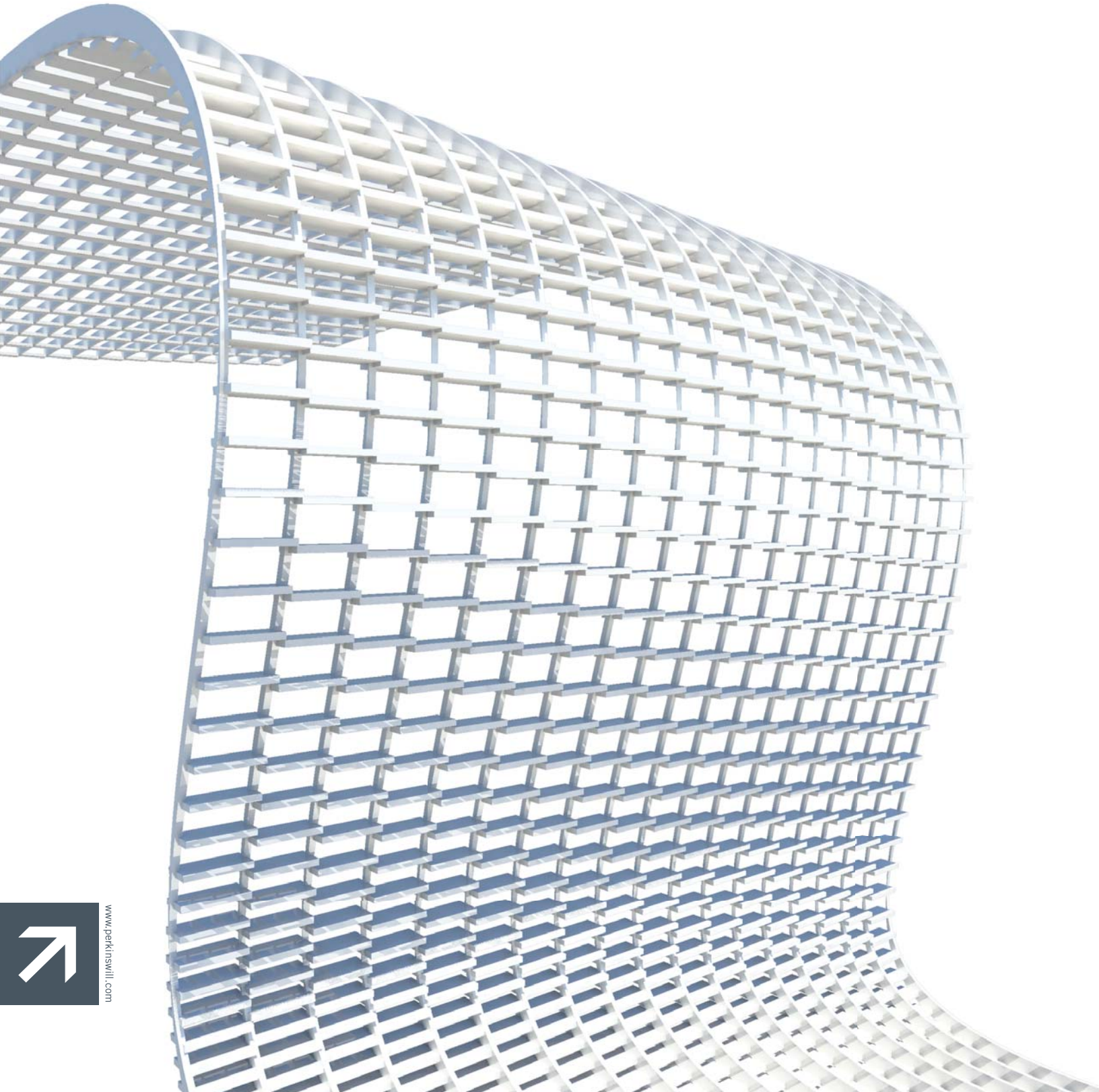


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GLOBAL DESIGN IN DEVELOPING COUNTRIES:

A Case Study for Kenya Women and Children's Wellness Centre

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ABSTRACT

This article discusses several key principles for foreign architects doing work overseas in the global workplace. The article uses the Kenya Women and Children's Wellness Centre as a case study in the development of techniques for the appropriate design process in Kenya. Although targeted specifically to Nairobi (Kenya), the information gathered and the processes established work effectively throughout the developing world. The areas of focus include social and cultural considerations, local environmental considerations and local construction practices. Specifically, the article targets techniques in the developing world due to less robust infrastructure and construction methodologies. The article also contends that the process of design in the developing world requires further consideration of local social issues than in the westernized world.

