# Pandemical Healthcare Architecture, Social Responsibility, and Health Equity*

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**Abstract**

The COVID-19 pandemic cast in sharp relief intense pressures placed on healthcare facilities to effectively, humanely, respond to the global public health crisis. In this paper, four types of pandemic-influenced healthcare testing/laboratory and 24/4 treatment facilities are reviewed: pop-up portable outdoor units; pop-up vehicular-nomad units; pop-up units installed in repurposed host structures; and 24/7 ICU-based surge capacity field hospitals and quarantine units installed as pop-up structures within host structures or as freestanding side-by-side autonomous installations. The wave of pandemical architecture for health is collectively reviewed for its biophilic and salutogenic content, social advocacy aims, attention to the minimization of health inequities, and ethical ramifications. An evidence-based case study is presented, a recently developed IDTM transportable field hospital, led by the World Health Organization (WHO). Architects and allied designers working in consort with engineers are challenged to design and build rapid response, therapeutic, socially responsive, health-equitable healthcare architecture. This is an urgent priority in light of the uncertainties associated with the global climate crisis and future public health emergencies.

*Paper presented at *EDRA54*, Mexico City, June 2023.

**Introduction**

Throughout recorded history pandemics and plagues have prompted mandated lockdowns and quarantine measures. This reaction to life-threatening public health events continues to this day as a timeless public health response to infectious disease and plague. During the recent Ebola outbreak in West Africa nations imposed near-total lockdowns as a means to stem widespread community contagion. In many instances, the local population became so fearful of their local hospital they did all they could to avoid any contact whatsoever with the result that entire hospitals had to be abandoned as they themselves had become infectious disease transmitters (Edelson, 2015). The COVID-19 pandemic has similarly caused profound upheaval, pain, and suffering to a degree that rivals the global 1918-20 Spanish Flu H1N1 pandemic. That event infected nearly 500 million people—nearly one third of the world's population—in four waves. Its death toll has been estimated between twenty and fifty million, ranking it among the deadliest pandemics in recorded history. The coronavirus pandemic has been virulent worldwide, resulting in 645 million cases and 6.64 million deaths at this writing (Worldometers, 2022). Early on, governments and medical centers, including in Israel, Italy, and New York City, sprang into rapid response mode. The Chaim Sheba Medical Center at Tel HaShomer, in the greater Tel Aviv area, quickly set up an underground 45-bed COVID-19 ICU surge hospital unit in just 72 hours in its parking garage (Kurtz, 2020). In Spain, two expansive halls of Barcelona's Olímpics Vall d'Hebron municipal sports centre were repurposed into a temporary 132-bed surge hospital; the city set up two additional temporary surge hospitals in the following three weeks in repurposed sports arenas (Barcelona Convention Bureau, 2020). In Guayaquil, Ecuador the healthcare system completely collapsed. At the height of an outbreak there in early 2020, bodies were crudely wrapped in plastic and placed at curbside to await transfer to a municipal sports stadium and then to the city morgue (Otis, 2020).

What has been the role of architecture in the 2020-2023 coronavirus pandemic? In short, relatively minimal. But it need not have been that way. Since the 1960s, the public interest (PI) movement in architecture has endeavored to address this persistent lacuna between unmet shelter and healthcare needs of tens of millions. Few professional architects in developed countries have demonstrably stood in the eye of this storm, and yet only when one steps away from the storm's eye is one able to realize it is a storm of transformational import. Inadequate healthcare infrastructure, non-existent or unaffordable housing, widespread health inequities, and life-threatening ecologically degraded conditions persist. COVID-19 stirred the winds of societal unrest and misery. Advocates of PI for decades have sought to rally architects to not remain on the sidelines in times of crisis. But capitalism being what it is, most architects still work mainly for wealthy individuals, corporations, institutions, and governments who can afford to pay full professional fees and who receive, in exchange, highly tailored professional services. This modus operandi, unfortunately, and often tragically, restricts the number and types of individuals and organizations able to be served in the everyday PI civic realm.

Professional architects only design about two to five percent of all buildings constructed annually in North America (Fisher, 2008). This unfortunate dilemma manifested in COVID-19. Meanwhile, the United Nations expects the number of medically underserved persons worldwide to reach two billion by 2050 in a world with 9.7 billion persons (United Nations, 2020). In tandem with the pandemic, social unrest erupted in the U.S. in the form of the Black Lives Matter movement, and millions globally lost their jobs due to economic and social displacement, potentially tumbling into housing and health insecurity. In a moment of such sudden dislocation, PI architecture provides an alternative operative paradigm for the design professional.

