

MODULAR CONSTRUCTION OF HEALTHCARE FACILITIES

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Abstract.

During the pandemic, many large-scale construction projects were put on hold. And now that there are supply chain issues, among other roadblocks, facility managers are sure to see an influx of projects with shortened deadlines, in order to meet the growing need. As the healthcare industry experiences continued growth, the demand for facilities increases as well. But due to the supply chain issues, as well as backed-up project schedules, the timeline for new construction may be stunted. However, pre-fabrication and modular construction—one of the fastest-growing trends in construction today—is prepared for the challenge.

Key words. modular architecture, modular construction, Covid-19, test stations, laboratories, covid hotels.

Introduction

Covid-19 has had a major impact on the restructuring of healthcare facilities, particularly testing, immunization facilities, acute care hospitals and quarantine spaces.

There was a great need for auxiliary means that could be easily arranged in a convenient place. It became necessary to think about modular architecture. Modular testing and immunization centers were needed.

Modular construction is a process where parts of a building are manufactured off-site in a factory and then assembled on site. This process takes two times less time. Several modules of the building come separately to the construction site and they are already connected on site.

This type of construction has many advantages, such as the fact that these

modules can be disassembled and become part of another structure, and since the building modules are made in a factory, the construction loss is as little as possible. This type of construction is also safer in terms of labor and has wider possibilities. But perhaps the biggest positive side is the time, which is much less than standard construction, and also the weather, which does not affect the construction process.

Structurally, modular constructions are stronger, each module is processed separately with an individual approach. This type of construction is gradually becoming more acceptable to architects as it offers more possibilities and most of the project is written in advance, so there is no change during the construction process on site. There are two types of modular constructions:

Permanent and temporary buildings

According to the size of the building, the size of the modules also differs. The larger the module, the more difficult it is to transport, but overall, the process is still simplified compared to traditional construction. Clinics, offices and schools are often located in such buildings.

During the period of Covid-19, modular architecture in Georgia can be said to have been replaced by Covid hotels. Georgia was the first to use hotels as quarantine spaces. The hotel had a clinical status and represented an intermediate link between the apartment and the hospital. Clinical hotels were a Georgian innovation and were considered an alternative to field hospitals and modular architecture. By the end of December, about 9,500 beds were mobilized

in clinical hotels. While the Covid clinics were working with almost 95% capacity. In 3 big cities, multi-specialty clinics were transformed into Covid clinics. Fever centers, quarantine and fever hotels were created, where the initial reception of patients was carried out, however, based on the general regulations, there were not so many hotels that met international requirements, for example:

Ventilation

According to WHO recommendations, hotel rooms should have central and/or individual heating/cooling systems that do not require air circulation between rooms.

Location

Priority was given to accommodation

facilities located near airports and border checkpoints; Also, objects located far from densely populated areas. However, later, with the increase in the accommodation flow, the location of hotels to be used as quarantine spaces exceeded the area determined according to the above-mentioned priorities. During Covid-19 Health organizations quickly rolled out an assortment of modular prefab tents, containerized structures, hybrids, and countless testing and treatment facilities. These structures were built near medical centers in their parking lots and other areas. Prefab systems have been put into operation as covid-19 testing sites, laboratories, immunization units.

Examples



Covid – 19 Testing Center M-RAD Santa Monica CA USA.

The modular unit is essentially a trailer that is

moved with the help of another vehicle. It is

made of light steel and has three testing stations. Each of them has a window. An external projecting panel provides a little isolation. The unit is staffed by three nurses. The portable lift allows a person in a

wheelchair to rise to standing height for covid-19 nasal swab. The main material used is copper. A copper alloy can destroy a virus in less than four hours.



Prefab covid-19 testing center

Firm: Grimshaw Architects w/ SG Block and Osang Healthcare, USA

A 20-foot intermodal shipping container is equipped with solar panels on the roof. Panels are installed on site. It has eight test stations. The test stations are partially protected from each other by means of

panels. At one end of the partition there is a contact window, and on the opposite side there is a staff entrance. A roof vent provides ventilation.