KEYWORDS: Africa, global design, social context, construction methodologies, developing nations

1.0 INTRODUCTION

The role of a global architecture firm, by providing ideas and expertise to work around the world, has the ability to provide for the latest in design and construction to areas that otherwise might not be able to benefit from a global perspective. Unfortunately with this global pollination of ideas, the global firm compels a locality into accepting a standard of care that might otherwise not be appropriate for the indigenous culture. This evasive firm has a duty to consider the indigenous methodologies and practices already established. The difficulty arises from the want to provide the best practices that otherwise might not be locally logical. This pollination of ideas becomes particularly acute when providing de-

sign services in developing nations. Special consideration must be made with the understanding that subjecting the locality to the global standard should not be the only measure of success. One should also weigh the bias dialogue if ultimately the local standard is preferred to the global. Global design firms must consider three key factors when designing in developing countries:

Successful solutions in developing countries consider:

1. Local environment and the regional climate.
2. Cultural context and social expectations.
3. Construction methods and locally established practices.



Figure 1: People, culture and environment.

These three strategies should be considered and implemented as part of the design process and tailored specifically to the country in consideration. These strategies should then be refined through research, local guidance, experience and expertise. Benchmarking also provided a means to assess the project performance relative to other national and international existing healthcare facilities. Facilities are assessed with the understanding that the manner of implementation in the developed world is not necessarily the correct approach in the developing world. For example, if the building energy use intensity in the developed world was implemented in buildings in developing world the global energy consumption would be unsustainable. Additionally, what might be considered efficient today in the world's largest economies might not necessarily appropriate to the developing world.

2.0 PROJECT BACKGROUND AND DESIGN HISTORY

The vision of the Jordan Foundation, based in Chicago, is to provide a 21st century, state-of-the-art wellness village for the women and children of Kenya. Their work is focused on health, well-being, counseling and education. By providing this facility to the local community, they will elevate the standard of medical care in Nairobi while providing for the future of Kenyans through education and training. The Foundation's mission is global care tailored to local needs. Key to their mission is to

provide a modern healthcare building that is not intimidating to the local users and to provide a high level of design using local expertise and to make the building locally appropriate while providing comfort and performance comparable to a global standard. These factors became the genesis of the Kenyan design mission.

Located on the campus of United States International University (USIU) northeast of downtown Nairobi, the Kenya Women and Children's Wellness Centre provides services to the surrounding communities, the city of Nairobi and all those underserved throughout the country. Figure 2 indicates the relationship of the village to the USIU campus and its proximity to downtown Nairobi. The overall project is comprised of several program elements that share a common bond of wellness. The key facility components include a 170-bed inpatient hospital, outpatient clinics for women and children, an institute of learning, Gender Violence Recovery Center (GVRC), family hostel and a forensics laboratory joined together in a campus setting as shown in Figure 3. The facilities are organized on-site by privacy, adjacency and accessibility overlooking the rolling plateau of east Africa. The project is designed to support national research by creating an effective science and technology institution capable of developing and adapting to world class technologies. The variety of complimentary wellness facilities provides a holistic approach to well-being that bridges local, traditional and global medical care.

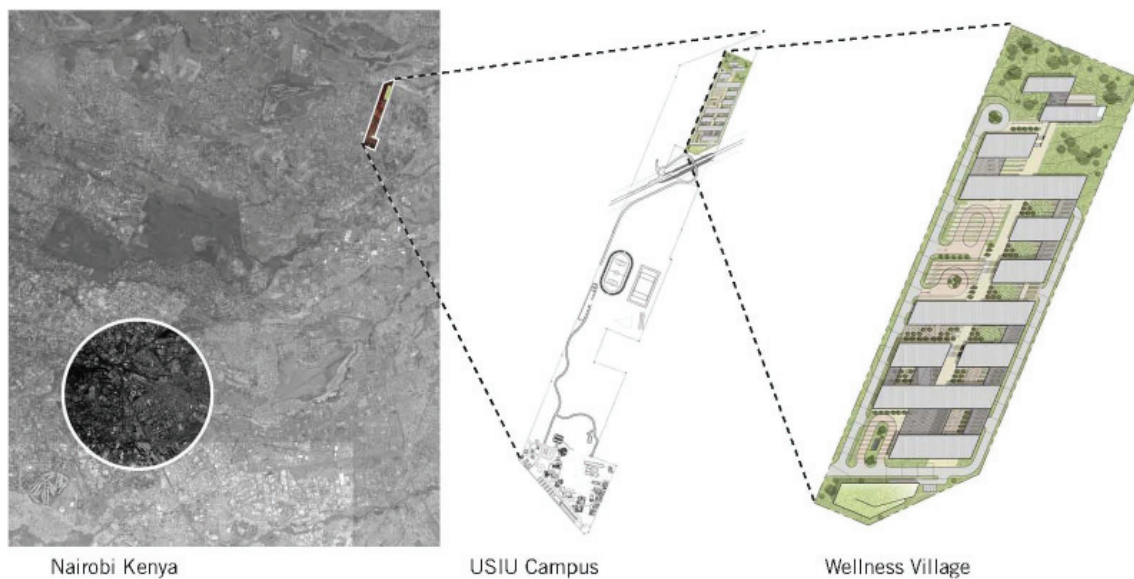


Figure 2: Wellness Village location, Nairobi, Kenya.

