Data in Brief 32 (2020) 106068

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Construction time, cost and testing data of a prefabricated isolation medical unit for COVID-19

Yu Zhou, Zhonghua Zhang, Bo Wang, Guangying Ren, He Qi*, Xi Wang

China Construction Science and Technology Group Cooperation, Room 703, G3 Building, TCL international E-city Nanshan, Shenzhen, China

A R T I C L E   I N F O

Article history:
Received 9 May 2020
Revised 8 July 2020
Accepted 20 July 2020
Available online 24 July 2020

Keywords:
COVID-19
Isolation wards
Prefabricated buildings
Construction cost and time

A B S T R A C T

Coronavirus Disease 2019 (COVID-19) has been identified as a global pandemic by the World Health Organization (WHO). The breakout of COVID-19 in various countries and regions brings a great threat to people's life and adds an unprecedented high pressure on healthcare systems. Due to the high infectivity of COVID-19, high standard negative pressure isolation units are required to accommodate the patients with COVID-19 and protect health workers. A novel prefabricated negative pressure isolation medical unit was designed and constructed in Shenzhen, China to help to accommodate the patients with COVID-19. This article provides detailed construction cost, time and testing data for this isolation medical unit. Considering the construction happened during the lockdown in Shenzhen (and in China), the construction cost and time can provide precious and rare information as well as guidelines to construct or expand appropriate medical facilities to accommodate the patients with COVID-19.

* Corresponding author.
E-mail address: qihe@cscec.com (H. Qi).

https://doi.org/10.1016/j.dib.2020.106068

Specifications table

Subject	Civil and Structural Engineering
Specific subject area	a novel prefabricated negative pressure isolation medical unit.
Type of data	Tables. MS Excel file.
How data were acquired	The data about construction cost and time were collected during the construction. Performance data were collected during a test operation of a HVAC system for the medical unit. Brand and model of the testing equipment are listed as follows: TSI Incorporated: AccuBalance Air Capture Hood 8375. TSI Incorporated: Velocial Air Velocity Meter 9545. Kimo MP 120 Manometer Pressure Sensor Monitor Meter.
Data format	Raw. Analysed.
Parameters for data collection	During the construction, the cost data were collected and categorized as various major components, including the containers, windows & doors, sanitation, indoor equipment, heating, ventilation and air conditioning. During the test operation of a HVAC system, the performance data, including the pressure difference between rooms, pressure difference against atmosphere pressure and ventilation rate for the clean (fresh) air fans, were collected.
Description of data collection	Construction cost data of the prefabricated isolation medical unit for the COVID-19, available in an associated Excel spreadsheet, and the construction time, testing and evaluation data of the prefabricated isolation medical unit for the COVID-19, available in tables within the main text.
Data source location	Institution: China Construction Science and Technology Cooperation City/Town/Region: Shenzhen Country: China Latitude and longitude (and GPS coordinates) for collected samples/data: 114.357712 E, 22.693763 N
Data accessibility	With the article.

Value of the data

- These data provide precious and rare information and guidelines to expand high standard medical facilities to accommodate the patients with COVID-2019.
- Medical and engineering professionals currently combat COVID-19 or consider expanding medical facilities due to COVID-19.
- The detailed construction time and cost breakdown of a negative pressure medical unit are presented, which will enable a cost analysis and comparison with the other medical applications and construction methods.

1. Data description

The data presented in this article have been collected under the construction of a high cleanness negative pressure prefabricated isolation medical unit constructed for the patients with COVID-19, locating at Pingshan People's Hospital, Shenzhen, China. In this project, this medical unit was constructed within five working days via prefabricated modular construction. Table 1 shows the daily construction progress during this period. The information includes the number of workers engaged each day, the working hours as well as the progress. As the construction happened via the lockdown in Shenzhen (and China), the cost of installation can be unique. Shown in the attached spreadsheet, the collected installation cost data were categorized as various major components, including the containers, windows & doors, sanitation, indoor equipment, heating, ventilation and air conditioning. All the costs listed are in CNY (Chinese Yuan). The last but not the least, testing and evaluation regarding the pressure and air flow rates in

Table 1
Construction time and progress.

Date	No. of labors	Working hours	Progress of the day
Feb. 04, 2020	3	12	Containers arrived and assembling was started
Feb. 05, 2020	7	12	Building envelopes were assembled Interior declaration/installation was completed
Feb. 06, 2020	10	12	Heating, cooling and ducting systems were installed Ventilation fans were installed and air purifiers were installed
Feb. 07, 2020	10	12	Control panels were installed and connected Electronic systems were tested
Feb. 08, 2020	8	12	Negative Pressure HVAC systems were completed HEPA Filters were Installed

Table 2
Measured pressure difference between rooms.