The pandemic demonstrated that PI advocacy-based architecture for health is indeed needed in partnership with the public health and medical professions. For example, joint initiatives are needed to mitigate severe epidemics stemming from sanitation crises in slums and shantytowns in underdeveloped nations. Yet the reality remains that engineers continue to dominate this arena when it comes to the provision of facilities, with architects' continued relegation to a secondary role at best, dismissed as impractical dreamers—not unlike what happened in Hurricane Katrina's aftermath in New Orleans (2005) and in the aftermath of Haiti's devastating earthquake (2010), to name but two recent catastrophes. Against this backdrop, COVID-19 proved compelling. Evidence-based research publications has begun to fill this gap in knowledge. This research includes the articulation of COVID-19-influenced design strategies for more resilient hospitals (Capolongo, et al., 2020; Marmo et al., 2022), airborne infection control strategies in alternative care facilities during pandemics (Gordon et al., 2021), pandemic-influenced recommendations for nursing home design (Zhu et al., 2022), and discussion of how the pandemic has changed healthcare design (Stichler, 2022).

Healthcare provider organizations, functioning as effective first responders, were compelled to quickly commission — often, in a matter of days — an assortment of modular, prefabricated tents, containerized structures, hybrids, and myriad pop-up testing and treatment facilities in response to the accelerated transmission rate of the coronavirus. These *ad hoc* structures were typically erected adjacent to medical centers in their parking lots and in diverse, remote, often random site contexts. Such prefabricated systems were commissioned for use as pop-up COVID-19 testing sites, laboratories, immunization units, and 24/7 ICU-surge facilities, including in the aforementioned convention centers as well as gymnasiums and big box stores. That said, the two aims of this discussion are:

*Typological Expression* — To review a subset of unbuilt and built projects representing four basic pandemical building types: 1. Redeployable walk-up/drive-up outdoor pop-up testing and/or immunization facilities typically deployed as autonomous and self-contained (Type 1); 2. Nomadic testing and immunization facilities combining a mix of vehicular with ancillary amenities such as roll-out fabric tenting (Type 2); Pop-up units installed in a repurposed host structure as 24/7 surge capacity ICU-based field hospitals and/or quarantine housing (Type 3); and 4. Freestanding ICU-surge capacity field hospitals (and quarantine housing) installed autonomously (Type 4). Note: only Type 3 and Type 4 case studies are reported below due to space limitations.

*Salutogenic/Biophilic Content, Social Responsibility and Health Equity*— To explore the typology vis-à-vis salutogenic and biophilic design principles, i.e., indoor-outdoor connectivity, personal privacy, and patient (and staff) dignity as expressions of broader socio-cultural and political narratives, plus the degree this typology expresses the Vitruvian precepts of *commodity, firmness, and delight*. As such, the work of architectural firms and collaborative design teams is reviewed against the backdrop of PI architecture for health (Statista, 2021).

Case Studies—Noteworthy proposals from 2020 included the *COVID-19 Superhospital* Firm: Opposite Office, Munich, Germany (Type 3)— This prototype is shown installed in the problem-plagued Brandenburg International Airport that had recently opened in Berlin. This pop-up is proposed for installation in a terminal close to where travelers board and deplane. With international air travel so drastically curtailed, many airports installed onsite testing units to control community contagion and for the distribution of PPE. This proposal, stark in imagery, consists of dozens of close-packed semicircular modules with each module fabricated of Plexiglas. The semicircular patient room modules are equipped with circular white fabric pull curtains and the curved wall panels of the modules repetitively interweave in an interlocking pattern. Patient room and diagnosis and treatment modules are decentralized in plan. The existing HVAC, electrical, plumbing systems and restrooms in the airport terminal are presumably repurposed to support the COVID-19 Superhospital. This honeycombed building-within-a-building's modules are visually open to allow a view of the ceiling high above the patient's bed (Opposite Office, 2020). Images courtesy of Opposite Office, Berlin (Figure 1a and 1b).

