

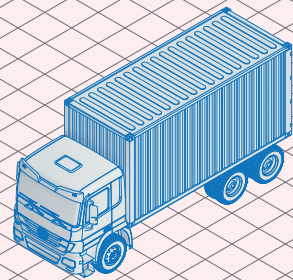
Emergency Anti-COVID-19 Medical Ward

Difficult Prospect to Workable Solution

Hospitals are filling with coronavirus patients. Hotels, gymnasiums and public buildings also begin to fill and more emergency patients are on the way. There is a deep need to build extra medical wards rapidly with no fuss! These wards must provide care in different urban situations such as parking spaces, industrial open spaces, shipping yards or army bases. They need to be temporary, outdoors, and should not damage their surroundings by anchoring or digging foundations into their surfaces.

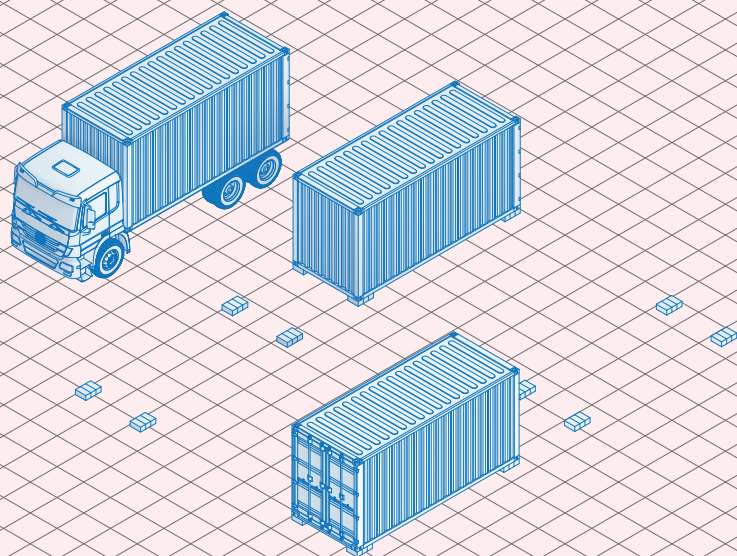
If your city has a shipping port, or container yard, it will surely hold a vast number of shipping containers that could provide a solution. Here is a dynamic suggestion for how to rapidly build an “Emergency Anti-COVID-19 Medical Ward” . Its advantages are many and in this challenging time, it introduces a path from difficult prospect to workable solution.