Pressure Difference between Rooms	Measured Pressure Difference (Pa)	Design Requirement	Requirement Met
Ward 1 and Restroom 1	5	$\geq$ 5 Pa	Yes
Patient Corridor and Ward 1	8	$\geq$ 5 Pa	Yes
Ward 2 and Restroom 2	8	$\geq$ 5 Pa	Yes
Patient Corridor and Ward 2	9	$\geq$ 5 Pa	Yes
Buffer Room and Ward 1	9	$\geq$ 5 Pa	Yes
Buffer Room and Ward 2	10	$\geq$ 5 Pa	Yes
Medical Corridor and Buffer Room	6	$\geq$ 5 Pa	Yes

Table 3
Measured pressure difference against atmosphere pressure.

Pressure Difference Against Atmosphere Pressure	Measured Pressure Difference (Pa)	Design Requirement	Requirement Met
Restroom 1	−19	$\leq$−15 Pa	Yes
Ward 1	−14	$\leq$−10 Pa	Yes
Restroom 2	−23	$\leq$−15 Pa	Yes
Ward 2	−15	$\leq$−10 Pa	Yes
Patient Corridor	−6	$\leq$−5 Pa	Yes
Buffer Room	−5	$\leq$−5 Pa	Yes
Medical Corridor	1	$\geq$ 0 Pa	Yes

each room have been conducted. Table 2 shows the details of the measured pressure difference between rooms, and the room with higher pressure is shown first (As an example, Ward 1 has a higher pressure than Restroom 1). Table 3 then presents the measured pressure difference between each room and the atmosphere pressure (Note: the negative value means that the pressure in the room is lower than atmosphere pressure). Lastly, Table 4 shows the results of the measured ventilation rates for the clean (fresh) air fans in each room. The locations of the fans are shown in Fig. 1. The experimental design and methods will then be discussed in the next section.

Table 4
Measured ventilation rate for the clean (Fresh) air fans .

Room/Fan	Designed Ventilation Rate (m^3/h)	Measured Ventilation Rate (m^3/h)			
		Level 10	Level 7	Level 5	Level 3
Ward 1 Fan No.1	350	635	555	335	N/A
Ward 1 Fan No.2	350	675	507	313	N/A
Ward 2 Fan No.1	350	530	400	275	N/A
Ward 2 Fan No.2	350	500	454	270	N/A
Buffer Room	150	353	320	300	150
Medical Corridor	450	510	N/A	N/A	N/A

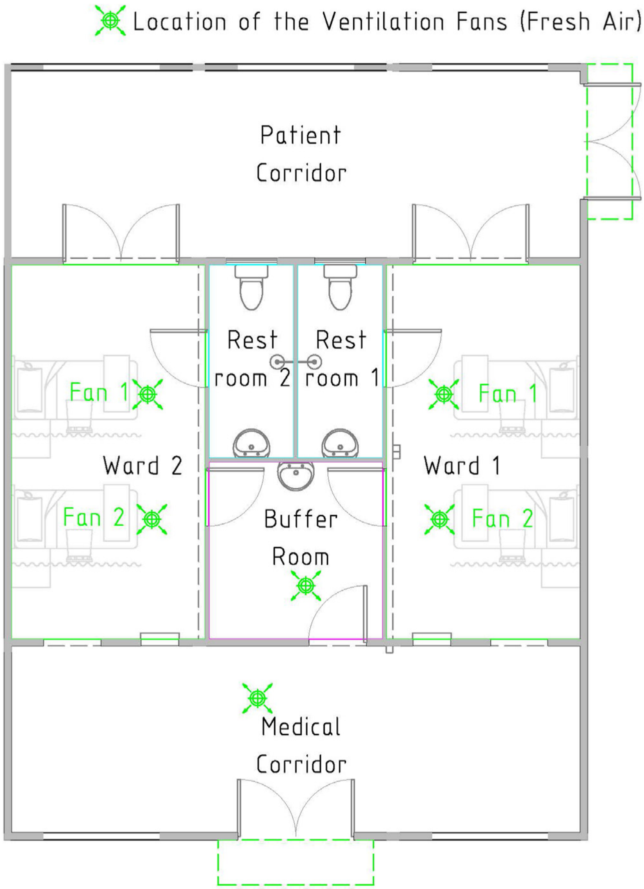

Fig. 1. Medical unit layout and locations of the ventilation fans for fresh air.