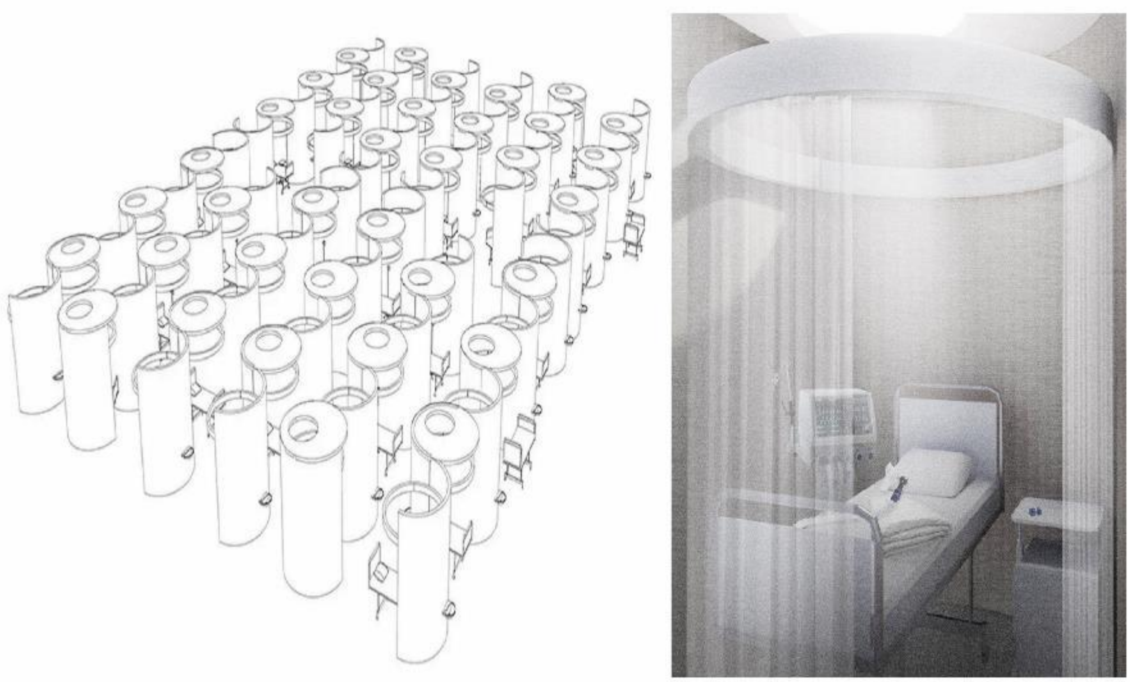

Figure 1a-1b

The massive *Huoshenshan Hospital* was constructed by the Government of China, Wuhan, China in early 2020 (Type 4)— This 1,000-bed COVID-19 field hospital was built in fourteen days near Zhiyn Lake, in Wuhan. A second field hospital, Leishenshan Hospital, was built just as rapidly using a nearly identical design; it also opened in February 2020. The site of the first facility was expediently prepared by a small army of earth movers (shown). The hospital's foundation consisted of several layers of fibrous matting insulation with interspersed layers of concrete. Up to 7,000 people worked around the clock in three shifts. This facility was based on the Xiaotangshan Hospitals in built in the suburbs of Beijing in six days during the SARS pandemic in 2003. Both hospital at Wuhan were modular prefabricated, with two levels housing thirty ICUs, nursing and medical support and multi-bed quarantine units. Each module was 10 x 10 metres and housed two beds; all rooms are negatively pressurized. This surge hospital was staffed by 1,400 medical personnel (Griffiths et al, 2021). The Wuhan hospital garnered extensive international media coverage for its extremely rapid construction and massive size. It is fair to view this facility as the mother of all specialized COVID-19 facilities built worldwide (Wang, et al, 2020). Nonetheless, interior spaces were strikingly bare bones; occupants lacked nearly all visual contact with the outside world (Figure 2a and 2b here).