by Pornthep Chatpinyakoop, Takuya Onishi, Alvaro Conti and Yusuke Takahashi



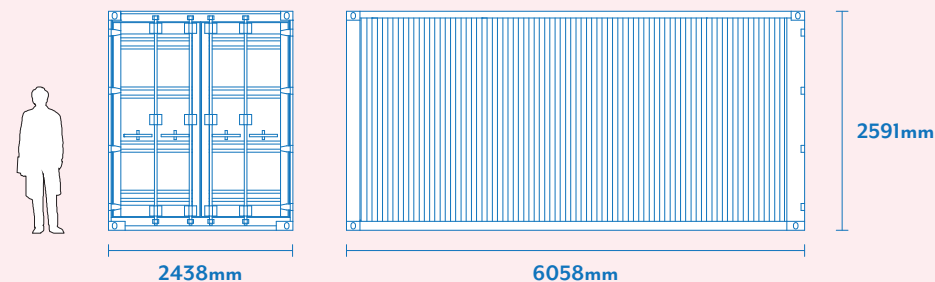
01 LOGISTICS

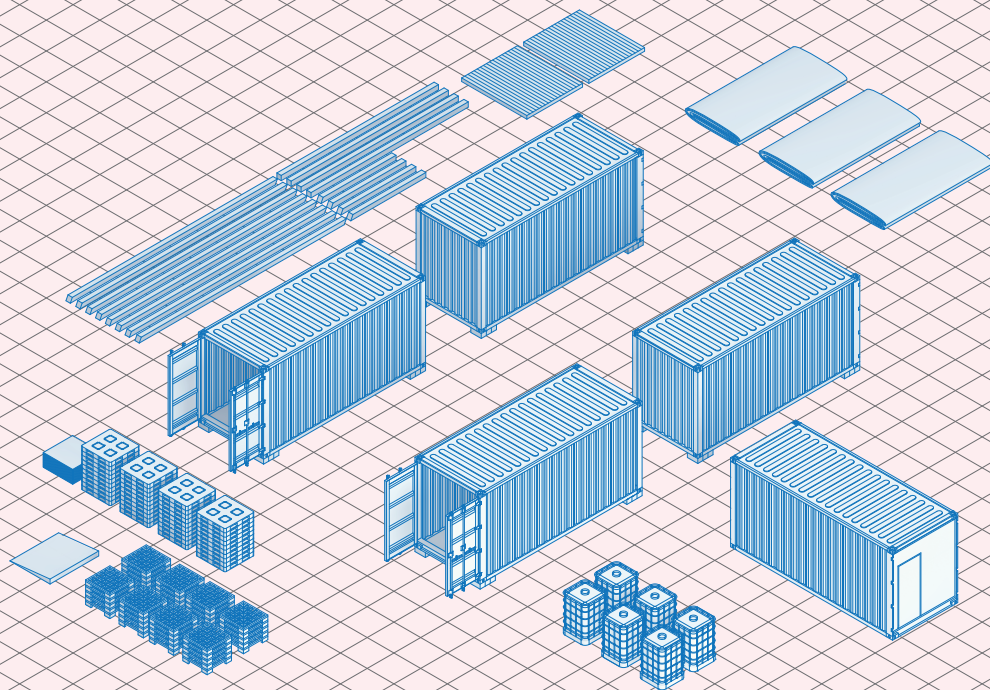
As long as there is a ship, a road, or rail line, a container can always be delivered! Logistically, they can be sent to just about anywhere on the planet. The UK-based transportation company Consultants-
ea Ltd. estimates forty-three million containers currently exist (43,000,000), and they are all wonderfully 'standardized' to fit the same logistic system in any city in the world. All containers are lifted and carried easily by standardized machineries. They are moved seamlessly in-and-out of shipping-yards, along highways and onto their final destination. The container and its logistic system is the most useful transportation network human' s have ever invented. Its qualities offer amazing advantages when considering the quick deployment and construction of an Emergency Anti-COVID-19 Medical Ward. To achieve a faster construction process, it is possible to use the merits of the container to respond quicker than ever to our urgent issue.



02 CONTAINER

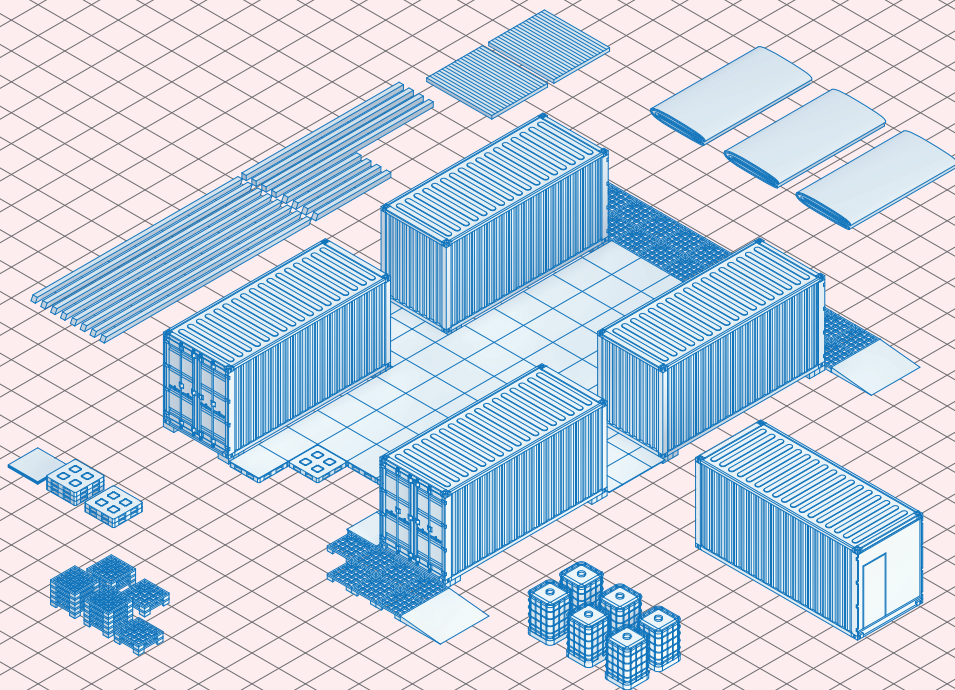
If you're a child at heart, a shipping container is LEGO for adults. It is colorful, has standardized modular blocks and is fun and easy to assemble into structures. In this way, the 'containers' used here are not seen simply as delivery-boxes in which to transport supplies, but also part of the building itself. The container offers a perfectly sealed and dry space that is habitable. It is 2.39 metres high and 2.35 metres wide. The exterior of the container is wrapped with corrugated steel panels. This makes it a light, strong and durable structure all at the same time. Ideally, containers for this project will need to be slightly prefabricated with insulation and wiring in advance at a factory.





