International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 07 | July 2021 www.irjet.net p-ISSN: 2395-0072

Design and Development of rapid economical Quarantine structure

Mr. Suhail Qureshi[1], Mr. Shah Varun[2], Ms. Shweta Wagh[3]

[1-3]*Department of Civil Engineering, Thakur College of Engineering &Technology, Kandivali (E), Mumbai-400101, INDIA*

Abstract - *This document is informed by current knowledge of the COVID-19 outbreak and by considerations undertaken in response to other respiratory pathogens, including the severe acute respiratory syndrome coronavirus (SARS-CoV), the Middle East respiratory syndrome (MERS)-CoV and influenza viruses. The ever-increasing population and underdeveloped public Healthcare system resulted in massive covid-19 cases across the country in very short duration Even people with severe cases were not able to find beds both in private as well as government run hospitals. To control the explosion of more cases the central as well as State Government imposed the lock down all over the country. It does not mean that the cases of covid-19 would stop it only made sure that the rate of growth of these cases would slow down which would further give time to health care services to prepare themselves. The major issues faced were the hospitals of covid-19 centers are out of beds in the Healthcare the state government started to convert various Institutions like colleges hospitals exhibition centers to covid-19 Care Centers to increase the capacity of beds at that to be too short for Metropolitan cities. Our research focuses on use of rapid and low-cost methods for pandemic preparedness.*

Key Words: Rapid construction, prefabricated units and low cost. rapid construction, massive scale and low cost.

1.INTRODUCTION

This document is informed by current knowledge of the COVID-19 outbreak and by considerations undertaken in response to other respiratory pathogens, including the severe acute respiratory syndrome coronavirus (SARS-CoV), the Middle East respiratory syndrome (MERS)-CoV and influenza viruses. On 30 January 2020, the WHO Director-General determined that the outbreak of coronavirus disease (COVID-19) constitutes a Public Health Emergency of International Concern. As the outbreak continues to evolve, Member States are considering options to prevent introduction of the disease to new areas or to reduce human-to-human transmission in areas where the virus that causes COVID-19 is already circulating, Quarantine is the separation and restriction of movement or activities of persons who are not ill but who are believed to have been exposed to infection, for the purpose of preventing transmission of diseases. Persons are usually quarantined in their homes, but they may also be quarantined in community-based facilities

When the government decided to provide temporary structures and provisioning services it realised the absence of any formal policy or administrative framework that could actualise such a move by inviting participation between the centre, state and civic organisations. By using prefabricated units, Birla Aerocon panels, steel structures, and makeshift medical facilities can be constructed with great speed. Fabricated off-site in a factory at the same time that the foundations were being prepared on-site, the units were brought in via cranes. To tackle the COVID-19 outbreak, they were large-scale, temporary hospitals that were built rapidly by converting existing public venues, such as stadiums and exhibition centres, into healthcare facilities. These shelter hospitals could be powerful tools for future epidemics and public health emergency

2.METHODOLOGY TO BE USED

- Layout of Quarantine centre.
- Planning Using Project Manager.
- Creating virtual BIM model in Revit and Google SketchUp.

2.1 Layouts

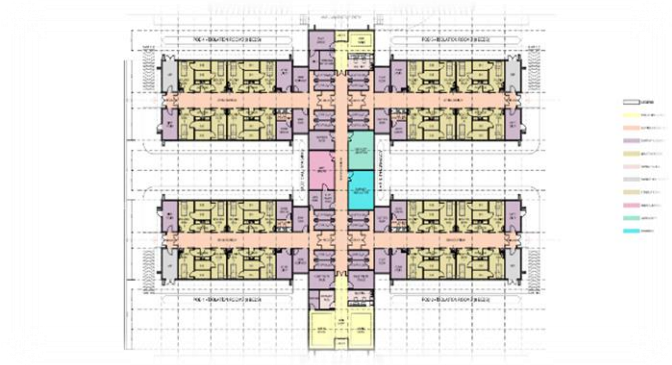


Figure 1 Pod system Layout

The central unit of the pod act as a branch in which all the medical and other equipment's are there. It is also using a communication centre. The branches connected are in complete isolation.

