

# **Journeyman International: Canopy Life School, Housing & Training Complex in Kenya**

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The purpose of this project was to provide a master plan for a primary school complex in a rural village in Migori County, Kenya. Children constitute the largest age group within the Kenyan population (approximately 40%). However, many children are not given an adequate opportunity to thrive. Some of the most significant difficulties they face are low access to education and malnutrition, as well as being kicked out of orphanages and other housing making it very difficult for them to succeed. This facility aims to eliminate any issues for students growing up in the area. The master plan includes a primary school, housing accommodations, a training center, and a dining hall to cultivate success through all stages of these children's lives. The project is headed by a non-profit organization, Journeyman International in conjunction with Canopy Life International – Take Heart Africa. The project was interdisciplinary involving a construction manager, an architect, and two architectural engineers all working together throughout the year. As the construction manager, I was responsible for a conceptual estimate, quantity takeoff, project schedule, site utilities analysis, hazard and risk mitigation, a site and safety plan, and a storm water pollution prevention plan (SWPPP).

**Key Words:** Non-profit, International Construction, School, Migori, Kenya

## **Introduction**

Journeyman International (JI) is a US-based nonprofit which provides architecture, engineering, and project management services to humanitarian and development organizations (Journeyman International). Their unique model allows university students and professionals to connect with organizations around the world to affordably bring greater value to projects that uplift people experiencing vulnerable circumstances. Having designed 132 projects worldwide to date, this company specializes in partnering with international organizations to provide young construction professionals with many opportunities to volunteer their knowledge and skills to provide designs and logistical planning for future projects ("About Us," n.d.).

I chose to work with Journeyman International when I was first speculating what type of project I wanted to explore working on, and Daniel Wiens came to our Senior Methodology class. As he was presenting about the possible senior project opportunities, I instinctively committed to utilizing Journeyman International as my senior project. My instinct came from a decision I had made my first year at Cal Poly when I first had heard about people being involved with construction projects in Africa. What really took my attention was that these people were also actually able to go to Africa and act as the Project Manager. I was very intrigued by this unique and lifechanging opportunity, but I knew I had a lot of time to decide what exactly I wanted to do. Fast forward to my Senior Year, I was approached by Carly Althoff who is the managing director for Journeyman International. She revealed this new project for the Canopy Life School in Kenya. As she explained who exactly would be involved, I was very impressed with not only the amount of committed people already involved in the project, but also the unique places and professions they all were apart of. Although I had very little knowledge of the area in addition to construction in Kenya, I was honored to be invited to help and devote my senior project to aiding in the construction management of the project.

## Project Based Criteria

Journeyman International was the non-profit collaborator on this senior project which affiliated students in the College of Architecture and Environmental Design to create a school, housing, and training center in Migori County, Kenya. The buildings were designed by a student seeking their undergraduate degree in architecture, while consulting me as the construction manager (CM) and two architectural engineering (ARCE) students. Once the design was finalized, as the CM student I compiled deliverables to include the conceptual estimate, project schedule, hazard and risk assessment, material take-offs, storm water pollution prevention plan (SWPPP), site utilities analysis, site and safety plan, and feasibility analysis. The design and preconstruction package from the architecture, CM, and ARCE students will be presented to Journeyman International, who will later review and present the design to professionals in Kenya. The professionals in Kenya will check the students work and make any necessary revisions to build the project in the future. Journeyman International and Take Heart Africa will seek funding as the project is being designed and constructed.

## Process

The process of this project began when Take Heart Africa bought a hillside property in Migori County, Kenya (See Figure 1.0). Delta Ryan, who is the founder of Take Heart Africa has a very special relationship with the people of Kenya. Without her dedication to change the ways in which children are raised in Africa, this project would not have been possible. The original plan for the purchased property was to develop a master plan which would include a school and training center development for Canopy Life International.



*Figure 1.0: Location of property in Migori County, Kenya*

Canopy Life International is the perfect organization to be in control of this future complex as they strive to give helpless children a new way of life through the very generous donations of international donors and partners. Their team of experienced local teachers, mentors, pastors, and administrators serve deprived children all over the country of Africa. As seen on the Canopy Life International website, “We give vulnerable students the heart, home, mindset, and skills to solve problems, start businesses, and create innovative solutions that will lead their families and communities out of poverty” (“Our Work,” n.d.). This type of work is not done easily and requires a very discreet process of raising and teaching younger generations. This process includes four main themes

including discipleship arts, canopy homes, engaging classrooms, and innovation programs.

The proposed school and training center development would fulfil Canopy Life International's demands and could provide all new resources for the children in the Migori County area. Throughout the design and development process the planned school complex was redesigned and changed many times. The original property included a school, training center, guest houses, and a kitchen/dining room which would be called Sam's House of Compassion. The planned school would include a playgroup, classrooms for grades PP1-PP3 and grades 1-8, a library, storage, 4 offices, a staffroom, an art room, a science room, a registry, and washrooms. The planned training center would include a conference room, 2 offices, 10 shared rooms, a TV room, 4 hotel rooms, a two-bedroom apartment, and washrooms. The planned guest house would include lounge/dining, a kitchen, a pantry, a laundry room, 5 bedrooms, a family room, a verandah/patio, balconies, and a porch. Sam's House of Compassion would include a children's dining room, a kitchen, a pantry, washrooms, changing rooms, training center dining, a boarding room, and storage. Lastly the property planned to also include extra items such as a gazebo, driveway, parking, a football field, a basketball court, and a volleyball court. (See Figure 1.1)