2. Experimental design, materials, and methods

An appropriate indoor environment can be essential to the isolation wards to form effective protections for the patients and medical workers [1-3]. The parameters need to be considered including indoor air temperature, relative humidity [4], ventilation and differential pressure control [5]. While indoor air temperature and relative humidity can be easily satisfied with the air conditioning system, the ventilation and differential pressure control can be critical and chal-

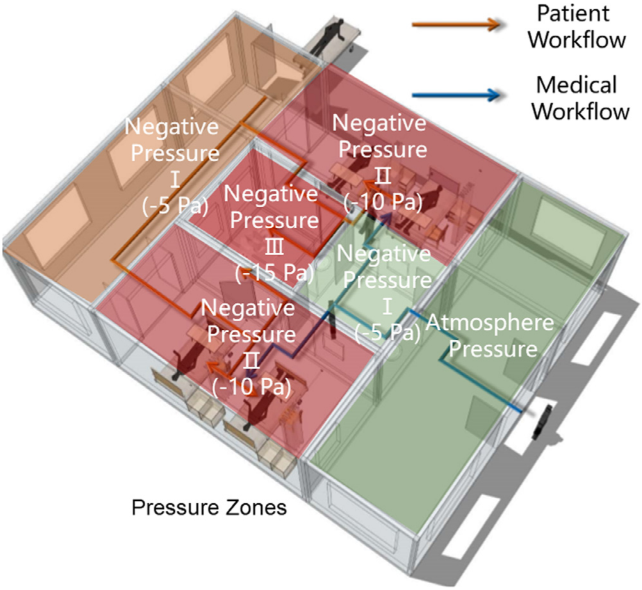

Fig. 2. Designed pressure zones and workflows.

Fig. 3. Top view of the prefabricated negative pressure isolation medical unit.

lengeable for isolation medical units [6]. In this practice, according to the cleanliness and functions, the medical unit is divided into five zones, such as the patient corridor, the patient room, the patient restroom, the buffer room and the medical corridor, and each with an independent fresh air conditioning system. Gradient pressure air distribution is adopted to achieve this aim, where different levels of negative pressure are distributed in different zones (Fig. 2). In this project, the isolation wards where patients are located are designed to have the −10 Pa comparing with the atmosphere and the restroom is kept as −15 Pa. This is to ensure that the clean air continues flowing into the patient rooms and the exhausted air can be pulled out without leaking to the health care workers' working area.

To achieve the design mentioned above, it took five continuous days during the construction period. The daily construction progress is organised and presented in this article (Table 1). The associated installation cost is also reported to reflect the price under the unprecedented challenges (due to lockdown) in the supply chain of equipment as well as the labor and workers (shown in the attached spreadsheet). The evaluation and testing were then conducted before handing over to the hospital. The testing includes the pressure differences and air flow rates in each room. The locations of the fans tested are shown in Fig. 1. The top view of the medical unit constructed is shown in Fig. 3.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Acknowledgments

Assistance from Tsinghua University and Pingshan People's Hospitalis highly appreciated.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dib.2020.106068.

References

[1] A. Shajahan, C.H. Culp, B. Williamson, Effects of Indoor environmental parameters related to building HVAC systems on patients' medical outcomes: a review of scientific research on hospital buildings, Indoor 29 (2019) 161–176.
[2] M. Dettenkofer, et al., Does the architecture of hospital facilities influence nosocomial infection rates? Infect. Control Hosp. Epidemiol 25 (1) (2014) 21–25.
[3] Y. Jiang, B. Zhao, X. Li, X. Yang, Z. Zhang, Y. Zhang, Investigating a safe ventilation rate for the prevention of indoor SARS transmission: an attempt based on a simulation approach, Build. Simul. 2 (4) (2009) 281–289.
[4] F. Memarzadeh, Literature review of the effect of temperature and humidity on viruses, ASHRAE Trans. (2012) 118.
[5] M. Leung, A.H. Chan, Control and management of hospital indoor air quality, Med. Sci. Monit. 12 (2006) SR17–SR23.
[6] C.B. Beggs, K.G. Kerr, C.J. Noakes, E.A. Hathway, P.A Sleigh, The ventilation of multiple-bed hospital wards: review and analysis, Am. J. Infect. Control 36 (2008) 250–259.