03 (UN)LOADING

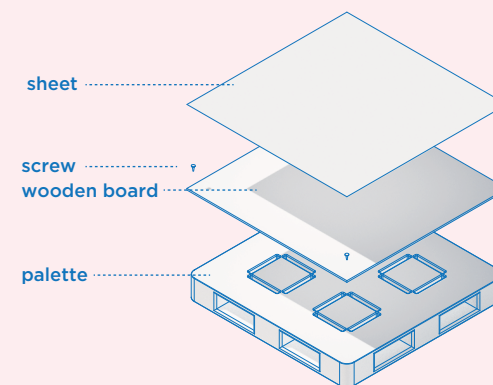
All building-materials can be delivered to the construction-site using containers. The average load-capacity of a container is 25 tonnes. In the scenario offered here, the total load-capacity of 5 containers covers 125 tonnes (approximately the weight of 80 mid-sized cars!). This number is big enough to cover all construction and equipment needs at an emergency site. It will be necessary to prepare, pack and load all building-materials and equipment in advance at the factory, before delivery. All building-materials and equipment can then be unloaded after the first 4 containers are correctly positioned on the cornerstones 200 mm above the ground level.



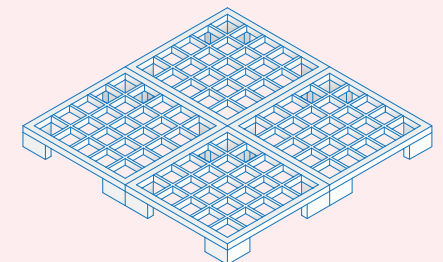
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04 FLOORING

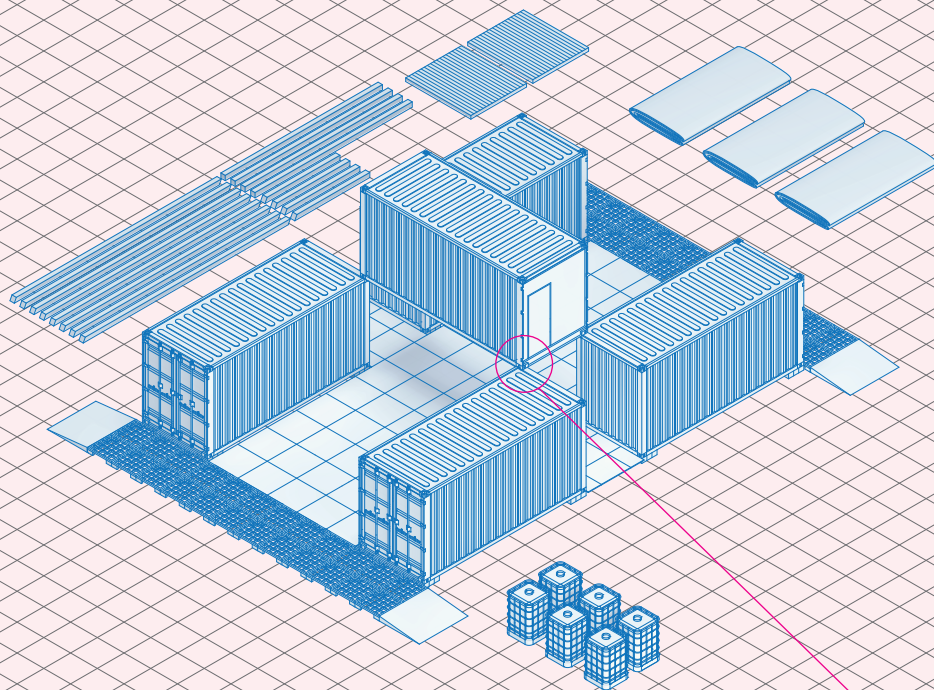
All floor paneling is made of a conventional 'palette' system. Its height is 200 mm above ground level (aligning perfectly with the container floor). This system raises the medical ward above any ground heat dissipation or running rainwater. A semi-outdoor access way is assembled with grating floor panels for good drainage against heavy rain. The gap underneath the container and floor functions as a drainage space, protecting those above from any harsh elements found on-site. This system however best functions when surrounded by paved or asphalted ground, not soil-ish conditions.



