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TECHNICAL REPORT

# HEAT-RESISTANT AND CROSS INFECTION RISK REDUCTION COVID-19 TESTING BOOTH

# TECHNICAL REPORT

## HEAT-RESISTANT AND CROSS INFECTION RISK REDUCTION COVID-19 TESTING BOOTH

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Derived from the actual demands and needs of the medical team in Bac Giang during COVID-19 outbreak and the prolonged nation-wide hot weather, the project team of Nam Viet Design, PAM Air and Signify (formerly known as Philips Lighting) has researched, installed and donated an intelligent COVID-19 testing booth which is capable of resisting heat and reducing cross infection risk to Tan Yen Medical Center on June 5th, 2021. At the same time, the project team has learnt from foreign models, received valuable feedback, professional contributions and recommendations from doctors and experts.

**The mission of the project team is to contribute Vietnamese wisdom and empathy to serve the community and support the frontline medical team to fight the epidemic more effectively. After successfully testing the intelligent COVID-19 testing booth at Tan Yen Medical Center in Bac Giang, the project team has announced and shared the design and technical instructions on the official website of Nam Viet Design, PAM Air and Signify to continue to support other medical teams in Vietnam.**

**"With this post, we are happy to announce all the results, technical description and guideline for everyone, every organization and every project team who has enough expertise and resources to apply, improve, customize and expand this model - for the community benefit, especially in supporting our doctors and nurses in the pandemic hotspots."**, said Ms. Phan Thanh Hai, Managing Director of PAM Air Solutions.

## 1. THE ORIGIN OF IDEA

**The idea came from the requests and needs of the medical team in Bac Giang. The COVID-19 outbreak and the prolonged nationwide hot and humid weather have caused many inconveniences for them during the sample testing process.**

The project team quickly referenced similar models in other countries around the world such as India, Thailand, Korea and from the report "Positive Pressure Testing Booths Development and Deployment In Response To The COVID-19 Outbreak" by a group of medical and technology experts include Kevin Aroom, Jiawei Ge, Lidia Al-Zogbi, Marcee White, Adrienne Trustman, Adena Greenbaum, Jason Farley và Axel Krieger.

(Click here to check out the full version of the report)

(Image: Internet)

## 2. ACTUAL IMPLEMENTATION

**After more than 78 hours of ideation, design adjustment, construction and 12 hours of continuous test operation, the project team has donated 01 heat-resistant & cross infection risk reduction COVID-19 testing booth and 01 Philips UV-C sterilization trolley to Tan Yen Medical Center in Bac Giang province at 21:00 on June 5th 2021.**

(Nguồn ảnh: PAM Air)

Along with the donation and instruction activities, the project team also accompanied medical team of Tan Yen Medical Center to execute trial testings in order to evaluate pros and cons of actual operation.

## 3. ACTUAL HANDOVER PRODUCTS

Products handed over to Tan Yen Medical Center include 1 testing booth and 1 portable UVC disinfection lamp from Signify, include:

**01 testing booth with 3 main blocks**: Fresh air intake and external air filter block, an operating block for up to 4 doctors working at the same time and a moving block with 6 wheels.

- Size: 1.2m x 2.4m x 2.65m
- Fresh air filter chamber: 540m3/h exhaust fan, 3 5-layer filters, 2 Philips Lighting UVC 36w lights
- Working chamber: 4 working windows, UVC lamp with 36w automatic human detection safety sensor
- PAM Air indoor and outdoor environment monitoring devices, measuring temperature, humidity, CO2, and PM 2.5
- The smart switch device can be controlled via the PAM Home mobile app