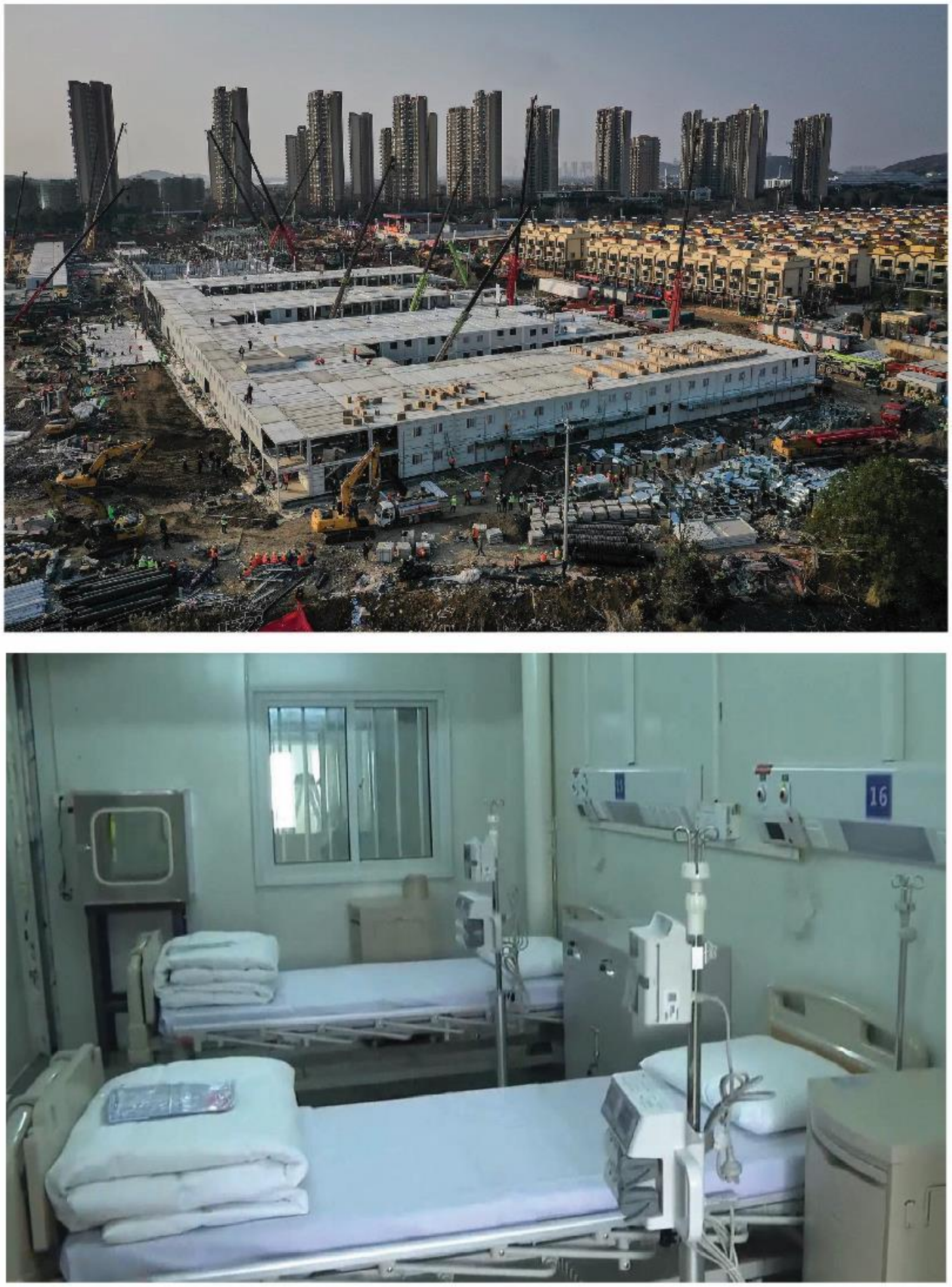


Figure 2a-2b

**Infectious Disease Redeployable Field Hospitals**

A graduate-level *architecture + health* design studio at the University of Toronto in the fall of 2020 programmed and designed a redeployable, Type 4, 24/7 infectious disease surge capacity hospital. The brief called for an offsite-built modular prefab prototype in a 50-bed (Phase 1) configuration and a 100-bed (Phase 2) configuration, for redeployable installation adjacent to an acute care hospital "mothership." Each of the four 2-student teams selected four installation sites. Diagnostic and treatment support was to be provided by the permanent mothership facility, i.e. MRI, surgery, nutritional services, counseling, administration, materials management, security, housekeeping and central laundry. The brief called for incorporating salutogenic (occupant-centric) and biophilic theory and design features, i.e. windows in patient rooms and staff work zones in accord with the fundamental premise of biophilia that psychologically meaningful engagement with nature functions as a positive distraction during hospitalization.

The COVID-19 *Plug-in/Pop-out Hospital* proposal is a portable, two-level prefab modular system featuring interlocking containers with multiple pop-out elements. In full deployment the containers form an A/B/A/B footprint punctuated by numerous exterior micro-courtyards. In accord with biophilic tenets the exterior spaces allow occupants the opportunity to engage nature while allowing for the transmission of natural daylight into interior spaces. The industrialized, custom-designed containers are transited in close-pack mode. The system is interlocked, iteratively, in either a 50-bed, 75-bed, or 100-bed configuration. The upper-level containers feature solar panels and mechanical equipment with patient beds housed on both levels. Relative transparency and openness is achieved to the extent medically feasible, as opposed to the two nearly entirely windowless COVID-19 ICU-surge hospitals built by the Chinese government in early 2020 (above). By contrast, this proposed custom, offsite-built containerized system features many full-height windows in patient housing zones with the upper-level containers overlooking the abstracted "green "painted roofscapes of the containers below. HVAC, electrical, and plumbing systems run under the floor and through overhead ducts (Figure 3a and 3b here). Images courtesy of Francesca Lu and Feibi Pan.