main medical room floor

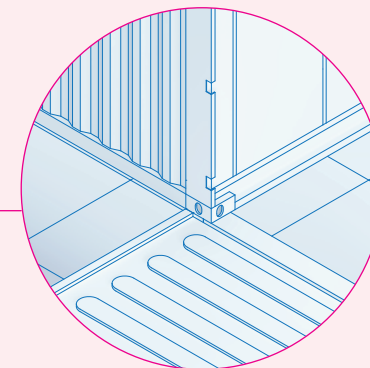


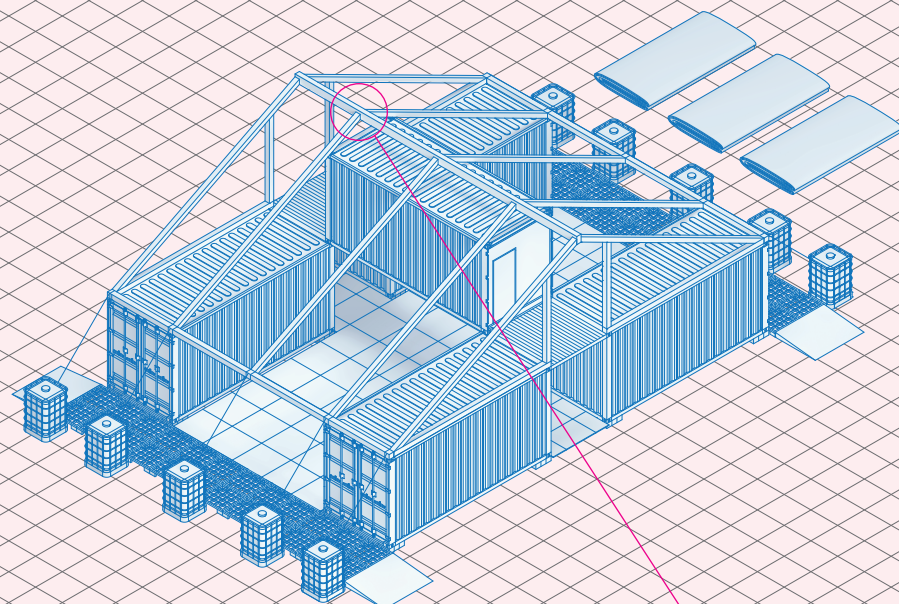
semi-outdoor access floor



05 STANDARD MODULE

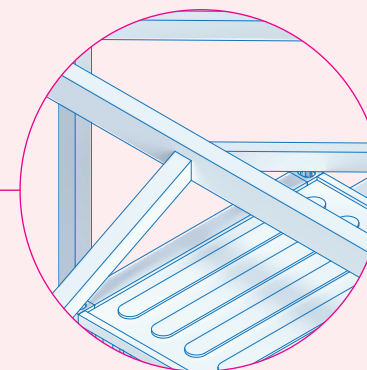
A standard 5-container module is recommended as the minimum for an Emergency Anti-COVID-19 Medical Ward (four containers on the ground and a fifth container stacked). This arrangement allows for a gabled-roof structure. No additional support is needed for the upper container as it fits tightly between the lower containers by its ISO standardized corner casting. The total indoor floor area is about 205 m² (ground floor: 140 m² + upper floor: 65 m²). The 4 ground level containers offer a well-equipped medical space with air-conditioning and ventilators for severely affected patients. The upper floor acts as a storage room. Its double-height can help relieve heat during summer time by creating good ventilation for greater comfort in all medical spaces.

