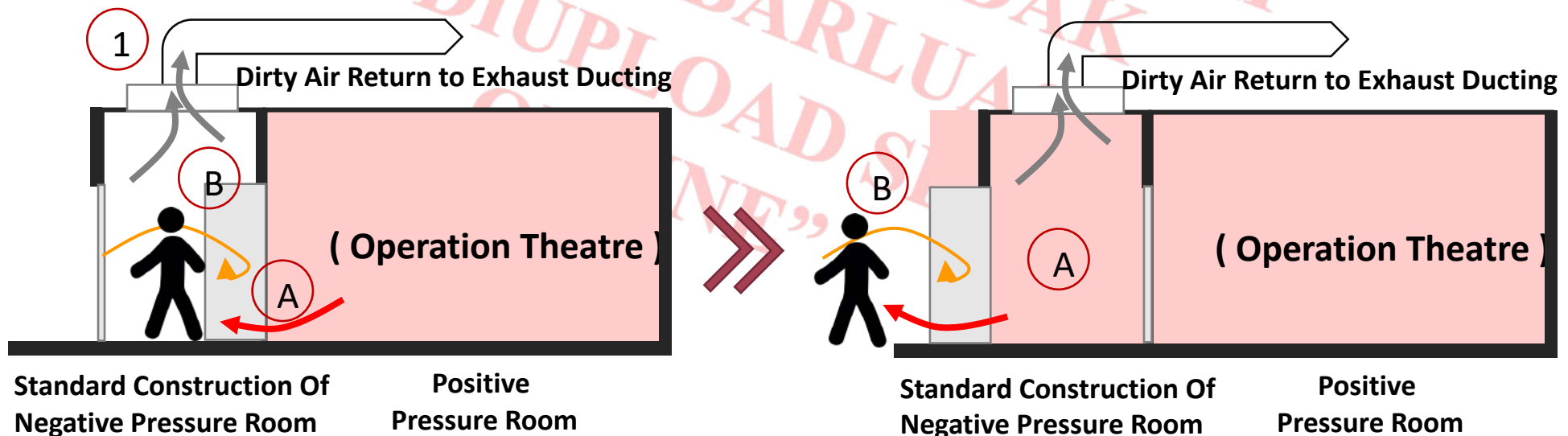
Konversi ruang yang ada menjadi ruang isolasi *airborne* (*Airborne Infection Isolation Rooms/AIIRs*) atau anteroom bertekanan negatif memang memungkinkan secara teoritis. Namun hal ini tidak memenuhi kelayakan karena harganya yang mahal dan menimbulkan risiko yang tinggi dari aspek teknis.





# RISIKO DARI RENOVASI RUANGAN STANDAR

1. Tambahan saluran pembuangan udara (exhaust) perlu disesuaikan. Perlu ada ruang cukup di atas langit-langit. Hal ini memerlukan kerja tambahan seperti melakukan plesteran ulang. → Risiko udara kotor masuk saluran dan risiko *downtime* yang lama.
2. Hanya mengandalkan tekanan statik negatif menyebabkan:
  - A. Anteroom kehilangan tekanan negatif saat pintu dibuka.
  - B. Pergerakan udara akibat dari pergerakan manusia, peralatan, atau tempat tidur, bahkan pintu itu sendiri dapat menyebabkan kebocoran kontaminan (lihat: Tang et al, 2005).
  - C. Kebanyakan ruang bertekanan negatif di RS tidak dapat mempertahankan performansinya (lihat: Servania et al, 2007)



# ISSUE I : POTENTIAL HAZARD

## Numerical study on the dispersion of airborne contaminants from an isolation room in the case of door opening

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Department of Energy and Refrigerating Air-Conditioning Engineering, National Taipei University of Technology, Taiwan

## A performance assessment of airborne infection isolation rooms

Stefan A. Saravia, MPH,<sup>a</sup> Peter C. Raynor, PhD, MSEE,<sup>a</sup> and Andrew J. Streifel, MPH<sup>b</sup>  
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**Background:** Airborne infection isolation rooms (AIIRs) help prevent the spread of infectious agents in hospitals. The performance of 678 AIIRs was evaluated and compared with construction design guidelines.

**Methods:** The pressure differentials ( $\Delta P$ ) between the isolation rooms and adjacent areas were measured, and ventilation and construction details were recorded for each room. Ultrafine particle concentrations were evaluated in the rooms, surrounding areas, and ventilation systems serving the rooms. Measurements were analyzed as a function of room parameters.