Figure 2 Pod system constructed with the shipping containers

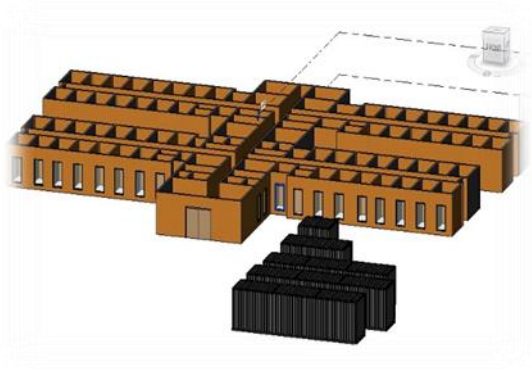
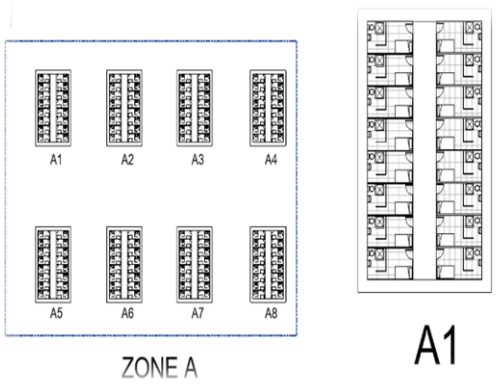


Figure 3 Zone wise distribution of Quarantine structure



2.2 Construction of Structure

The form is simplest in shape i.e., cuboid which is easily construct-able, portable, cheap and is adaptable as well as scalable according to the needs

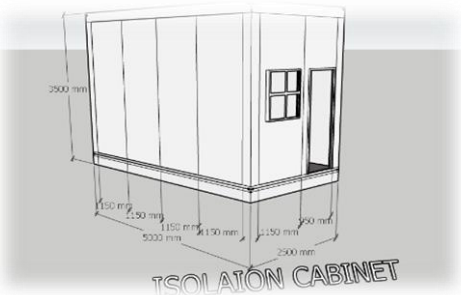
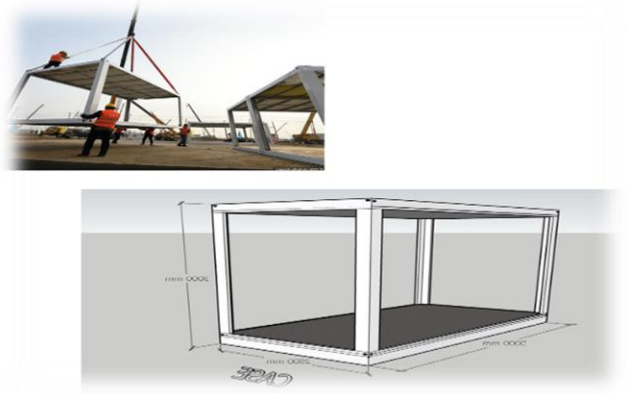


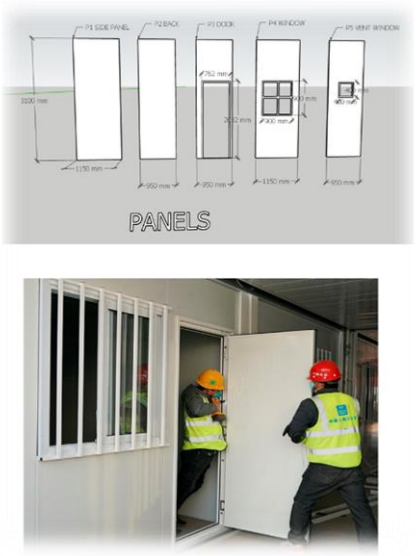
Figure 4 Isolation cabinet

1st stage of construction

2nd stage of construction



3rd stage of construction



4th stage of construction

Using the simplest cuboid container structure.

- Step 1- Preparing the concrete bed.
- Step 2- Laying Bed Plates.
- Step 3- Adding the vertical space ensuring the proper open space.
- Step 4- Attaching the Top Panels.

• Step 5- Attaching the side panels and door.

• Step 6- Ensuring proper connection.

2.3 Material to be used.

We Suggest the use of Aercon Panels or Corrugated Metal Sheets for the following reasons:

• Portable • Durable • Easy Customization • Easy dismantle • Recyclable • Adaptable in extreme weather • Easy Construction • Lightweight yet tough • Time efficient • Cost efficient

2.4 Estimation of Single unit

• Acquiring the site

This cost can be reduced as the project can established at government places or other public places. The most suitable location would be parking lots for government buses and the stadium as these places are fairly level and have suitable supply for electricity and connectivity. As the project is under government supervision the expenses for renting the place can be exempted.