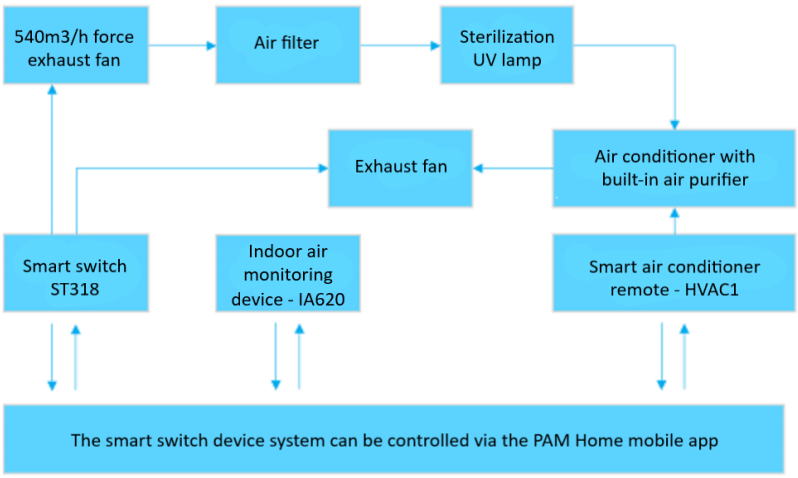

*Image: PAM Air*

Image: Signify Vietnam

**01 Philips UV-C Disinfection Trolley**

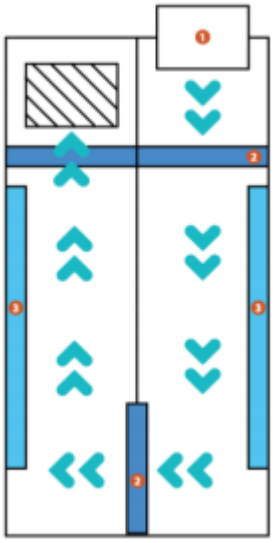
- Designed to disinfect specialized surfaces in a 30-square-meter square area or a 48-square-meter circle area
- 3-log level disinfection trolley in 15 minutes with 2 light lifters
- Environmentally friendly as it does not produce ozone during or after use
- Safety control features
- Philips UVC bulbs: 4 TUV 30W bulbs

## 4. PRINCIPAL OF OPERATION




- Natural air from the environment is sucked into the air cushion compartment by a forced exhaust fan, moves through the filter, and then is shone through a Philips UVC lamp that has the ability to disinfect without producing Ozone before it is released into the room.
- The air continues to be circulated through the air conditioner's indoor unit, cooled and filtered once more to ensure air quality.

### 4.1. Disinfecting the fresh air intake compartment



1. Fresh air exhaust fan with a capacity of 540m3
2. 5-layer filters
3. UVC 36w lights

Fresh air is taken from the outside environment and passed through a filter before being disinfected by UVC lamps. The capacity is calculated in accordance with the space of the air filter chamber. The gas is designed to move as shown before being brought down to the working chamber through pressure.

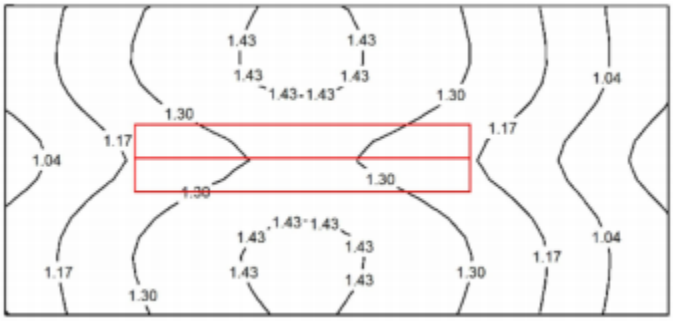
The light from Signify's UV lamp when tested can break the DNA structure of microorganisms within 3 seconds and up to 99% in 6 seconds.

When using UVC, we have considered the safety factors related to eye and skin damage, so the fresh air filter layer is designed to separate from the working chamber and not let the light get below.

### 4.2. Disinfecting the working chamber

The working chamber is designed to disinfect automatically when no one is working by using lights with sensors that recognize people in the room. The human detection radius range is set to 4 meters around the test chamber when the light is on to ensure safety and prevent any risks.