**Results:** Only 32% of the isolation rooms achieved the recommended  $\Delta P$  of  $-2.5$  Pascals (Pa) relative to surrounding areas. AIIRs with solid ceilings had an average  $\Delta P$  of  $-4.4$  Pa, which was significantly higher than the average  $\Delta P$  of  $-2.0$  Pa for rooms with dropped ceilings ( $P = .0002$ ). Isolation room ultrafine particle concentrations were more highly correlated with particle levels in surrounding areas ( $R^2 = 0.817$ ) than in the ventilation systems serving the rooms ( $R^2 = 0.441$ ). Almost all ventilation filters serving AIIRs collected fewer particles than anticipated.

**Conclusion:** The results indicate that hospitals are not all maintaining AIIRs to correspond with current guidelines. The findings also support the contention that having tightly sealed rooms helps maintain appropriate pressure differentials. (Am J Infect Control 2007;35:324-31.)

## Door-opening motion can potentially lead to a transient breakdown in negative-pressure isolation conditions: the importance of vorticity and buoyancy airflows

J.W. Tang<sup>a,\*</sup>, I. Eames<sup>b</sup>, Y. Li<sup>c</sup>, Y.A. Taha<sup>d</sup>, P. Wilson<sup>e</sup>, G. Bellingan<sup>f</sup>, K.N. Ward<sup>a</sup>, J. Breuer<sup>d</sup>

Received 28 January 2005; accepted 18 May 2005

### KEYWORDS

Chickenpox; Varicella; Nosocomial; Aerosol; Transmission; Negative-pressure isolation room

**Summary** A patient with severe chickenpox was admitted to a negative-pressure isolation room. He remained sedated, intubated and mechanically ventilated throughout his admission. He was managed only by nurses immune to chickenpox. A non-immune male nurse occasionally handed equipment through the doorway, without entering the room. Ten days later, he also developed chickenpox. Sequencing of viruses from the patient and nurse showed the same rare genotype, indicating nosocomial transmission. An experimental model demonstrated that, despite negative pressure, opening the door could have resulted in transport of infectious air out of the isolation room, leading to a breakdown in isolation conditions.  
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Hanya 32% ruang isolasi yang memenuhi rekomendasi  $-2,5$  Pa akibat *door-opening*

Akibat *door-opening*, nosocomial transmission dapat terjadi walaupun perawat tidak masuk ke ruang isolasi.

# SOLUSI DARI BIOFACTORY

## SPARCX Anterooms

- SPARCX Anterooms WHERE?
- SPARCX Anterooms –PORTABLE SOLUTION

# SOLUTION

## New Innovation: Prefabricated Intelligent Anterooms 'SPARCX™ Anterooms'

Utilization of prefabricated intelligent anterooms to **instantly upgrade** key hospital infrastructure into safer **isolating spaces** capable of housing airborne infectious patients with **no renovation and no downtime**.

### SPARCX Anterooms

#### Kelebihan dari solusi SPARCX:

- Hemat biaya
- Tidak perlu biaya renovasi
- *Downtime* yang minimal
- *Plug & Play* (hanya memerlukan 1 steker listrik)
- Teruji secara klinis dapat menjadi pelindung terhadap aerosol virus hidup

#### Key Features:

- Patented air decontamination mode
- Medical grade HEPA Filtration
- Negative or positively pressured (more than -2.5Pa)