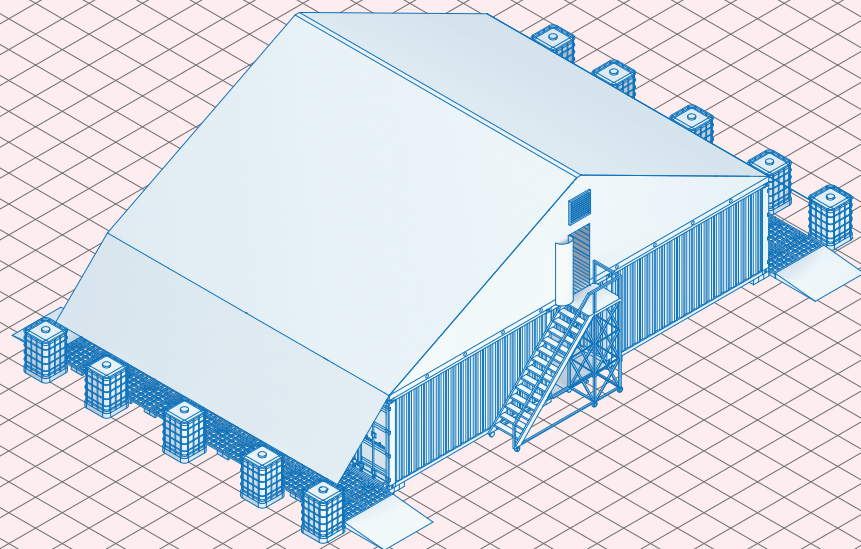




06 ROOFING

The 'roof structure' is assembled with rectangular steel tubes and joints. This construction method is now the industry-standard in all cities. A simple roof-system can be quickly designed by any local engineer within a few hours. However, to further increase the speed of construction, the use of a 'pre-cut' steel frame system can radically reduce working-hours and man-power needed on-site. A wooden-frame is also optional (however all roof structures should be checked by a local engineer to confirm strength). The choice of steel-tube or timber is completely dependent on the accessibility of local industry to the site. Additionally, water tanks around the building can function as anchors for a tent membrane option if preferred.