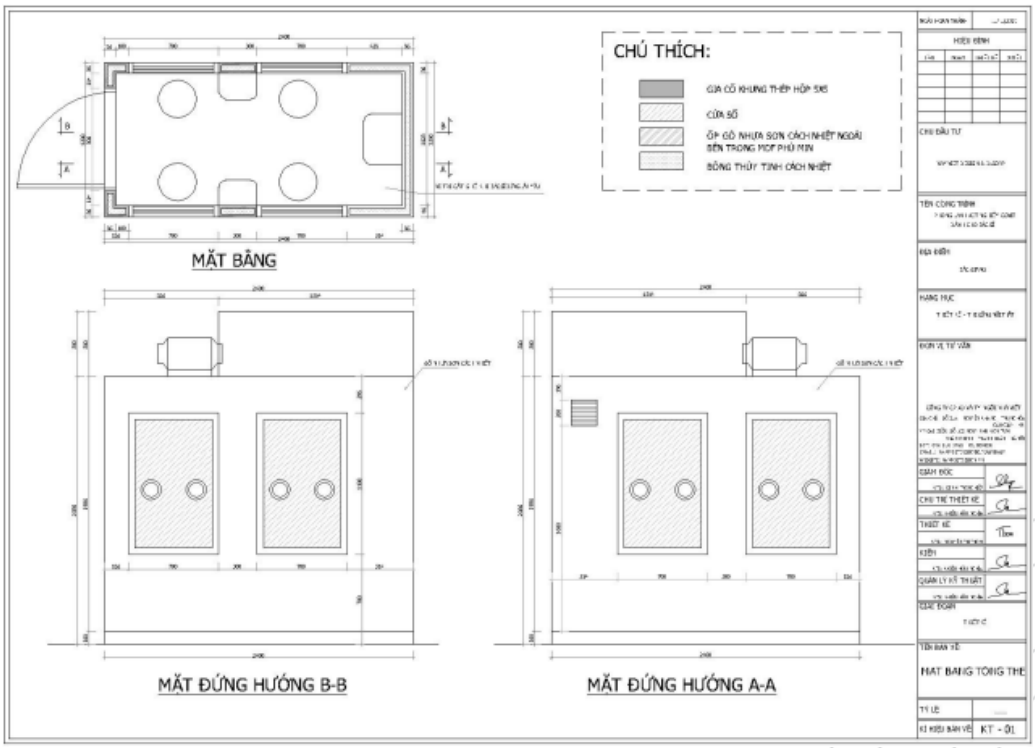
Based on the expert's calculation according to the designed room size, the disinfection time for the working compartment is 8 minutes for the entire surface and room space.