3.0 ENVIRONMENTAL CONSIDERATIONS

The increased focus on global warming has raised concern about the consumption of fossil fuels and has suggested entities develop strategies to reduce consumption. As an initial observation, the per capita contribution to global warming in the developed world is much more severe than in East Africa, thus the project

must side-step the consumption habits present in the developed world and suggest a new paradigm. Each Kenyan consumes about six percent of the energy that their average American counterpart consumes¹. In addition, environmental concerns are viewed in a different light in the developing world where the energy consumption is not curtailed because of environmental



Figure 3: Aerial of Wellness Centre.

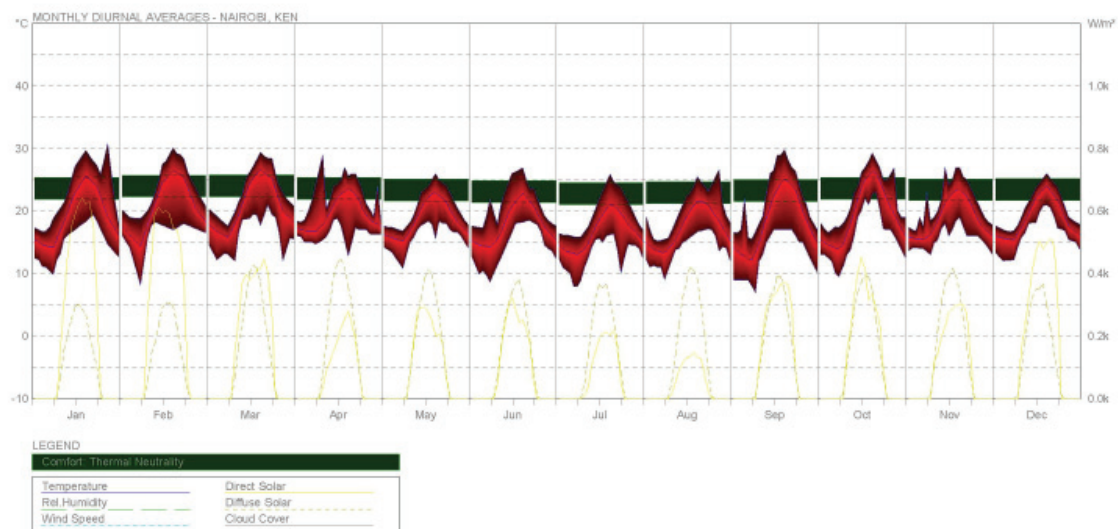


Figure 4: Monthly averages – Nairobi, Kenya.

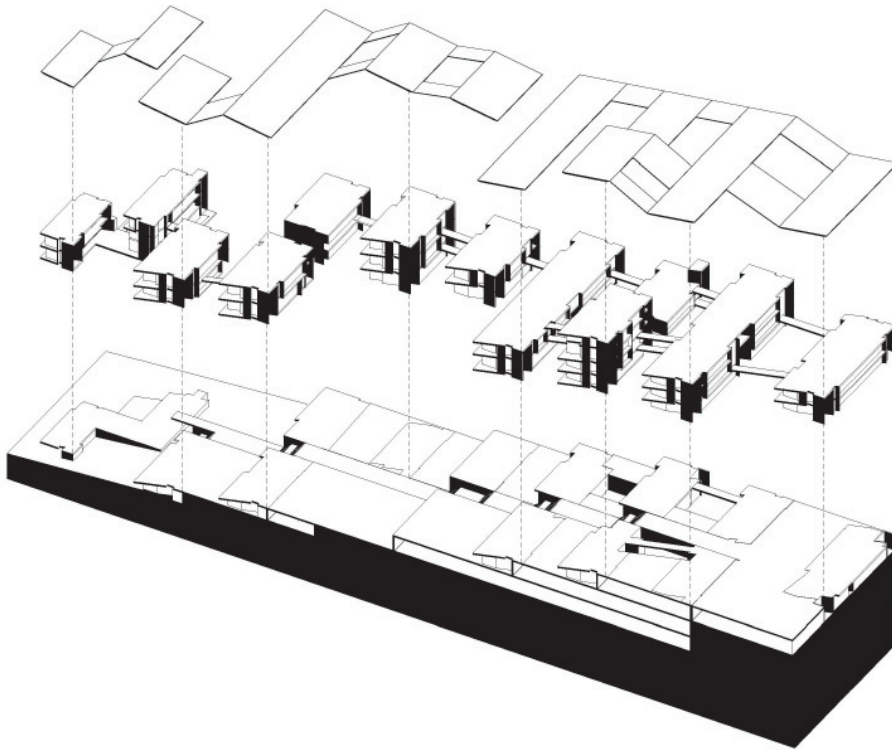


Figure 5: Exploded roof diagram of Wellness Centre.

concerns but more for complications in distribution and transmission. The cost of electricity in Kenya on average is two to three times more than the United States². Most Kenyans view “sustainability” as common sense strategies that are not incentivized to an energy reduction checklist. The 1992 Earth Summit in Rio de Janeiro stated the common responsibility of all nations to establish sustainable development as the new standard. The experience since Rio has shown that it is not possible to define “sustainable society” absolutely and exactly. There is not one solution that works well globally. Sustainable development should not be understood as a normative concept, but rather as a regulative idea, comparable to the leading ideas like freedom, equality and justice. Sustainable design should act as guidelines for our behavior and our actions and be tailored to that of each individual country.