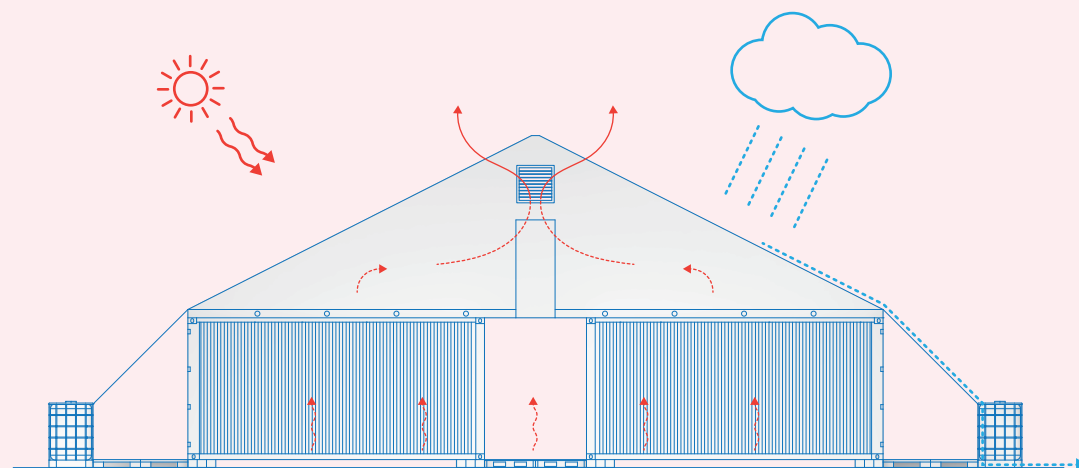


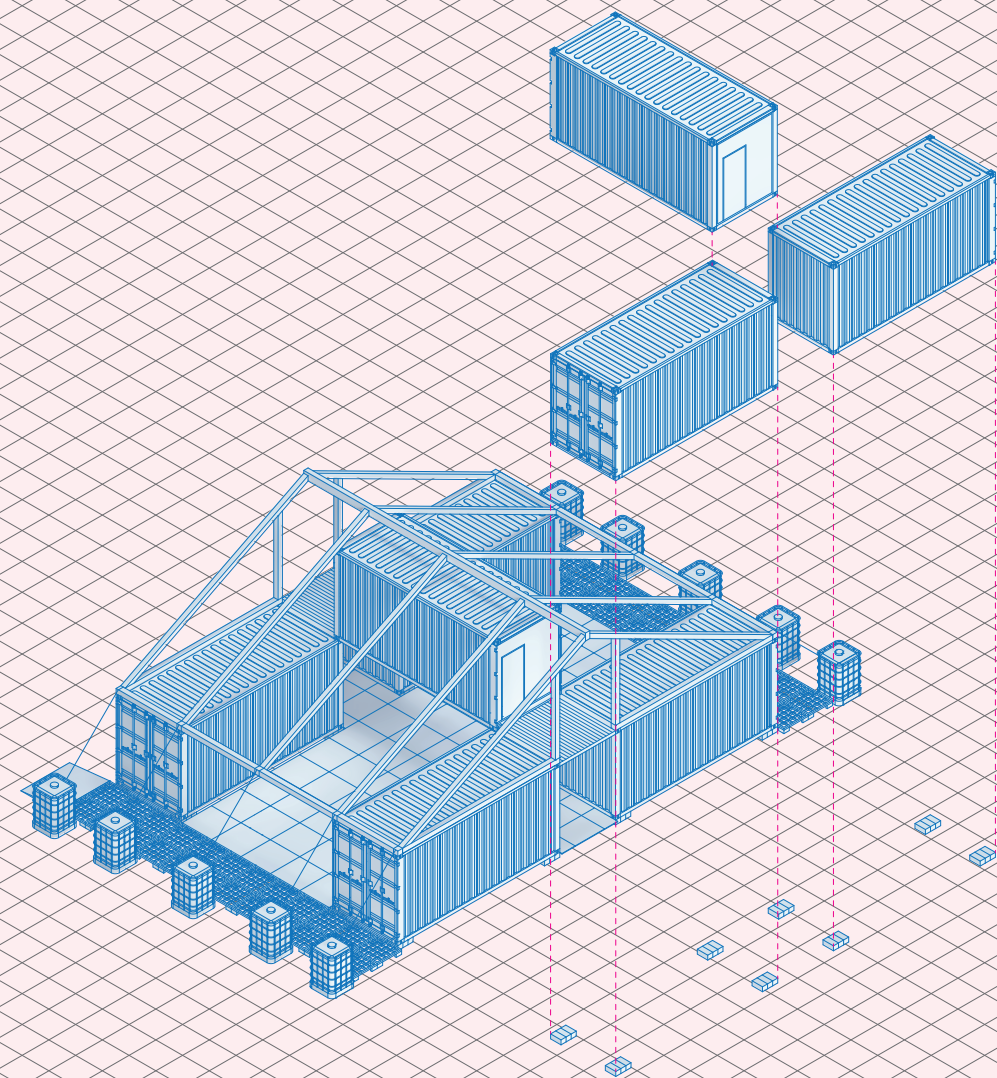


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07 COMPLETION

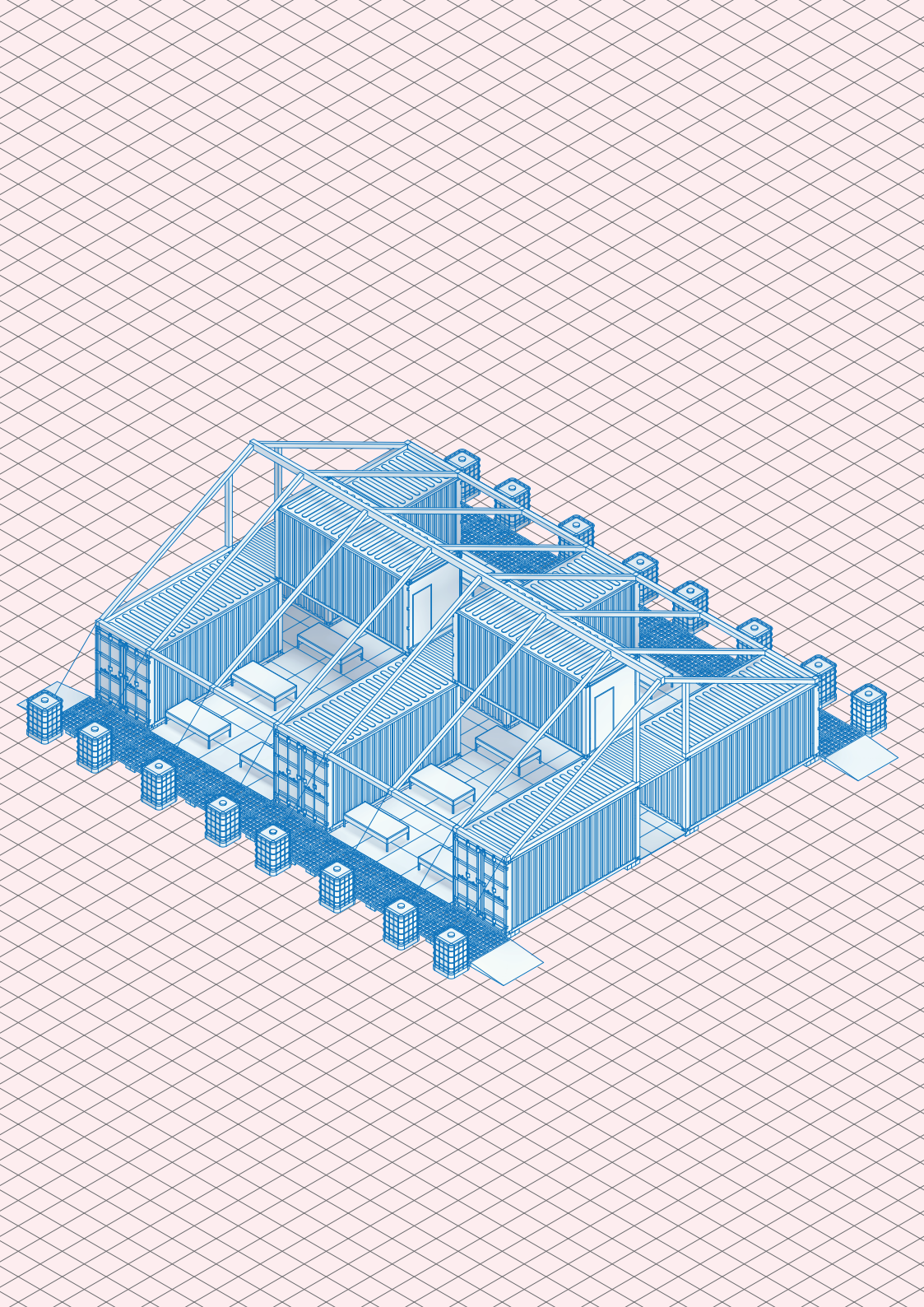
The completed 'standard module' (seen here with a tent membrane to protect from direct sunlight and rainfall) provides a maximum of 14 beds and 1 storage room. If the medical space gets hot in summer, the tent's membrane design helps to vent-out any hot air passively. For more accurate environmental control, a building utility system can be easily added to adjust for local conditions. All electronic devices are wired from the above ceiling/roof structure. This cleverly avoids the risk of electric shock during rain. A stairwell has also been located outside of the building that leads to the upper storage room.