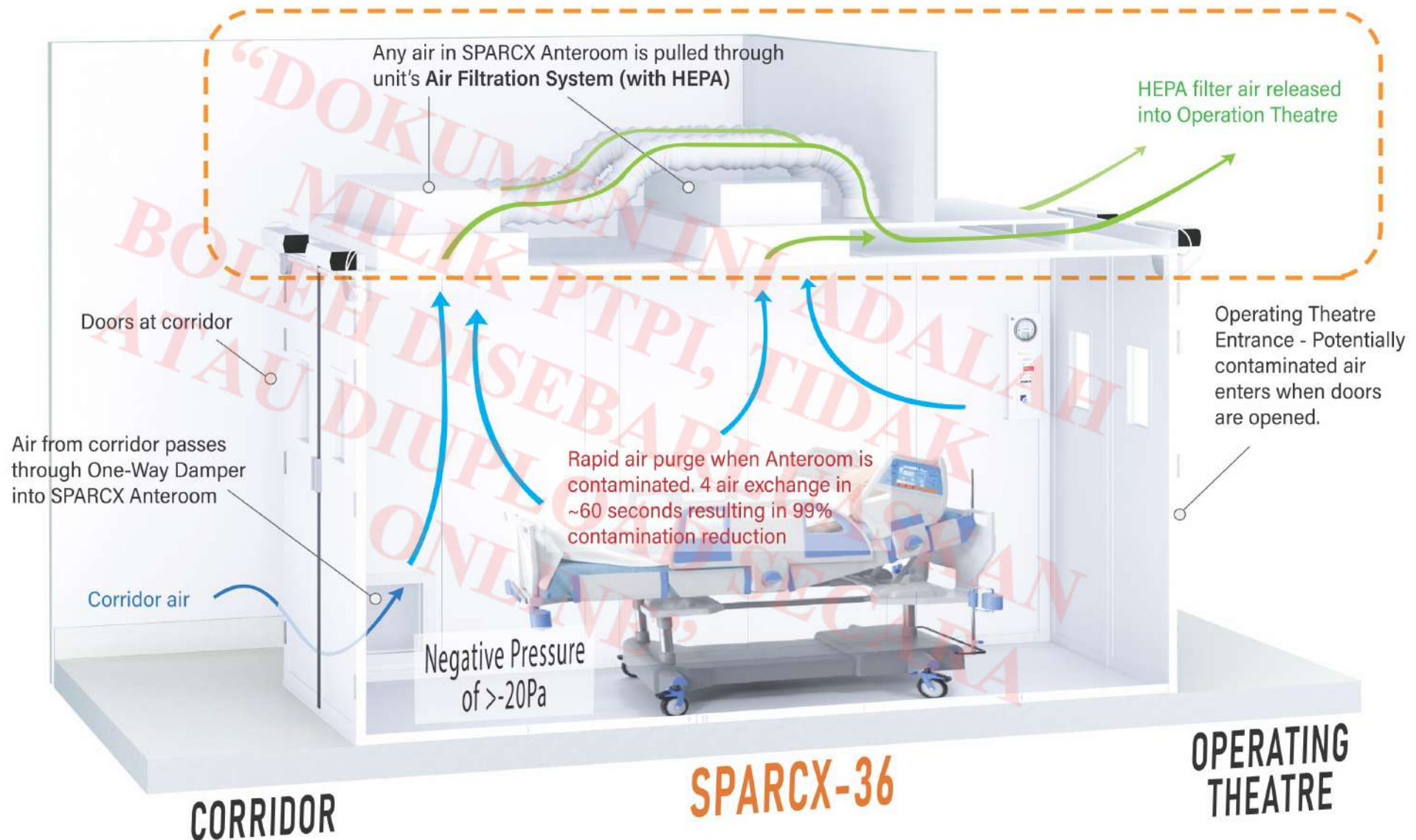


Singapore  
General Hospital





# SPARCX™ – AIRFLOW SYSTEM







# SPARCX

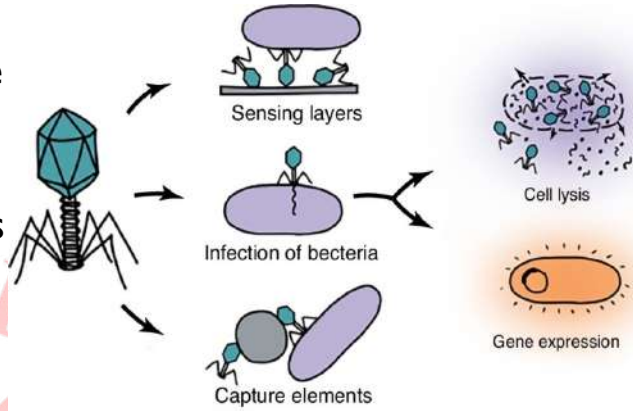
Game Changing Isolation Technology

# SPARCX™ Anteroom system meets ASHRAE 170-2021

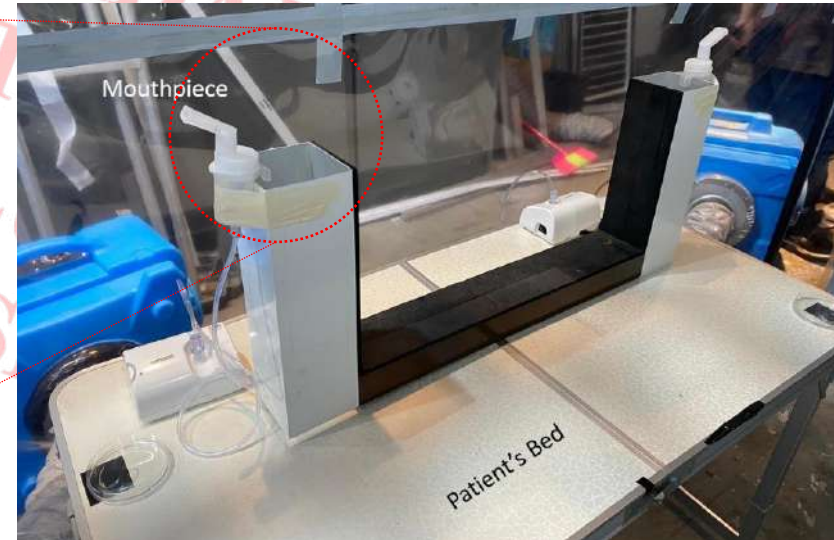
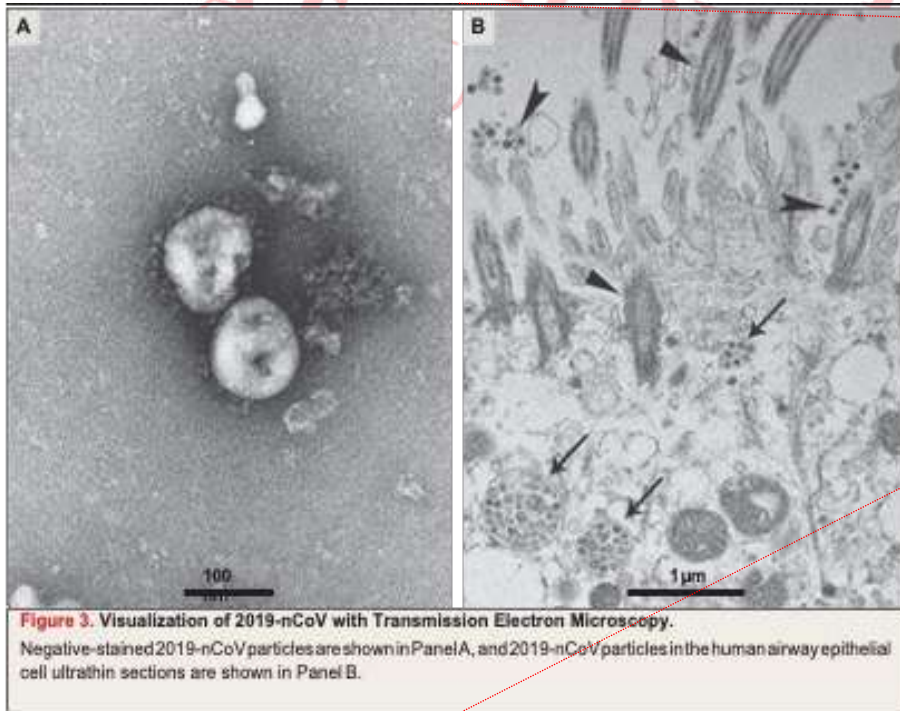
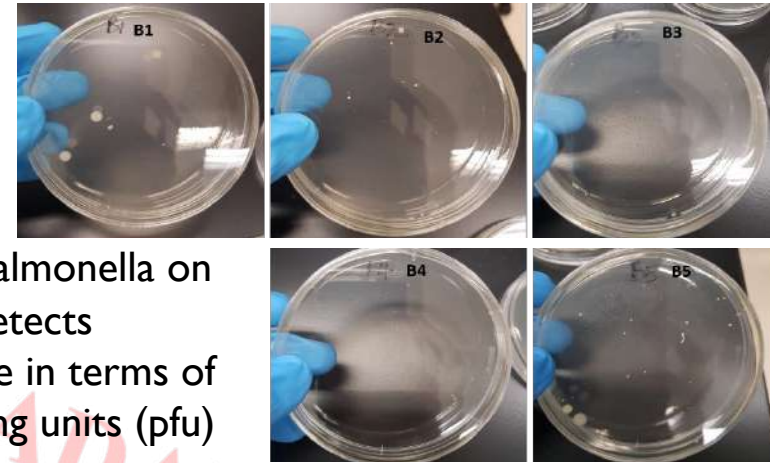
Requirements	Procedure Room	Protective Environment Room	Operating Room	Air Borne Infection Anteroom	Air Borne Infection Room	PE Anteroom	Combination All / PE Anteroom	Combination All/PE room	<b>SPARCX™</b>