At an elevation close to 6,000 feet above sea level, Nairobi benefits from an ideal year-round climate. As

indicated on Figure 4 temperatures only vary on average from 50 degrees F (10 degrees C) to 78 degrees F (25 degrees C) throughout the year, thus Nairobi is classified as subtropical highland under the Koppen classification system¹. The sunniest and warmest part of the year is December through March. Nairobi also has two rainy seasons in April-May and October-November, but overall there is not much variation throughout the year with the green band indicating thermal comfort in thermal neutrality.

With its location on the equator, Nairobi has minimal deviation in the hours of sunrise and sunset with the sun remaining high overhead throughout the day and throughout the year. Its location on the equator also requires careful consideration on the impact of solar radiation. Efforts must be made to protect from the rising east and setting west sunlight. Building facades must also consider shading on the south and north facades. Sunlight and building orientation is important to the

[i] Kenya has up to seven different climate zones ranging from humid to very arid. Elevation plays a large part in its climate variations. Most of the humid regions are at an elevation over 1500m. The majority of the country, 46 percent, is very arid.

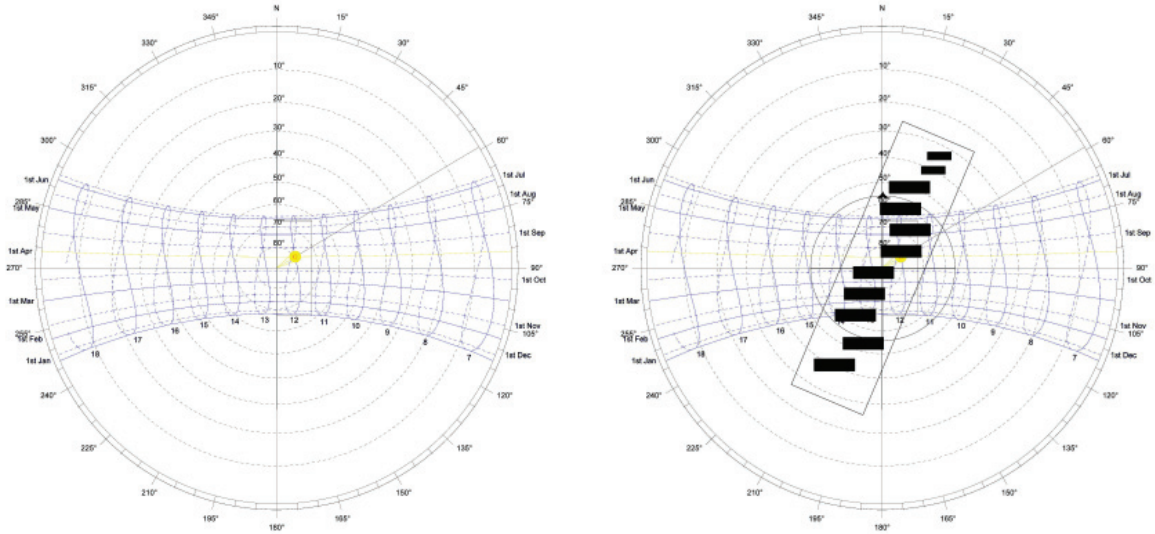


Figure 6: Stereographic sun path diagram.

health of the building occupants while understanding the need to provide for protection from too much sunlight or glare.

There are several cities that benefit from the same climate conditions as Nairobi including the nearby cities of Kigali, Rwanda and Bujumbura, Burundi. The climate immediately suggests that the types and complexity of mechanical systems present in the more extreme climates of the northern and southern hemisphere need not be present in high plateaus of East Africa. This alleviates and simplifies many of the enclosure systems used in Nairobi, often eliminating walls, insulation, windows and doors where not necessary for privacy, acoustics or security. The local climate culture also allows for more variation of the “inside” temperature than highly mechanized westernized standards. Kenyans will commonly work in warmer or cooler spaces than their counterparts in developed nations. The simplified enclosure systems and mechanical requirements provide for a reduction in building areas that would typically be reserved for mechanical ventilation in North American and European projects. The Nairobi building model also prefers a higher quantity of externalized spaces, single loaded corridors and smaller floor plates that take advantage of daylight.

Another strong influence on the environmental design

of the facility was optimizing the sun utilization to the design of the wellness facility. The effective solar yearly radiation in Nairobi is approximately 1900 kWh/m² with the highest intensity January through Marchⁱⁱ. These levels are comparable to the southwestern United States and provide ample opportunities for solar power, solar hot water and daylighting, but also require thoughtful design strategies to reduce solar gain through overhangs and external shading devices.