• Transportation cost

As the complete unit is pre-fabricated in the factories, the cost to transport the material from place of manufacturing to the actual site can vary. There are various factors and major being the distance of factory. For the specific for Mumbai varies factories are available outskirts of the city. And major hub at Pune.

• Plant and machinery cost

For setting of the facility 5tons mobile cranes are of major use. These will help to unload the materials and also setting up of the complete facility.

• Waste management charges

There is need to establish varies waste collection instruments and setting up of the dustbin. The use of varies dustbin are essential as it contain virus also.

• Operation charges

The operational cost is the cost of the water service, electricity consumption and the charges for the disposal of waste with proper case and require use of additional PPE suits.

• Cost of units

The manufacturing cost of single unit is discussed below the data for the cost is being used by varies wholesale retailer the prices can be much lower as the material require is in large quantity and government can also invite the tender

SR	NAME	DECRISPTION	REQURED	PER UNIT	AMOUNT IN RS.
1	BASE PLATE	THE BASE CONSITS OF			
		TOP PLATE (5 X 2.5)	12.5 M. SQ		
		SIDE PLATES 1 (2.5X0.3X2)	1.5 M. SQ		
		SIDE PLATES 2 (5X0.3X2)	3 M. SQ		
		UNDERNETH PLATES (2.5X0.3X2)	1.5 M. SQ		
		TOTAL AREA	19.25 M. SQ		
		VOLUME	0.09625 M.CU		
		WEIGHT	750 KG	40 / KG	30,000.00
		1 MM VINYL CARPET	134 SQ. FT	15/SQ. FT	2,000.00
		18 MM CEMENT FIBRE BOARD	138 SQ FT	18 / SQ. FT	2,400.00
2	L SECTIONS	4 L SECTIONS ARE TO BE USED WHICH WEIGHTS 10 KG EACH	40 KG	35 /KG	1,400.00
3	PANELS	THE PANEL USED ARE 50MM THICK WITH GLASS WOOL INSULATION AND ALL ELECTICAL EQUIPMENTS AND WIRINING CONCEALED	40 M. SQ	1000/ M. SQ	40,000.00
4	PARTATION WALL	THE PARTATION WALL WILL BE USED FOR SAPERATING WC AREA WITH A 3MM LAYER OF APC SHEET FOR WATER PROOFING	7 M2	600/M. SQ	4,200.00
5	TOP PANEL	THE TOP PANEL WILL BE MADE OF FALSE CEILING PVC MATERIAL WITH PRE-FIXTURES FOR LIGHT	53 SQ FT	50/ SQ. FT	2,500.00
6	WC UNIT	THE WC UNIT CONSITS OF A WATER CLOSET, A SINK AND BATHING AREA AND WILL BE INSTALLED AS A SINGLE UNIT			15,000.00
7	FUNITURE	BED - TWIN SIZE METAL BED WILL BE USED			3,000.00
		WINDOW - METAL GLAZED WINDOWS			1,500.00
		DOOR- METAL GLAZED SINGLE DOOR			6,000.00
8	FIXTURES	THE FIXTURES CONSISTS OF ALL THE ESSENTIAL ELECTRICAL UNITS			3,500.00
		TOTAL COST FOR A SINGLE UNIT			1,11,000.00
		RATE PER SQ. FT			800

Cost of single unit

As per the above estimation the cost of construction of a unit will cost approx. RS1,11,000/- and the cost per sq. Ft comes out be RS800/- the total cost for the facility can achieved by multiplying with the number of units required

Cost comparison

The quotes we received are as follows: -Cost of containers = 1,80,000/-

Cost for fitting of WC unit = 15,000/-

Cost of furniture beds = 3,500/-

Total cost of the unit pre-taxed = 1,98,500/-

Total cost after 18% GST = 2,34,230/-By our approach we were able to reduce the cost by **47**% and with the help of Pre fabrication and prior planning the construction can be completed withing a week.