Pressure Relationship to Adjacent Areas	Positive	Positive	Positive	(e)	Negative	(e) – section 7.2.2	(e) – section 7.2.3	Positive	Can be configured with (i) cascading negative, (ii) positive or (iii) positive to both Room and corridor and (iv) Negative to both Room and corridor
Minimum Outdoor ACH	3	3	4	No Req.	2	No Req.	No Req.	2	Exceeds Outdoor ACH through Air purge
Minimum Total ach	15	12	20	10	12	10	10	12	Exceeds Min Total ACH through Air purge
All Room Air Exhausted Directly to outdoors	No Req.	No Req.	No Req.	Yes	Yes	No requirement	Yes	Yes	Yes through connection to All or PE or Combination All / PE room
Air Recirculated by means of Room Units	No	No	No	No	No	No	No	No	No
Unoccupied Turn down	Yes	No	Yes	Yes	Yes	No	No	No	Yes
Minimum Filter Efficiencies	MERV-14	HEPA	MERV-16 (hh)	Merv-8	Merv-14	HEPA	HEPA	HEPA	Exceed with HEPA
Designed RH	20 to 60	Max 60	20 to 60	No Req.	Max 60	No Req.	No Req.	Max 60	No Req.
Designed Temperature	21-24 degrees	21-24 degrees	20-24 degrees	No Req.	21-24 degrees	No Req.	No Req.	21-24 degrees	No Req.
Monitoring & Alarms	Required	Required	Required	Required	Required	Required	Required	Required	Has both data readout and alarms