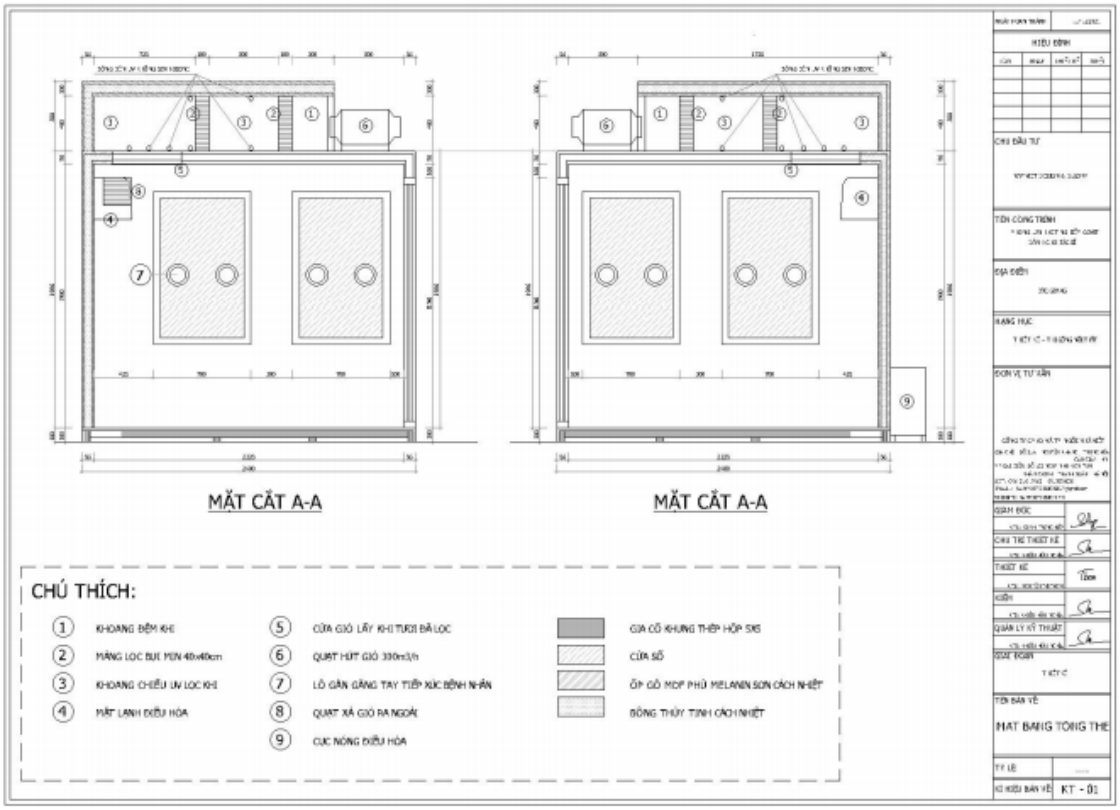



### 4.3. Working environment

The working environment is guaranteed for the working activities of 4 doctors and is automatically alerted through the display light of the environmental quality monitoring device with important parameters such as temperature, fine dust and CO2, ensuring the best environment for doctors and nurses in a closed environment.

## 5. BLUEPRINT




MẶT CẮT A-A
MẶT CẮT A-A
CHÚ THÍCH:
1 KHOANG ĐỆM KHÍ
2 MÀNG LỌC BỤI MỊN 40x40cm
3 KHOANG CHIẾU UV LỌC KHÍ
4 MẶT LẠNH ĐIỀU HÒA
5 CỬA GIÓ LẤY KHÍ TƯƠI ĐÃ LỌC
6 QUẠT HÚT GIÓ 330m3/h
7 LỖ GĂN GĂNG TAY TIẾP XÚC BỆNH NHÂN
8 QUẠT XẢ GIÓ RA NGOÀI
9 CỤC NÓNG ĐIỀU HÒA
GIA CỐ KHUNG THÉP HỘP SXS
CỬA SỔ
ỐP GỖ MDF PHỦ MELANIN SƠN CÁCH NHIỆT
BÔNG THỦY TINH CÁCH NHIỆT
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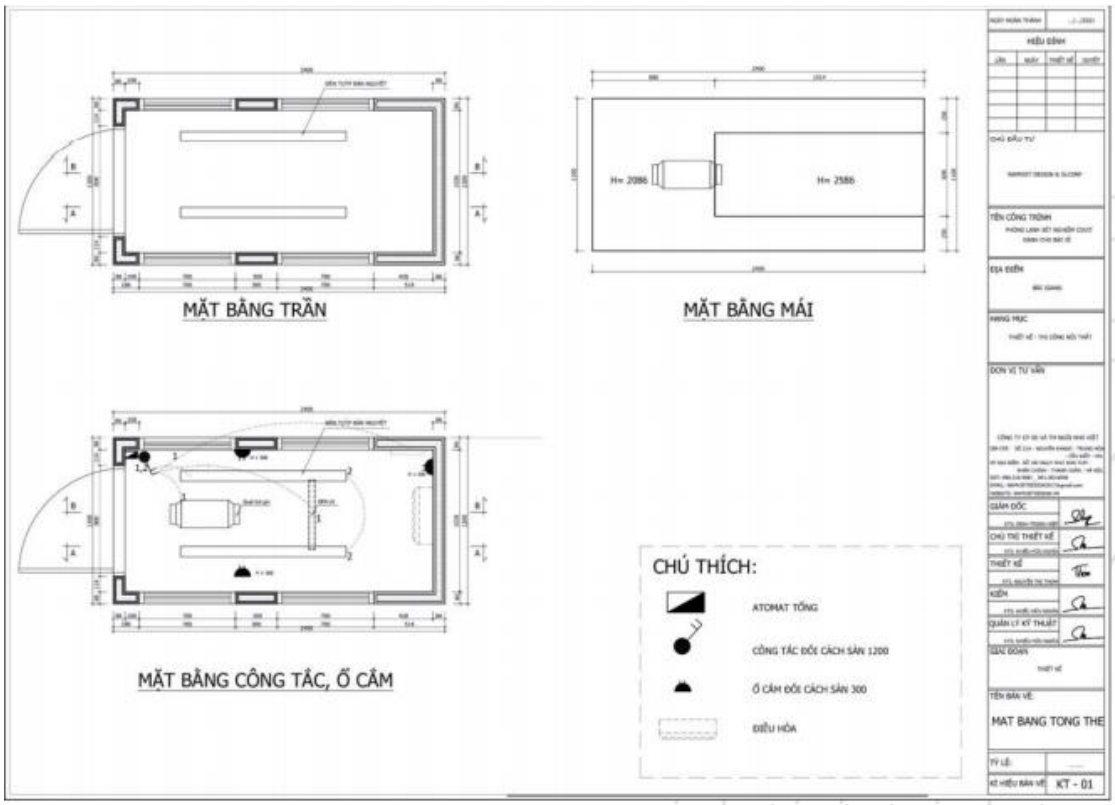
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MẶT BẰNG MÁI
MẶT BẰNG CÔNG TẮC, Ổ CẮM
CHÚ THÍCH:
ATOMAT TỔNG
CÔNG TẮC ĐỔI CÁCH SÀN 1200
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**3D images**