Citizen Care Pod, Canada

Firms: WZMH Architects, PCL Construction, Insight Enterprises and Microsoft, with Parkin Architects, Toronto

This built prototype is based on a standard modular shipping container. It is adaptable to different functional needs, reconfigurable

and can be quickly installed. Test stations are separated by a projecting diagonal steel panel with a provided test station number.

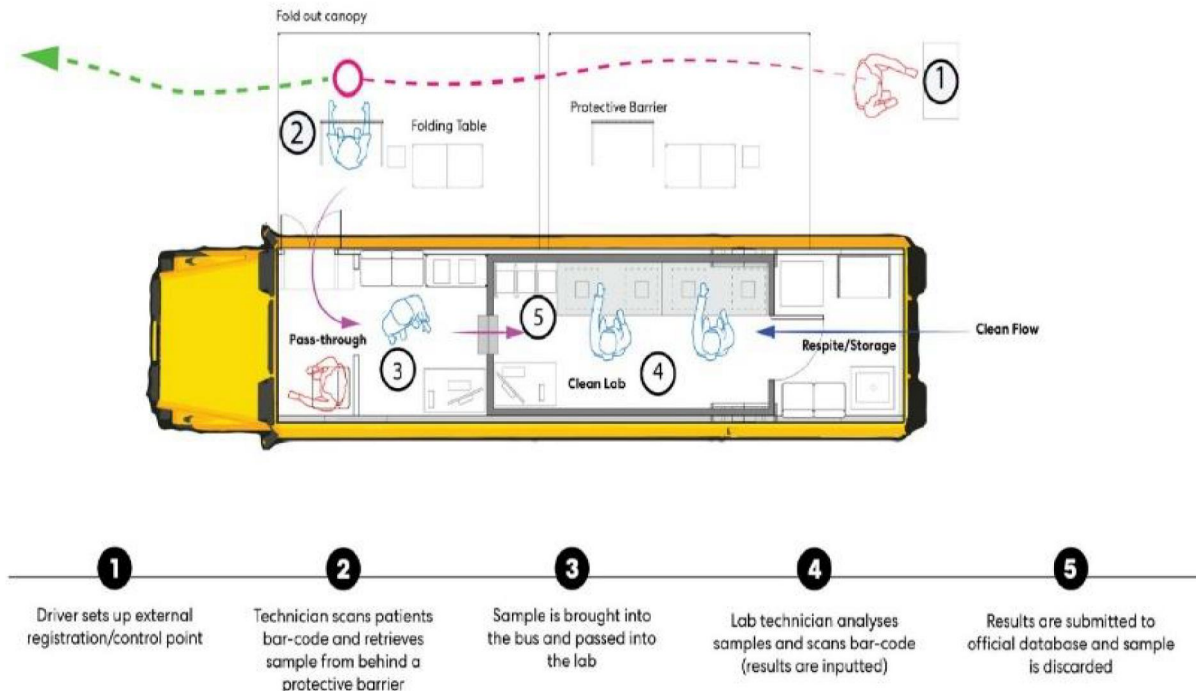


Figure 9

Testing center

Firm: Perkins and Will/ Scgmidt Hammer Lassen/ ARUO Group, USA

An ordinary school bus has been converted into a mobile Covid-19 testing and immunization unit. The bus will move to different places as needed. The interior of the bus is divided into three sections:

Administration/Registration/Testing laboratory

Personal work area

A canvas tent protects patients from the weather. The outer "room" functions as a waiting room **Conclusion**

Modular architecture design can achieve fast, economical and sustainable construction of emergency medical facilities:

Economic efficiency is significantly improved.

- 106% increase in time savings
- Cost efficiency increased by 203%

Architects and engineers living in the pandemic era are now taking on the responsibility of providing rapid design solutions in emergency situations. Now more than ever, it is important to develop a standardized design approach that will allow the country to respond quickly to the spread of the pandemic. The integration of modular construction into temporary health care facilities allows for the provision of areas with isolation units.

Reference

- *Pandemical healthcare architecture and social responsibility - COVID-19 and beyond. White Paper - University of Toronto Centre for Design + Health Innovation*

The Pandemic Effect - Blaine Brow