# LIVE VIRUS STUDY CONDUCT

Bacteriophage p22 (signal)  
approx. 60nm  
= same size as SARS-COV-2



(Detection) Salmonella on agar plates detects bacteriophage in terms of plaque forming units (pfu)



Aerosolized bacteriophage p22 coming out from mouthpiece of a compressed nebulizer at both ends of "Patient's Bed" at approximately 1 m above ground.



# VALIDASI PADA AEROSOL VIRUS HIDUP

Bacteriophage p22 (60nm) yang dijadikan aerosol menggunakan dua *compressor nebulizers* (MMAD 3 $\mu$ m) di dalam ruang bertekanan positif dengan simulasi berupa aktivitas manusia masuk dan keluar ruangan.

## Standard Room System:

ICU	SPARCX	Corridor
Total PFU	Total PFU	Total PFU
164,642	2,140	0

## OT Room System:

OT	SPARCX	Corridor
Total PFU	Total PFU	Total PFU
21,173	993	0

### Kesimpulan:

SPARCX System teruji dapat mengisolasi dengan baik dan melindungi koridor dari kontaminasi bahkan dalam kondisi ruang isolasi memiliki tekanan positif yang tinggi.

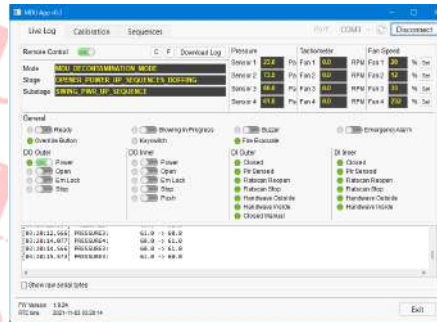
# SPARCX™ KEY FEATURES

4G or mobile network

3rd Party CCTV integration



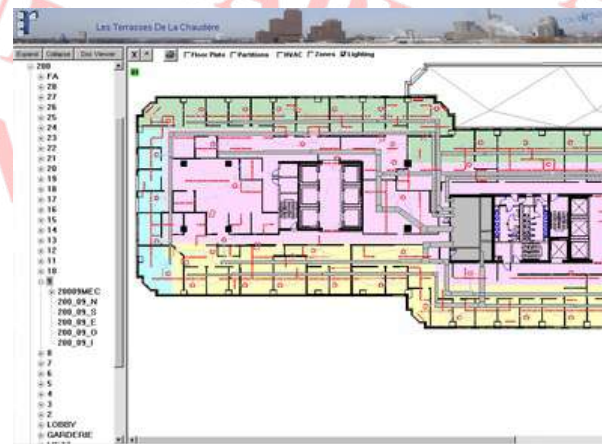
## SMART INTEGRATION



Full Dashboard and logging of Anteroom Parameters



Remote monitoring of key parameters



Schedule Preventative Maintenance

Rekonfigurasi ruang (Business as usual → Kombinasi All+PE atau *unoccupied downtime management*)