**Demo video:** https://www.youtube.com/watch?v=Fakri_5t1bI

## 6. PRELIMINARY RESULTS

After the handover and trial operation, the results obtained from the doctors at Tan Yen Medical Center show that the product operates stably, serves well for the testing process and ensures the basic objectives of the product. This version helps medical staff to work in a cool, safe and convenient environment to take samples for a long time in hot and humid weather.

Currently, Nam Viet Design is working on product improvement activities according to feedback to provide more practical solutions.

At the same time, based on professional contributions and recommendations from doctors and experts about the convenience and safety of the product, the project's expert team also has some recommendations:

1. The intelligent COVID-19 testing booth is designed and operated with the goal of serving and ensuring that the medical team in Bac Giang work in a cool and safe environment.
2. Depending on the characteristics and needs of the sampling staff, the design will need further improvement to adapt to each environment and requirements of the COVID-19 Prevention and Control Force of the Ministry of Health.
3. It is recommended that the testing booth have a bactericidal system, equivalent to the UVC system being used in this project. Although direct exposure to UV-C rays is dangerous, UV-C lamps pose very little risk when used correctly. Lamps should always be installed with adequate shielding and protective methods (such as presence sensors or timers) to avoid minor as well as serious injuries to eyes and skin. Without those protections, our UV-C

sterilization luminaires may only be used as part of a sterilization system with the safety regulations stated above or mentioned in the installation and user manual.

4. The Philips UV-C light source is capable of neutralizing 99% of the SARS-CoV-2 virus on surfaces within 6 seconds of irradiation, according to an experiment validated by the National Laboratory of New Infectious Diseases ( NEIDL) at Boston University, USA.
5. Along with the announcement and technical contribution of this solution to the community, PAM Air and Signify are committed to continuing to accompany the Covid-19 Prevention and Control Force and other units as a consultant and supporter based on expertise, practical experience, smart solutions and corresponding UVC disinfection lamps.

## 7. A PROJECT FOR THE COMMUNITY AND BY THE COMMUNITY

We would like to express our sincere thanks to the professional contributions of the following doctors:

1. **Assoc Prof. PhD. Pham Thi Dung**, Thai Binh University of Medicine and Pharmacy – who is currently doing medical work in Bac Giang
2. **Dr. Mai Van Que**, Director of Thang Long Medical Equipment Company
3. **MMed. Khieu Huu Thanh**, Thai Binh University of Medicine and Pharmacy
4. **MMed. Do Thai Son**, Otorhinolaryngology Specialist, Phuong Dong General Hospital

Last but not least, we would like to thank all partners and the community for your valued contributions and support during our project.

"*With the aim of unlocking the extraordinary potential of technology for a brighter life and a better world, Nam Viet Design - PAM Air - Signify project team hopes to help improve working conditions and ensure the safety of medical staff on the front lines of epidemic prevention, contributing to the new norma*l", said Mr Phuong Hoai Duong, General Manager of Signify Vietnam./