As part of the environmental research of the building, the Perkins+Will Tech Lab determined the optimal orientation, potential kWh production and payback period of the installation of a solar photovoltaic system³. The report determined that the high solar radiation and constant levels throughout the year provided an ideal scenario for the investment in solar power and domestic hot water. In addition, the high cost and unreliable source of electrical power from the government-owned KPLC further resulted in the provision of multiple alternative sources of power for the functionality of the healthcare facility. The renewable energy recommended for the building influenced the roof design, as shown on Figure 5, which is optimized to its location one degree south of the equator.

For all the renewable energy benefits that the sun provides, steps also have to be considered in the design

[ii] Nairobi has 1900 kWh/m² of annual solar radiation compared to Phoenix, AZ with 2100 kWh/m² and Seattle with 1200 kWh/m².

to reduce or eliminate solar gain without compromising the ability to daylight the patient rooms, classrooms and counseling spaces. This was achieved with two complimentary design strategies. Constant throughout the entire building perimeter, a two meter overhang provides a fixed level of control from the sunlight. In addition, the overhangs support a louvered screen system that further diffuses the sunlight that is optimized to its particular orientation. The long north and south facades are substantially protected from direct solar radiation while the short east and west facades have porches to help buffer the interior spaces against the low sunlight angles. Of particular design influence is the stereographic solar diagram, shown in figure 6, that illustrates the high overhead sun position throughout the year with sunlight hitting the building from all directions because of Nairobi's equatorial location.

Environmentally, the width of the building was an important design consideration. Fixed at 14 meters wide including the overhangs, the width plays an important role in daylighting and the collection of rainwater. The building width was determined by two factors, the ability to daylight to protect against intermittent power supplies and the optimal width that would provide for a single-loaded condition, a double-loaded condition and a double-loaded condition with a centralized storage. The single loaded condition is used for classrooms-corridor and patient ward-corridor. The double loaded condition is the typical patient room-corridor-support or office-corridor-office. The third condition combines the double-loaded condition with an additional layer of support or storage that does not require daylight. This condition was implemented in the outpatient and GVRC conditions. A result of the building width, the 14 meter shed roof provides an ideal scenario to collect rainwater. The Wellness Centre will use rainwater to supplement to landscape irrigation and gray-water fixtures.

The environmental considerations implemented in the Wellness Centre were optimized to the conditions using local data, customs and constraints along with benchmarking against other healthcare facilities, global trends and past project experience. Typical African architects, developers, builders and owners often overlook the site as one of the significant elements of sustainable development and construction and thus special consideration was given on the preservation and reintroduction of the environment and landscape into the building design⁴.

4.0 SOCIAL CONSIDERATIONS

Foreign architects must also take into consideration the unique customs and social mores when suggesting the needs of the local occupants versus global standards. In the case of Kenya, citizens are generally group-orientated rather than individualistic. "Harambee," defines the Kenyan approach to others they meet in lifeⁱⁱⁱ. The concept is about mutual assistance, mutual effort, mutual responsibility and community self-reliance⁵. Using this social standard as guidance provided the appropriate balance between global healthcare standards and local customs in healthcare delivery. To that end, refinements were made to the design and the process to customize the hospital typology to be uniquely Kenyan.

Some of the early considerations discussed in the planning and development of the Wellness Centre were the access to the site and the building's position on the site. The long rectangular ten acre site is located at a remote corner of the USIU campus, that until recently, was not completely accessible. In tandem with the design of the centre, the Kenyan government is constructing the new 31 km northern bypass road that connects the city of Nairobi from east to west. This new roadway sits along the south edge of the site, making accessibility to the site relatively easy. With the ease of access, the team had concerns about traffic and safety due to the local commuting customs. The transit system, heavily influenced by matatu's or mini-buses, makes for a necessary "evil" in providing cheap public transit within a largely unregulated system. The decision to restrict mini-bus access to the site by providing a distinct off-site bus stop alleviates many safety, security and noise concerns of not regulating access. Another important social consideration is the needs of the walking public. Most Kenyans will walk distances unheard of in the rest of the world. It would not be unreasonable to expect that people would walk 12 km from downtown Nairobi to the site. Considerations were made in providing the infrastructure necessary to access the site by a large number of walking public along with supporting a system of specialized buses dedicated to serving the local community.