# PROJECT REFERENCES

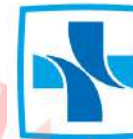
## REFERENCE SITES



Singapore  
General Hospital



Tan Tock Seng  
HOSPITAL



Changi  
General Hospital



**THOMSON**  
MEDICAL



National Heart  
Centre Singapore

SingHealth

**TEMASEK**  
LIFESCIENCES  
LABORATORY



Singapore National  
Eye Centre

SingHealth



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Our Ref.: [REDACTED]  
Date: 09 April 2021

**The BioFactory Pte Ltd**  
10 Ubi Crescent #02-41  
Ubi Techpark  
Singapore 408564  
Attention: Rose Lim

Dear Rose,

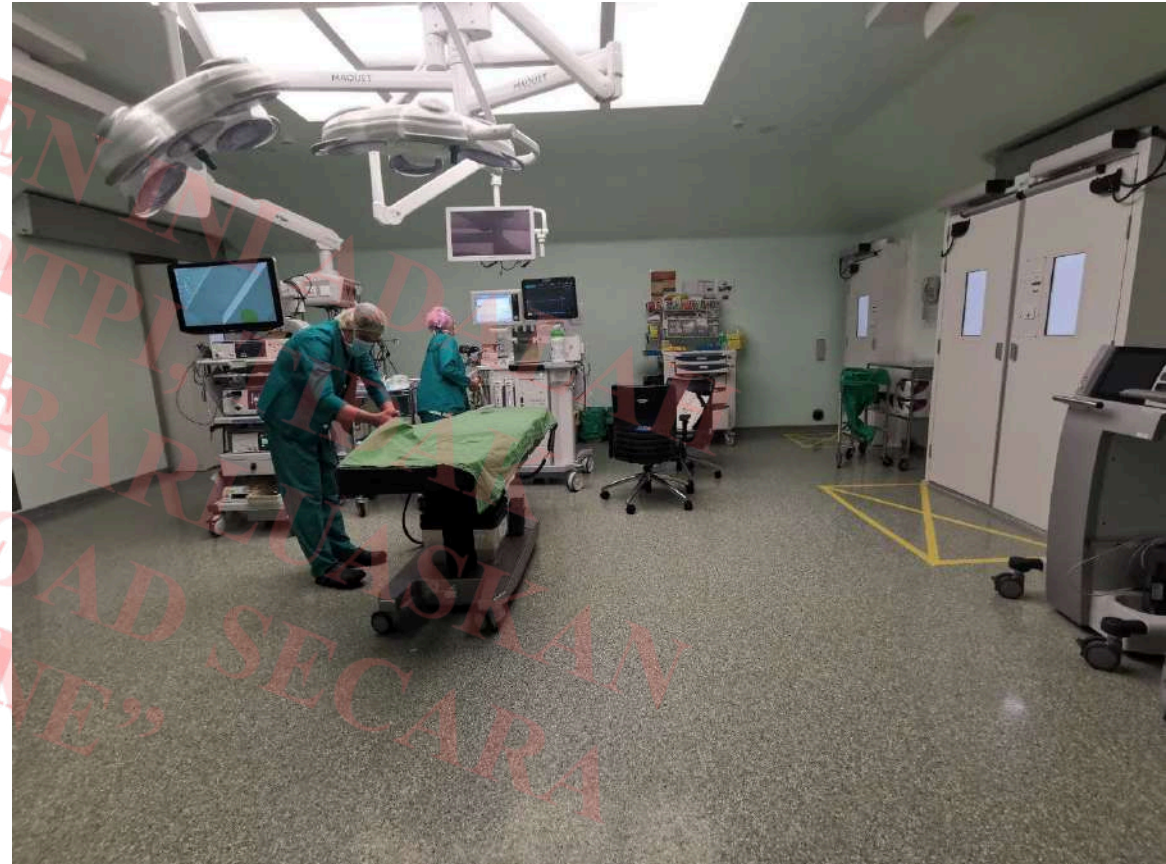
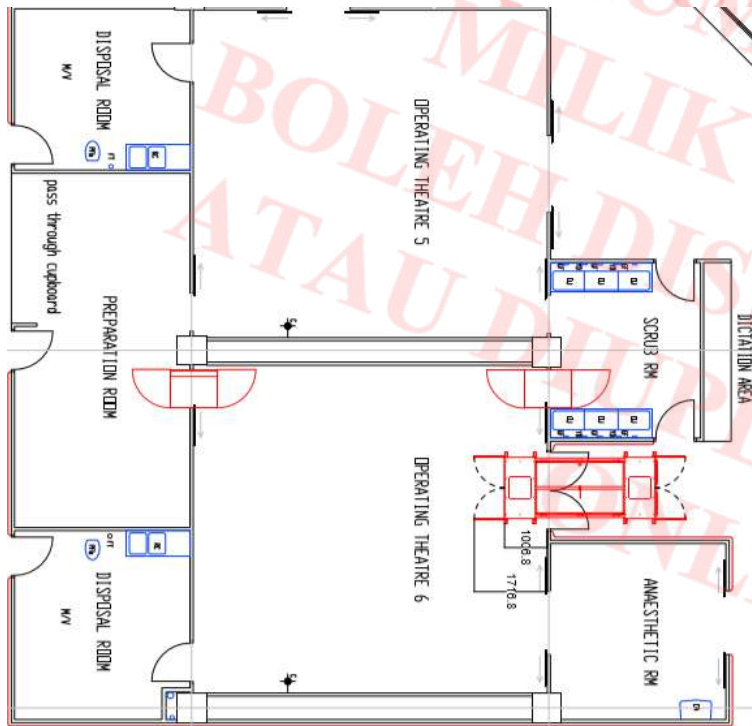
**LETTER OF AWARD  
REQUEST FOR PROPOSAL (RFP) NO.: [REDACTED]  
FOR THE SUPPLY AND INSTALL NEGATIVE PRESSURE MODULAR PORTABLE ANTEROOM**