2.5 PROJECT SCHEDULE

By using the given schedule, the Quarantine structure can be constructed within 6days of time frame

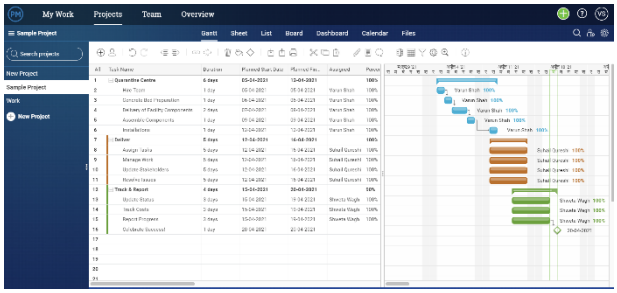


Figure 5 Construction schedule

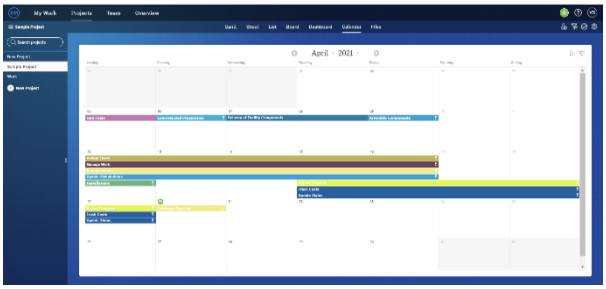


Figure 6 scheduling milestone

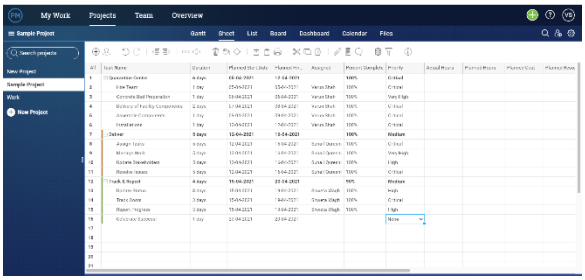


Figure 7 Sequence of activity

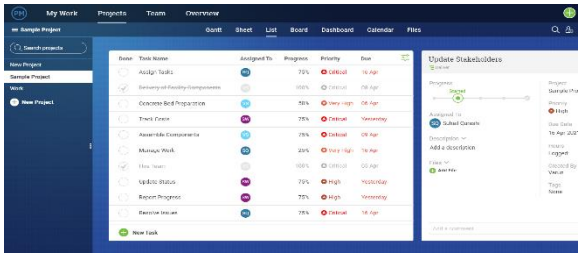


Figure 8 Sequence of activity

3 Conclusion

By this approach we will able to develop the quarantine centers effectively and in less time. As per the given schedule and design these centers are cost effective also. By using principle of pre fabrication we will able to tackle such situation in future also and its application are also in Army camps, Flood Relief Camps, Transit centers.

4. References

[1] H. Stambaugh, National Research Council (U.S.). Transportation Research Board., Airport Cooperative Research Program. and United States. Federal Aviation Administration., Quarantine facilities for arriving air travelers: identification of planning needs and costs, Transportation Research Board, 2008, p. 27. [2] THAPI.NET, “TAHPI | TAHPI Quarantine Hospital Modular Design (COVID-19),” 2020. [Online]. Available: http://tahpi.net/2020/04/22/tahpiquarantine-hospital-modular-designcovid-19/.

[3] WHO, “Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19): Interim guidance-2,” GENEVA, 2020.

[4] MINISTRY OF HEALTH, "Guidelines for Quarantine facilities COVID-19," DELHI, 2020. [5] "Best Practices for Setting Up COVID19 Mobile Testing Facilities | Kimley Horn," [Online].Available: HTTPs://www.kimleyhorn.com/best- practices-covid19- mobile-testing/. Construction Engineering and Management, vol. 146, no. 5, 1 5 2020.

[6] "Shipping container micro homes with green roofs planned for UK," [Online]. Available: https://www.dezeen.com/2019/07/31/shippingcontainer-micro-home-fraser-brown-mackennaarchitects/. s

[7] "The UK is using shipping containers to create homes amid the affordable housing crises | World Economic Forum," [Online]. Available: https://www.weforum.org/agenda/2019/08/ukssolution-affordable-housing-shipping-containers/.

[8] X. Li, M. Liu, R. Zhou, Y. Zhang, C. Wu and L. Xu, "Centralized medical quarantine for imported COVID-19 in Shanghai, China," 2020.