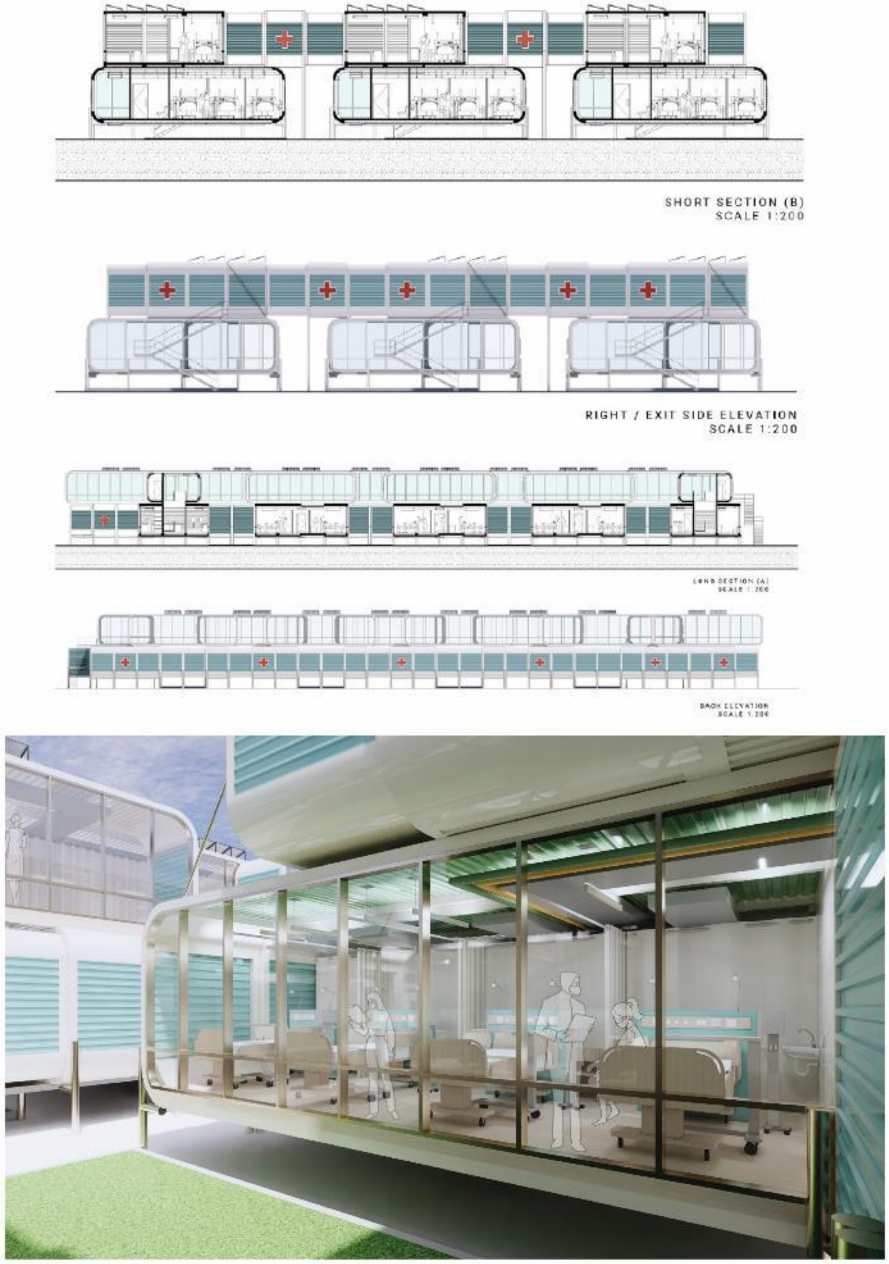
SHORT SECTION (B)
SCALE 1:200
RIGHT / EXIT SIDE ELEVATION
SCALE 1:200

Figure 3a-3b

## Initiate²

In 2022 the *World Health Organization* (WHO) in Geneva launched the *Initiate²* project. This project was created by Téchne (the WHO's Technical Science for Health Network), an infernal program established in the early months of the pandemic in 2020. Techne's membership is comprised of a consortium of global universities working in tandem with the WHO. Its members are collaborating with the WHO on a diverse range of activities to adroitly respond to infectious disease outbreaks and complex emergencies. Specifically, *Initiate²* focuses on medical facilities for containment and eradication of infectious disease. The *Infectious Disease Treatment Module* (IDTM) project was launched in mid-2022 resulting in the design of a modular medical facility for use in pandemic strike zones globally beginning in mid-2023.

The programming and design processes for the IDTM project was guided by ten provisos: the provision of dignified and humane care including patients with physical and psychological/cognitive disabilities, children, the aged and maternity patients; environmental sustainability; disaster resiliency; socio-economic and health equity; cultural adaptability to diverse geographic contexts; rapid deployment and installation (based on modularity and constructability) , efficient internal function; sustainable maintenance and repairability; compatibility with local healthcare systems in field deployments; and ease of day-to-day operation. In addition, the system must be easily transited. At the outset, the team identified 32 commercially available pop-up tent and containerized systems available and studied in further detail 15 of these to glean concepts and insights across five modular facility types: tents, containers, tent-container hybrids, pneumatics, and pop-ups. No single currently available product met the abovementioned set of criteria in its entirety. However, five concepts were gleaned and subsequently incorporated. Following this, forty-nine design precepts were articulated by the project team in an on-site workshop held in Italy in August 2022.

The resultant IDTM modular field hospital synthesizes four specific features gleaned from the analysis of the commercially available products on the market in 2022: 1. A pneumatic structural system; 2. An internal semi-autonomous pop-up patient treatment module with transparent "interactive wall" that allows for staff to reach into to treat the highly contagious patient without physically entering the patient zone; 3. A sunscreen that simultaneously functions as a rain shield, and 4. A rigid modular flooring system. A full-scale mock-up of one module was piloted in Germany in October 2002. It was evaluated by a team of emergency infectious disease medical specialists, providing feedback on all aspect of the mock-up. This feedback mainly addressed internal circulation, functional adjacencies, visual transparency, and the ability to accommodate equipment and supplies. This was incorporated into the final design proposal, presented for review to *Initiate²* internal and external sponsoring organizations in December 2022 (Figure 4a and 4b, Figure 5a and 5b, Figure 6a-6d).