The building's integration into the site was also carefully considered to satisfy political concerns of all stakeholders. Although the project is headed by the Jordan Foundation, they have made it a priority throughout the design process to include several other groups in the

[iii] Coming from the Bantu word meaning "to pull together".

decision process while reinforcing their inspired vision for the facility. These stakeholders include USIU, the Kenyan government and the United States government. As part of this stakeholder involvement there were various discussions in regards to the visual impact of the facility and visibility of the project within the community. One discussion involved the need for a “glass and steel” building that “reflected” the notion of world-class healthcare in a modern facility. Furthermore, to supplement the notion of a world-class building it should be very visible and make a statement in this formerly rolling farmland. In review of the target audience, the team ultimately suggested a much less grandiose design approach that minimized the visual cacophony of the building and integrated it well into its surroundings. This approach was pursued for two reasons: visibility and perception. Because most of the visitors to the Wellness Centre will be from the villages surrounding Nairobi, the building needed to relate to its surroundings. An unapproachable, reflective glass building was not the image the centre wanted to promote. Secondly, minimizing the visual size of the building on the site was important to help focus on the delivery of healthcare and not the extravagance visible in the modern US healthcare systems. The practicality was achieved by burying large portions of the diagnostic facilities and daylighting with courtyards and light wells as shown in pink in figure 7.

Another aspect of the site organization that was purely culturally driven was the placement of the different program elements on the site. The facility is specifically designed for women and children as a direct response to the gender discrimination that exists in Kenya. Although better than the northern African countries, Kenya ranks 96 out of 134 countries in gender equality. In sub-Saha-

ran Africa, countries like Lesotho and South Africa have been able to bridge the gender gap by focusing on education and health equality^{iv}. In the Health and Survival Equality Index, Kenya performs poorly against neighboring countries Uganda and Madagascar⁶. To help bridge this gap the Wellness Centre is focused on an integrated approach of health, education, counseling and family support. One of the primary goals of the James R. Jordan Foundation International is to “encourage and engage communities, providing the resources, support and motivation to ultimately help themselves.”

To help reduce prevalence of gender discrimination in Kenya, an essential component in the Wellness Center is the Gender Violence Recovery Center. Placement and vision of this counseling and group therapy program on site was critical to its success. To make abused women feel protected from their abusers, the GVRC was deliberately sited away from the main entry and secluded from the main entry. Also special provisions were made to make private patient entries and courtyards designed for group therapy away from other campus activities. Particular care was made to keep the GVRC away from the forensics lab because of potential inference that abusers might conjure because of their proximity. Talking to a counselor should not imply that evidence is being collected against an abuser. Figure 7 indicates the organization of the major program elements on the site accounting for cultural and privacy concerns. The placement of the family village, day care and Institutes of Learning adjacent to the GVRC was designed to augment the success of the centre by providing women and families the means to improve their personal situation through empowerment.

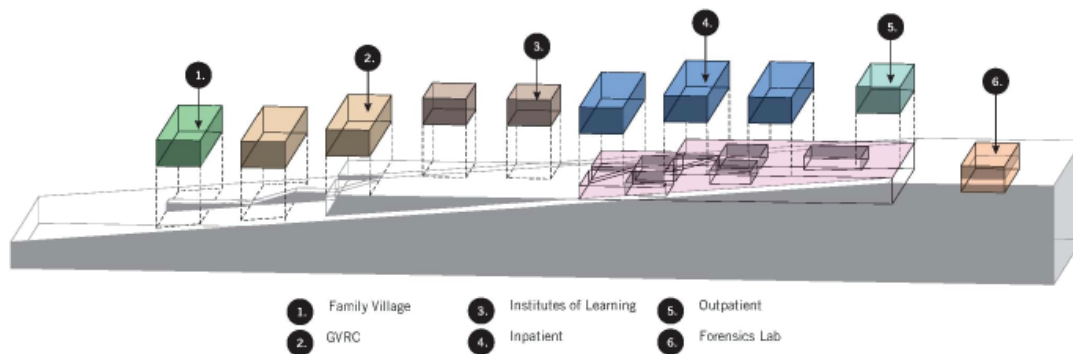


Figure 7: Program organization on the site.

[iv] Gender equality rank of Lesotho (8th) and South Africa (12th) Kenya ranks 15 out of 25 in sub-Saharan Africa.

Landscape and the connection to nature are critical in the success of the health, wellness and recovery program in the centre. Recent studies have established that no matter the social or economic status of a person, proximity to green space and nature will reduce blood pressure and stress levels thereby promoting faster healing in patients⁷. The facility design invariably focused on creating a patient link to nature with multiple courtyard spaces, single loaded rooms and high floor-to-ceilings. In addition, the climate allows for extensive natural ventilation including a fixed open louver system in all patient rooms with operable windows for additional individual patient control. The orientation of the buildings also takes advantage of the prevailing easterly winds to cool the courtyards from the intense equatorial sun. The widths of the courtyards are optimized to provide a sense of comfort and place while maintaining visual privacy between buildings.

5.0 CONSTRUCTION TECHNIQUES

In most developing nations, any construction is viewed as mostly favorable to the local community and is usually regarded as an improvement over the status quo. It has been argued that the construction industry is unique in its ability to facilitate development by providing directly for human needs, stimulating investment and generating employment. This can be made possible if the nature of the building industry and its role in the

national economy is well understood⁸. Specifically, Kenya is well positioned through its ease in obtaining construction permits in the world compared to its neighbors Rwanda and Uganda⁹. On the other hand, corruption affects the land acquisition and construction activities in Kenya with the country ranking 147th out of 180 in the corruption perception index¹⁰.