We refer to the above matter and your RFP submission dated 17 March 2021.

We are pleased to inform you that we accept your RFP submission and approval has been given for the supply of Negative Pressure Modular Portable Anteroom to The BioFactory Pte Ltd for 2 years from 09 April 2021 to 08 April 2023 with an option to extend the contract for another 2 years, subject to the satisfactory performance of the vendor, at the same prices, terms and conditions.



# CASE STUDY 1: OT



# CASE STUDY 1: OT



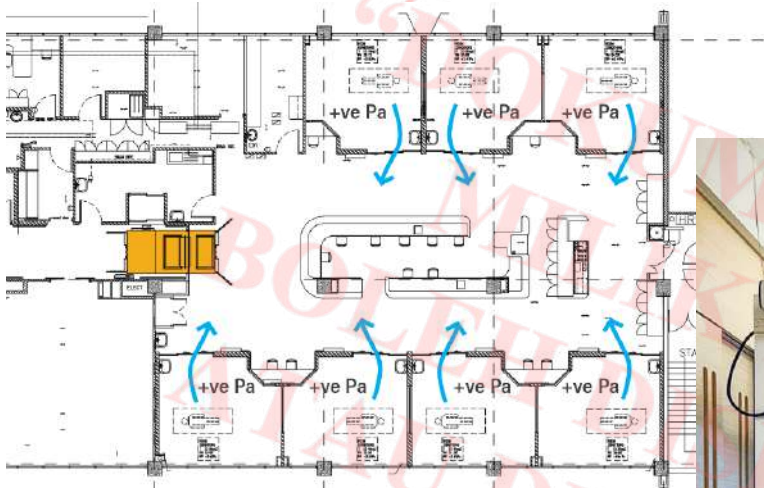


# CASE STUDY 1: OT





# CASE STUDY 2: ICU



# CASE STUDY 3: MOBILE DEPLOYMENTS



## VALUE PROPOSITION DARI SPARCX

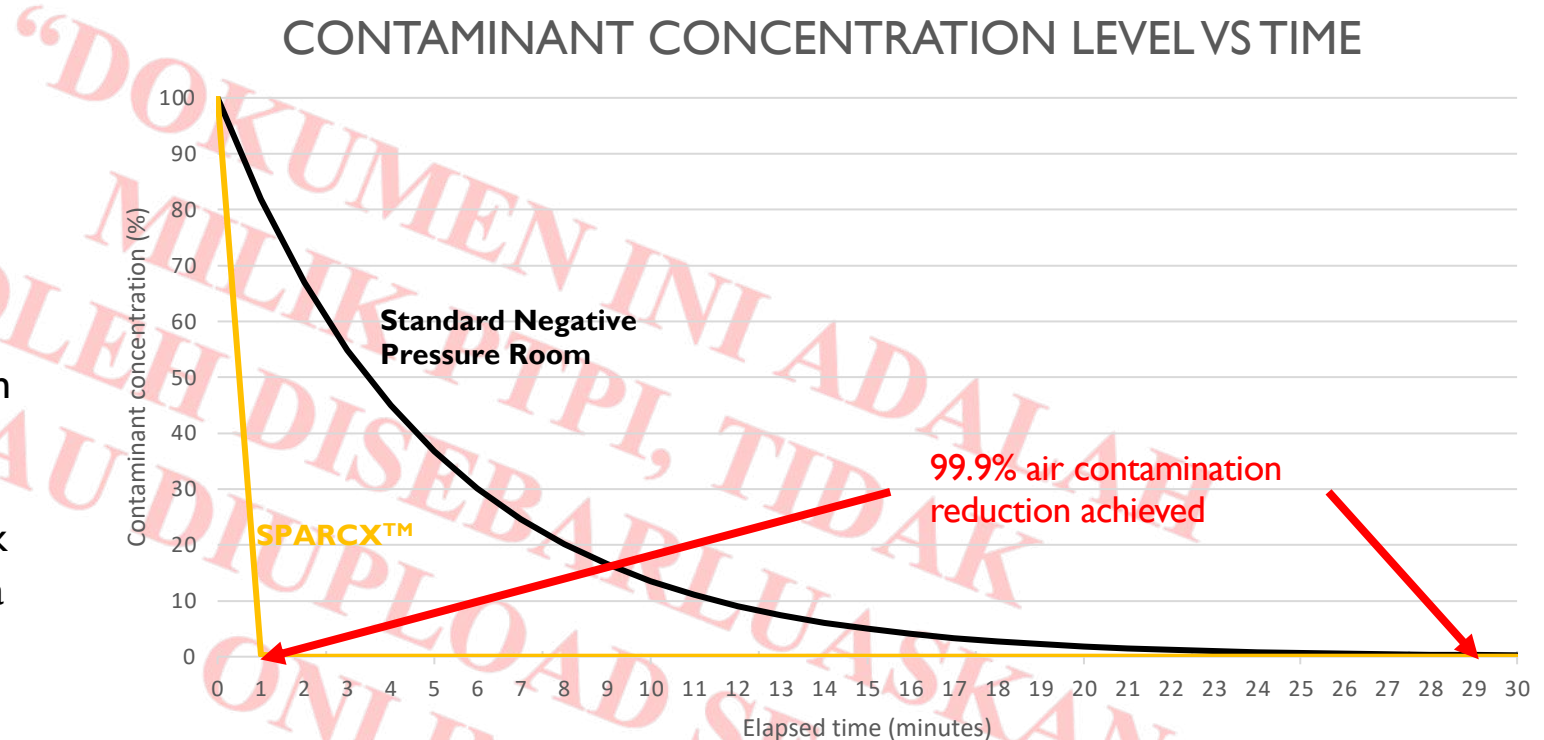
- ✓ Tidak ada renovasi/pengaruh terhadap *Air-Conditioning and Mechanical Ventilation (ACMV)* yang sudah ada.
- ✓ Tidak mengakibatkan *downtime*
- ✓ Isolasi terbaik di kelasnya
- ✓ Teruji terhadap aerosol virus hidup
- ✓ Opsional: *Next generation smart integration for smarter and more effective OTs*



**“DOKUMEN INI ADALAH  
MILIK PTPI, TIDAK  
BOLEH DISEBARLUASKAN  
ATAU DIUPLOAD SECARA  
ONLINE”**

# INTELLIGENT AIR CONTAMINATION REDUCTION (PATENTED)

Berdasarkan risiko bahwa Anteroom bertekanan negatif sering kotor dan kemungkinan kehilangan tekanan selama *door-opening*, kami mengembangkan **lapisan perlindungan tambahan** → Untuk menghilangkan semua kontaminan sebelum pintu lapisan luar dibuka.



From <https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#table1>

**Kesimpulan:** Dengan fitur unik ini, Sistem SPARCX™ mampu memastikan *clean zone* selalu dijaga kebersihannya dengan mengurangi 99,9% tingkat kontaminasi udara dalam ~1 menit yang biasanya dicapai ruang ICU dalam ~30 menit.