The treatment module houses a patient room with chairs for two visitors, compartmentalized toilet/shower unit, adjacent 'Green Zone' for staff-only use, and open-air family area referred to as a 'Front Porch' by the design team with door providing direct access to the patient treatment zone. The design team leading the design process was based in Canada, led by Parkin

Architects’ Vancouver, British Columbia office. Additional design input was provided by Carleton University, the *Centre for Design + Health Innovation* at the University of Toronto (represented by an architecture graduate student team led by this author) and team members based in Italy at the University of Turin. Core *Initiate*[2] organizations contributing to the development of the IDTM project under the direction of the WHO included Alima, International Medical Corps (IMC), Doctors with Africa (CUAMM), Médecins Sans Froontiéres (MSF), Ministry of Health of Malawi, Ministry of Health of Guinea, Samaritan’s Purse, World Food Programme (WFP). Throughout the schematic design and module mock-up phases, the IDTM design evolved to accommodate many features unavailable anywhere in the world at this writing in a redeployable infectious disease field hospital, including:

- Patient assessment/treatment zone totally distinct from the staff caregiver work zone
- Adaptability from passive cooling to a mechanical HVAC system as warranted
- Clip on modular components for observation from outside the core treatment module
- Expandability to up to nine modules on a single site housing up to 16 beds
- Full-size windows allowing patients and staff to directly view the exterior environment
- The ability of family members to directly view from the outside the isolated patient
- Quasi-residential formal composition allows aesthetic compatibility in diverse contexts

The IDTM is scheduled to be available for initial field deployment in mid-2023 (World Health Organization ,2022). This project was able to be fast tracked from inception due to the contributions of those who made this project possible. As mentioned, the IDTM was designed based on the aforementioned key design precepts, design guidelines, and general expertise provided by *Initiate*[2] partner organizations. An evidence-based, occupant-centric design response was emphasized from the outset focused on the facility’s habitability, occupant well-being, and daily facility operations. Human factors, ergonomics, and field experience acquired through past epidemics pandemics as well as the recent literature on this subject was incorporated in the design (Verderber, 2016). Accordingly, salutogenic and biophilia-based theory, physical amenities were of priority. Images courtesy of Parkin Architects.