The problem that developing nations tend to have is a shortcoming in modern construction techniques and less stringent environmental controls. Critical to design abroad is a clear understanding of the local construction culture. A large part of this understanding comes from working directly with local practitioners and learning through their existing work. On this project the relationship was fostered through a healthy discussion regarding the best design solutions for the Wellness Centre. Although many aspects of the design process can be accomplished without local input, it is this input that makes work truly localized and tailored to its own environment. Working with the local design professionals provided valuable insight into methods of construction and successful design details (Figure 8).

A review of Kenyan construction practices revealed that construction methodologies have long been modeled on the experience of the developed world. In Africa many of the project delivery methods are modeled on their former colonizers. This is manifested in education, profes-



Figure 8: Kenyan construction methods and details.

[v] Ease of obtaining construction permits: Kenya 35th, Rwanda 85th and Uganda 133rd. United States ranks 27th.

sional training and legislation. Kenya's construction industry currently uses similar procurement systems that were historically used in the United Kingdom including the traditional contracting, the design and build, construction management, management contracting and project or program management systems. A large part of understanding the local design process was working with the Kenyan quantities surveyor to establish the locally appropriate construction practices based on their experiences. Ultimately this collaboration guided the rules for the structural systems, materials, constructability and building cost. This transfer of knowledge was significant in the understanding of Kenyan construction and the appropriate design approach.

Understanding the local design approach helped guide in the selection of materials including the appropriate sources for those materials. With regard to African con-

struction, traditional communities have always used the natural materials in their immediate environments for construction and the resultant buildings are well integrated into nature. Traditional building materials also have the advantage of being cheap and readily accessible. The material selection of the structural system was significant in the construction of the building. A hollow pot concrete structural system was selected because of its prevalence and understanding in the Kenyan construction industry. The structural spans designed allow for proper healthcare planning modules while eliminating drop-beams that would adversely affect the naturally ventilated slab strategy.

Redundancy is also important in the design of buildings in Kenya. Because the overall construction quality is lower than the industrialized world, a "belts and suspenders" approach was taken in the design of the

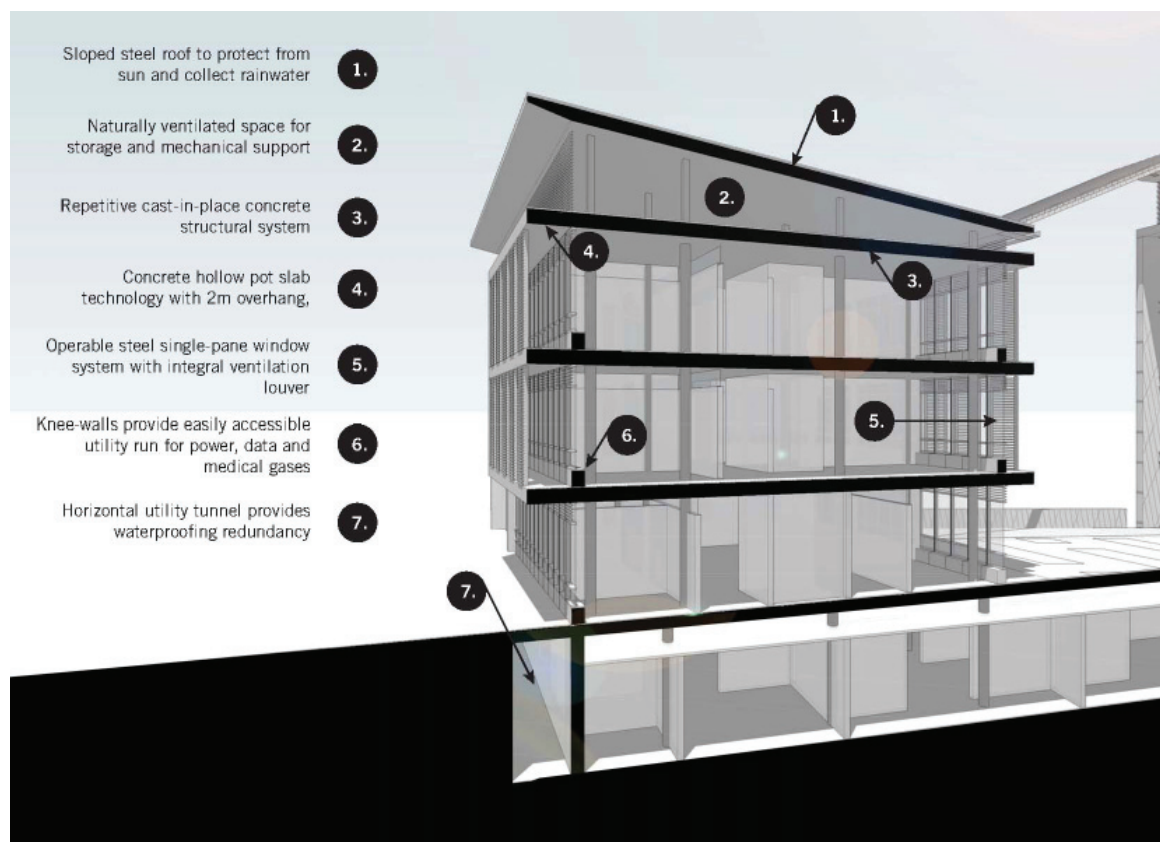


Figure 9: Cutaway section of typical enclosure.