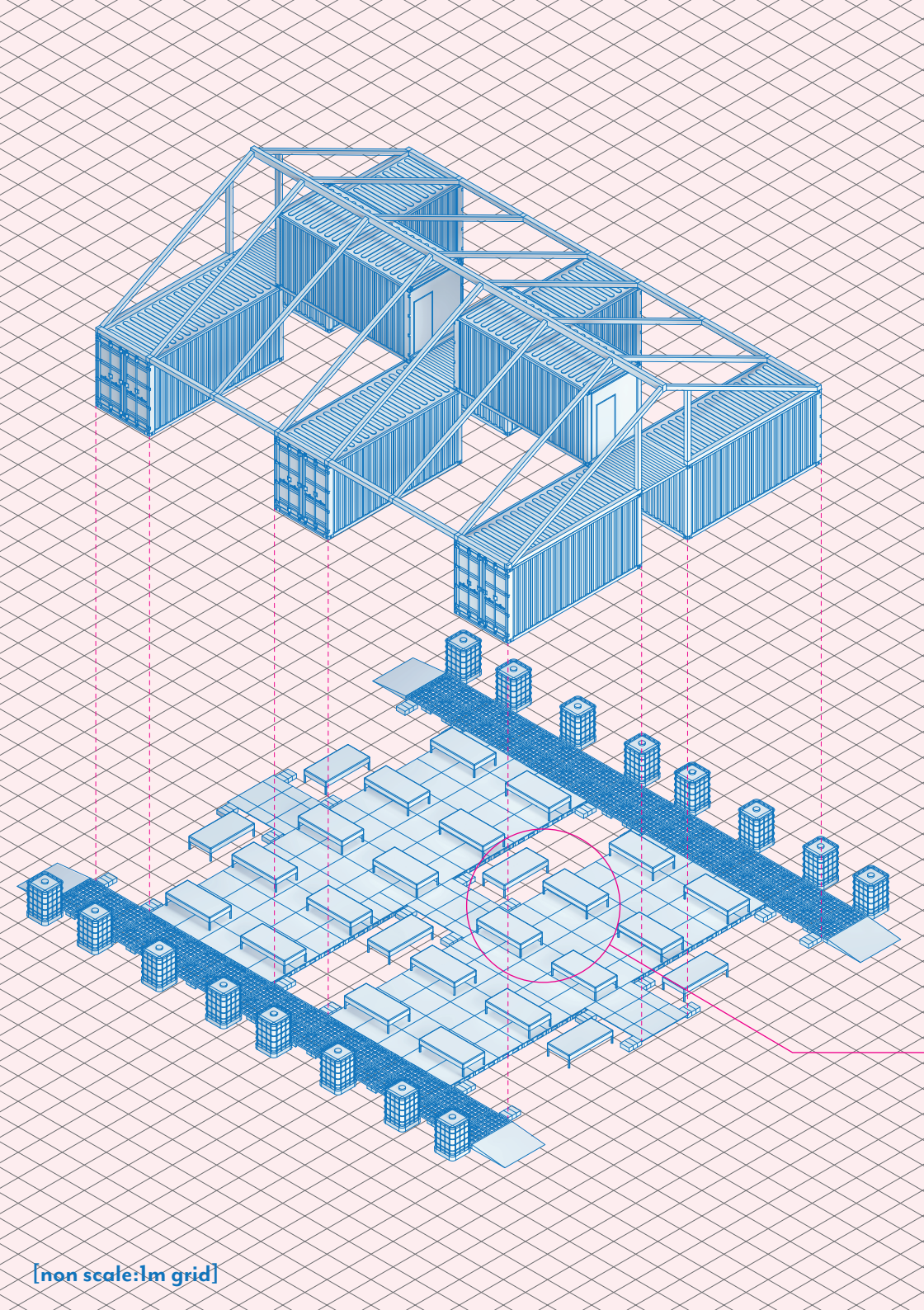
08 EXTENSION

The extension of the Anti-COVID-19 Medical Ward is simple and rapid! It can be multiplied with only 3 additional containers. Technically this pattern is endlessly repeatable (however the overall length of the access-way should be considered). Its strongest advantage is that any extension to an existing medical ward is easily completed without interrupting the care being given in earlier modules. Any new modules are simply pinned at either end. All future extensions can get underway as and when they are needed.



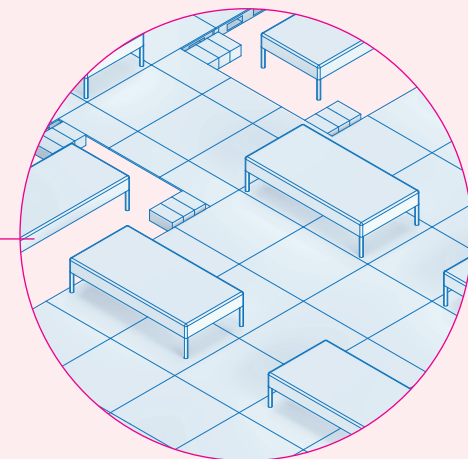
09 EXTENSION

The ability to create additional high-quality medical spaces by the simple extension of an existing Medical Ward offers a tremendous adaptability. This helps to meet all unpredictable conditions and possible scenarios. When more medical space is required, the movement of all necessary equipment and goods can be served by the same logistic system. All building-materials and equipment needed for an extension arrive in a single journey. Should the need arise, the Emergency Medical Ward can just as easily be 'contracted' and dispatched to other locations in greater need.



10 LAYOUT

By extending the 'standard module' with 3 more containers, 26 beds can be installed (20 beds in the medical space and 6 beds within special-care containers). There are 2 semi-outdoor access-ways located along both sides of the module, and an additional centre access is also possible via the removal of 4 beds. The space within containers can be converted into advanced medical care rooms for emergency patients, preparation rooms for medical care workers, or refrigeration/storage zones for vaccines etc. These different layouts will depend on the stage of the emergency.



II

DEPLOYMENT

The Emergency Anti-COVID-19 Medical Ward easily responds to any increase or decrease in demand and changes in conditions. Here is one example of 'parallel deployment' with 28 containers for 100 patients. It shows how easy it is to start the medical ward, and its outstanding potential for rapid future extension. There is a minimum of workload at the building-site with no interruption to medical operations already underway. If a re-location of the facility is required, it is a lot easier to achieve than with other more conventional structures. This emergency medical ward fits any urban situation in any city in the world. Additionally, an alternative energy solution i.e. 'solar panels' can be installed on the roof if required (especially in remote areas where energy may be unavailable). In this 'parallel deployment', the alternative energy system offers a total capacity of 9 kW and can supply 22 kWh/day. This capacity is equivalent to 24 ceiling fans running continuously for 12 hours.