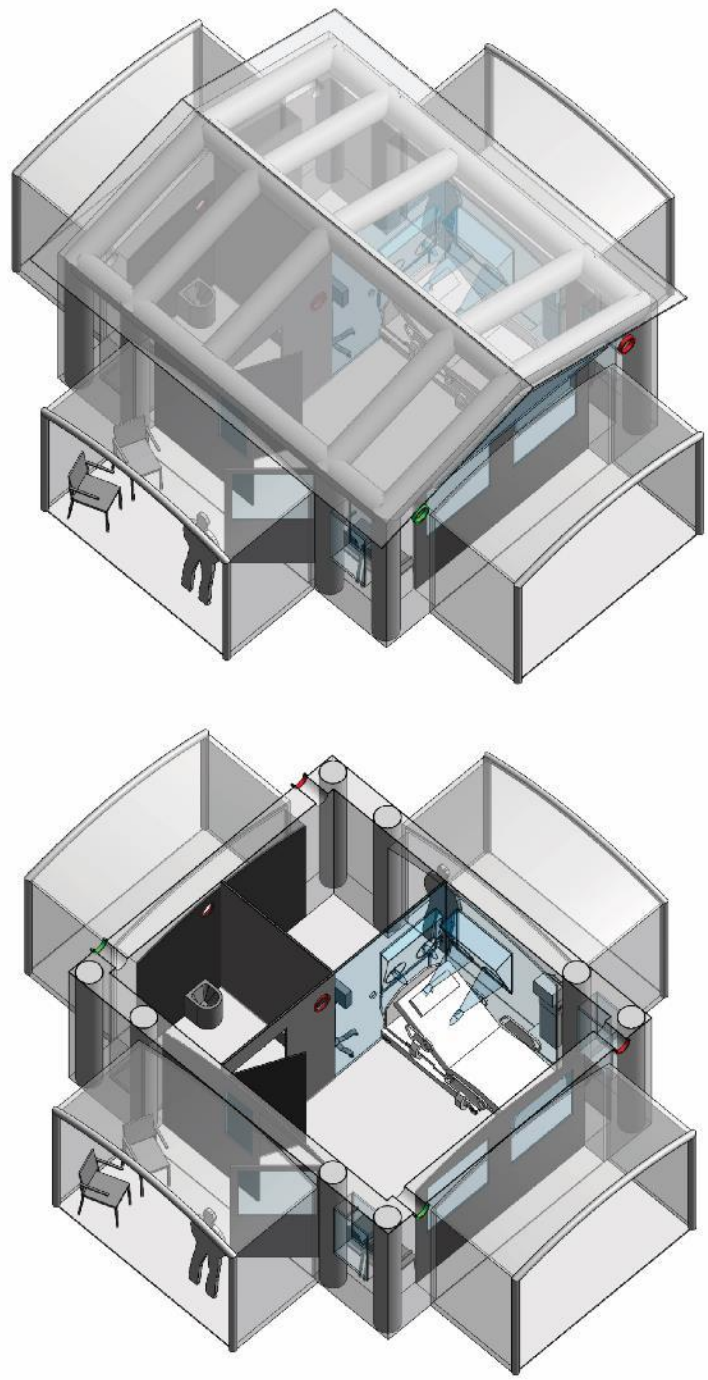

Figure 4a-4b

Figure 5a-5b


Figure 6a-6d

**A Modular Redeployable for Health is a Prosthetic Device**

A modular redeployable healthcare facility shares much in common with prosthetic devices worn by humans. It is not unlike an artificial limb. Both are built in a factory. Both fabricated of modular components and assembled by means of a repetitive manufacturing process. Both must be lightweight, malleable, and readily adaptable to change in the face of sudden, and, at times, blunt force impact. Both must be capable of returning *resiliently* to some approximation of their previous functional state prior to the disruptive event. Both must somehow continue to function should one module or wing (limb/system module) go down or offline if even temporarily. Both must be made (to the extent possible) of biodegradable parts in a manufacturing process that minimizes generation of ecologically harmful waste products. Both must maintain fluidity to interdependently function while the larger system (human body/total installation) readjusts in response. Finally, both must remain operational and useful in diverse topographic and climatic contexts (Verderber, 2016). More specifically, in the case of a redeployable facility for health, in the programming and design phase two questions arise: 1. How can a transportable prefabricated modular architecture most therapeutically express the Vitruvian triumvirate of commodity, firmness, and delight? 2. Can offsite-built *architecture* provide more than minimal, baseline physical support in the face of a major public health emergency?

*Salutogenic and Biophilic Affordances*

Aaron Antonovsky, a medical sociologist, first defined the concept of salutogenics as the confluence of multiple positive factors supportive of human health and well-being. This flew in the face of then-prevailing, negativity-based definition of sicknesses and diseases traditionally associated with pathogenesis (Antonovsky, 1979). The term *salutogenesis* is derived from the Latin *salus*, meaning "health," and the Greek *genesis*, meaning "origin." Antonovsky believed humans need and require cognitively supportive, meaningful environments in order to cope with highly stressful everyday situations — conditions that threaten to destroy our sense of place attachment in the world. He defined *cognitive coherence* as a three-faceted phenomenon consisting of *comprehensibility*, the belief that things occur in an orderly and relatively predictable manner allowing humans to reasonably predict future events; *manageability*, the belief that humans possess the capability to successfully solve problems and any given situation is therefore potentially soluble, and within one's grasp and range of control; and *life meaning*, the belief that life, intrinsically interesting and a source of fascination, is worth living, with each person possessing a unique purpose and mission in life.

The mental and physical challenges of being hospitalized for COVID-19 are obviously intense. Jan A. Golembiewski and others have recently applied salutogenesis to the planning, design and daily management of psychiatric facilities. The argument is essentially that unsupportive, countertherapeutic environments challenge our physical and psychological coping abilities (Golembiewski, 2012). Meaning is derived from the capacity to recognize and find interest in normalized elements from everyday life: a window with a view out, or a nature-scene mural. Biophilia theory seeks to capture the human natural predilection for transactional relationships with nature. Its theoretical tenets have been explored in psychology and sociology since the 1980s in the work of Edward Wilson (Wilson, 1984) and more recently, Stephen Kellert (1997; 2007; 2018; Peters and Verderber, 2021). The therapeutic role of nature and landscape is increasingly recognized by architects, landscape architects, and allied designers. Kellert defined the fundamental tenets of biophilic design as two primary dimensions: *organic or naturalistic,* and *place-based or vernacular.* He defined six additional biophilic design elements: environmental features; natural shapes and forms; natural patterns and processes; light and space; place-based relationships; and evolved human-nature relationships (Verderber and Peters, 2019). Browning, Ryan and Clancy (2014) distilled a useful compendium of biophilia-based design concepts, summarized below:

> *Nature in space patterns*: Visual connectivity with nature, non-visual connections with nature, non-rhythmic sensory stimuli, thermal and airflow variability, the presence of water, dynamic and diffuse light, and connections with natural ecological systems.
>
> *Natural analogical patterns*: Biomorphic forms and imagery, materiality connections from or inspired by nature), and amelioration of discombobulation (overcomplexity versus patterned order.

*Nature of the space patterns*: Prospect-refuge behaviors, the function of mystery and intrigue, and the role of risk-reward behaviors in relation to satisfaction and well-being

Evidence-based research is needed on the staff and patient experience in this type of facility for the treatment of infectious disease, and on best practices to foster patient and staff participation in the planning and design process. It is worthwhile to review the unbuilt and built projects discussed above through the translational lens of redeployable facility design principles drawn from biophilia theory and from environmental psychology such as attention restoration theory (Gillis and Gatersleben, 2015; Olhy et al., 2016). By contrast, many of the walk-up/drive-up and 24/7 surge field hospitals proposed in the months immediately following the coronavirus outbreak appear to have suffered from one or more of the following salutogenic and biophilic-related architectural deficiencies:

- Lack patient confidentiality and privacy in waiting areas, and inadequate protective screening at pop-up testing stations.

- Lack of adequate circulation pathways that separate symptomatic from asymptomatic individuals awaiting testing or immunization, especially in pop-up facilities in repurposed host buildings.

- Inadequate staff workspaces and insufficient storage space for supplies such as PPE equipment, refrigerators, and laboratory equipment.