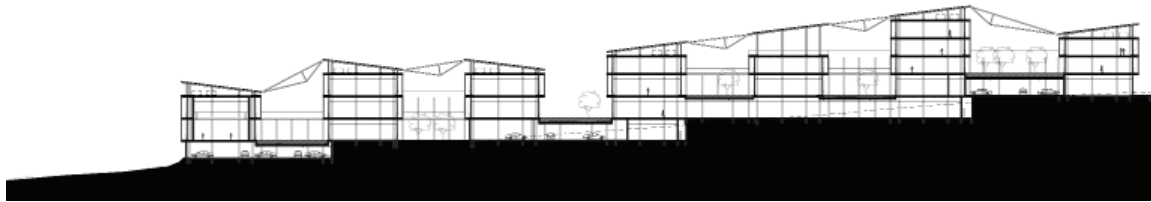


Figure 10: Integration of building into the site slope.

building enclosure. The roof enclosure was specifically designed to have a flat concrete slab system with a secondary standing seam sloped system. The concrete slab was a natural extension of the typical floor slab system. Because of the shortfall in the means and methods of flat roof enclosure systems, the design includes a secondary sloped roof to prevent the infiltration of rainwater (Figure 9). This double roof strategy has several unintended positive results including the ability to collect rainwater and the provision of additional mechanical and support space between the two roof systems. The double roof system also provides added acoustic insulation from rainwater beyond a traditional sloped metal roof. The roof redundancy uses the traditional sloped metal roof in a technically sophisticated manner that combines the best construction techniques in Kenya with global technical standards.

Another redundancy strategy involved waterproofing the foundation. The desire to minimize the visual footprint forced the location of a large portion of the diagnostic facilities into lower levels that are partially buried as they step down the sloped site. Locating expensive diagnostic equipment close to the foundation walls suggested the development of a design strategy that always provided a buffer space between the red volcanic soils and the sterile diagnostic spaces. This strategy was implemented with the addition of service tunnels and underground parking areas that serve as a buffer between foundation walls and program spaces where appropriate as illustrated in figure 10.

Local construction techniques also guided the means of incorporating medical gas, plumbing and electrical distribution in the modern facility. The resultant design strategy includes a utility spine that connects all the buildings together at the service level. The utilities are then routed through vertical shafts to a utility knee wall that runs along the exterior wall of the building. This design strategy is illustrated in figure 9, item #6. The knee wall, which supports the typical window and louver sys-

tem, is designed to be easily accessible for installation and repair. Such a system would otherwise not be appropriate in colder climates because of the potential to freeze, but the simplicity of the exterior wall enclosure allows for this locally appropriate system. This design provides a single solution to all the primary exterior wall enclosures.

The resulting building design had as much to do with the construction means and methods as it did with the social and environmental concerns in Kenya. The overall design strategy was to fine tune the design to its locality while providing a state-of-the-art facility. The repetition of the design elements provided an economy of scale in design and ultimately construction. Details and design revisions were implemented throughout the facility reducing atypical and special conditions. Redundancy in building enclosures reinforced design and performance goals. The flexibility in the building enclosure allows the use of traditional construction systems adapted to the specialty healthcare facility. The local culture of construction was as much an influence on the ultimate design strategy as was the desire to provide a healthcare facility that was comparable to any other in the developed world.

6.0 CONCLUSION

As with any revolutionary project there is a desire to provide a product that meets or exceeds that of its global counterparts. This desire, however, might exceed the appropriate local response ignoring the needs of the target population. It is important to consider and balance both the global design standards with the appropriate local response especially when working in developing economies. Environmental, social and construction criteria are each equally important in the establishment of a localized design process. The interconnectivity between local social and cultural factors and global benchmarks for quality of care are also key components in the success of the design. The resultant design should become

a fusion of global ideas localized to the people it serves. The Wellness Centre in Kenya is customized to people of Nairobi and no one else. This project illustrates that the model for healthcare and sustainability is different around the world and the criteria with which we measure their performance must be adjusted to its locality. There is no one solution approach but resultant design should be customized without compromise in quality or building performance. As development becomes equalized through globalization it will become apparent that the design response in the developing world will have to be adjusted to its locality due to energy and infrastructure shortfalls. Ironically the lessons learned in the developing world will encourage a revolution in the design and sustainable approaches worldwide.

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