- Inadequate protection from the elements (weather) for persons availing themselves of outdoor testing and immunization pop-up facilities.

- Windowless conditions in 24/7 facilities precluding the occupant's direct contact with natural daylight, views and ventilation, and inadequate artificial lighting options in support of attention restoration theory's advocacy for positive multi-sensory distraction.

- Absence of representational or surrogate 'nature views' and especially in insufficiently windowed spaces where a nature-themed mural, external window, window treatment, pull curtain, and/or actual plant could help to ameliorate patient stress.

- Monochromatic interior spaces difficult to navigate due to a confusing spatial layout, worsened by ineffective directional graphics.

- Overcrowded and under-designed patient housing zones, resulting in inadequate privacy and confidentiality, further compounded by a lack of bedside amenities.

**Summary—Social Responsibility, Ethics, and Health Equity**

The IDTM prototype developed by the WHO-led design team seeks to confront the shortcomings cited above. However, design innovation does not occur in a vacuum. Ethical conundrums and potential health inequities associated with these design shortcomings must be addressed. Unfortunately, the operative biases of architects and allied designers often result in the poor and the marginalized members of society being undervalued or outright dismissed in the planning and design of healthcare architecture, whether fixed site or redeployable. It has been argued that these biases begin early on. In *The Scope of Social Architecture*, C. Richard Hatch (1984) defined architectural education as an effective pedagogical vehicle for inculcating advocacy in serving the marginalized and the disenfranchised (Hatch, 1984). Hatch advocated the professional architect must strive to fulfill unmet needs for equitable, affordable, dignified housing for underserved minority populations. He saw the need to think and act with *rational transparency*. Rational transparency is about addressing critical moral, ethical imperatives. Thomas Dutton, in citing the educational theorists Roger Simon and Henry Giroux, reinforced Hatch's advocacy position, arguing for inculcating a moral imperative, where, in a world of needless pain and inequality, critical pedagogy in architectural education and practice must value social justice, democracy, full equality, and social emancipation (Dutton, 1996). This type of attitudinal commitment to advocacy for marginalized and overlooked individuals and groups can be transformative (Verderber, 2003).

As for redeployability, Le Corbusier recognized the architectural significance of the earliest transportable building type: the primitive temple he wrote of was little more than a portable, nomadic structure consisting of crude poles covered in fabric or animal skins. It could be disassembled and relocated across deserts, grasslands and forests to the next place. To Le Corbusier, temporality embodied the essence of architecture: "There is no such thing as a primitive man, there are only primitive means" (LeCorbusier, 1923). The ancient *yurt* was a portable dwelling transited by mule or horse-drawn wagon. Seasonal factors weighed in, of course, as did the necessity of sudden relocation due to war, conflict, famine and other adverse events (Kronenburg, 1995).

Shigeru Ban advocates for lightness as an essential tool of the designer in the 21st century. Winner of the 2014 Pritzker Prize in Architecture, Ban pioneered the use of paper tubing as a structural design element in post-disaster housing and emergency shelters in projects throughout the world including the aftermath of the Tðhoku earthquake and tsunami in Japan (2011). In the heart of that strike zone, Ban modified an overcrowded emergency shelter into inhabitable space with relatively minor interventions. His work personifies the ability to traverse back and forth across the line that demarcates non-elitist public interest architecture from commissions for well-heeled private clients. In reality, health equity, public health, medical science, and compassionism are interwoven constructs. When an architect complains about being underappreciated this frequently indicates that she or he may feel disengaged from the pressing socially-based challenges of the day. Indifference holds no reward in the face of a crisis like COVID-19 and the climate crisis.

There is no silver bullet blueprint for achieving rational transparency and compassion in architecture. In uncertain times, practitioners, educators, social and mainstream media, and the general public share a joint responsibility to act.

Will the multinational healthcare industry reach a point where these facilities can be routinely designed, manufactured, and field-operationalized to provide baseline as well as salutogenic and biophilic amenity in public health crises? It is not a question of if another global pandemic or catastrophe will strike but *when*. As David Wallace-Wells asserts (2019), the compounding impacts of coming catastrophes in this century will place unprecedented burdens on the planet's healthcare infrastructure. By inference, he calls for advocacy-based public interest architecture as a fundamental part of the rapid response equation in mitigating global health inequities. The reality is our future will likely be reshaped by pandemics, food desertification, earthquakes, droughts, starvation, mass migration, intense hurricanes, and typhoons, mega-wildfires, the deleterious impacts of global sea level rise on coastal cities, and depletion of non-renewable natural resources (Hancock, 2016). This is the New Normal (Lu and Flavelle, 2019; Stiglita, 2020). In the 1960s, Martin Luther King Jr. frequently spoke of the need for thoughts and actions to be guided by *radical empathy*. Radical empathy has a definite place in architects' response to the COVID-19 pandemic while rapid responsiveness requires personal conviction, perseverance, and appreciation of the timeless Vitruvian precepts of architecture: commodity, firmness, as well as *delight*. The first two precepts alone will be insufficient.

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