*Figure 1.1: First proposed site plan*

One of the first orders made in the construction scope included a survey of the land. A topographical survey report was necessary to obtain a detailed description of the site which would ultimately aid in the design and construction of the future facility. The topographical survey report was created on the 16<sup>th</sup> of January 2021 by Geoinventiff Limited. Some of the activities carried out during site preparation included: Site meeting with the client representative to orient the survey team with the general area of interest, Requisition of materials which would be used during the survey, and site clearing to enable access to parts that were bushy. The site survey included: detailed picking of all existing physical features and terrain, and a topographical survey which was carried out in the WGS84 Coordinate System and Orthometric Height. The project fell under Zone 36 South. GPS observation included was carried out on temporary benchmarks which established points using a GPS rover unit. GPS observations were adopted to coordinate the three established temporary benchmarks. (See Figure 1.2)



*Figure 1.2: Temporary benchmarks established on the ground*

Topographical Surveying was done by feature picking with optical equipment using the Leica total station. The features included spot heights, fences, rocks, and trees. Real-time kinematic positioning

(RTK) readings were done using a grid of 10 by 10 meters on the gentle slopes and a grid of 5 by 5 meters on the steep slopes. (See Figure 1.3) Data processing was carried out to transform and model the raw data observed in the field into meaningful information. Coordinate computations and data processing was carried out using various software. Data processing steps included: step one involved a post-processing of the raw data captured by the RTK GPS equipment using LISCAD software and the true coordinates of the occupied stations as observed by the GPS, the final step involves grouping the picked data sets according to their respective codes and plotting them in AutoCAD. From the exact points, linear features were connected using 3-D lines and polygons and the terrain was then modeled using Survey Master Software. All data including the profiles were combined in AutoCAD so that a final drawing could be generated. The results of the survey are a Topographical Survey Drawing and a Survey Report. The surveyed area as pointed out during the survey by the property owner's representative is approximately 3.42 Acres.



*Figure 1.3: Surveyor during RTK picking*

During and after the survey, reoccurring group discussions transpired over several months as various important decisions had to be made early on so that the project was feasible. During these meetings it was necessary to review different types of designs based off the available land which was purchased. After the land was surveyed, we found the property to be approximately 3.42 Acres. Our proposed design would work on this size of property, however we found additional information about the land. Although the size was sufficient, the slope of the property was very difficult to design around. From the lowest point of the hillside which the property is located on to the highest point was 147 ft. One major decision which had to be made involved choosing to build the school directly on the hillside or attempting to level the property to the best of our ability to build the school on a flatter surface. We chose to build the school directly on the hillside by creating buildings that are reduced to one level so they could be built into the hillside the whole way up the property. (See Figure 1.4)



*Figure 1.4: Slope of property requires buildings to hug the hill*

In addition to the actual property which the school will be built on, the materials in which the school

will be constructed with had to be chosen very meticulously. We chose to include materials which would be easily accessible in Migori County as well as pleasantly aesthetic and structurally acceptable. These materials include but are not limited to wood, thatch, concrete, plaster, and tile.

### **Deliverables**

There are quite a few deliverables for the construction manager on a Journeyman International project. Collaborating and using the designs from the Architecture and Architectural Engineering students on the project, I produced the following deliverables: Construction Estimate, Project Schedule, Hazard and Risk Mitigation, Material Take Offs, Storm Water Pollution Prevention Plan (SWPPP), Site Utilities Analysis, and Site and Safety Plan. The deliverables included in this paper are specific to the student seeking a BS in Construction Management from Cal Poly San Luis Obispo, and the preconstruction portion of the Canopy Life School project.

#### *Construction Estimates*

There were two estimates made for the Canopy Life School Complex including a conceptual estimate and a final estimate. The conceptual estimate was created by first utilizing the finalized site plan and finding the square footage of each building. I then created a spreadsheet where each Master Format division could be estimated using a scope percentage breakdown of each building. An average of \$50/SF was based off historical data from JI and was observed when estimating each building. The final estimate was composed of a variety of allowances and estimates based off historical data, material take offs, and unit prices.

#### *Project Schedule*

The schedule for the Canopy Life school project in Kenya was broken down into three phases. Each phase allows construction to take place efficiently while addressing concerns about building on the hillside. The first phase involves all buildings in the lower portion of the complex including the school with eight classrooms, a library, two administrative offices, a staff lounge, and three dining halls. The second and third phases involve all buildings in the middle and back portions of the complex both including a kitchen, a community room, three offices, five short-term visitor apartments, and ten long-term visitor apartments. Each phase was compiled in MS Project and the buildings were broken down into construction milestones including: Site Work, Foundations, Structure, Roof, Interior Finishes, and Exterior Finishes. The buildings in the project schedule are based off the same milestones, but the activities included vary depending on the scope of work for each building.

#### *Hazard and Risk Mitigation*

The Hazard and Risk Mitigation analysis was based on previous JI projects near the area as well as the CM student's knowledge of typical construction risks. Along with natural disasters and safety, the CM student provided potential risks that may cause problems during construction such as funding, labor, crime, and phase occupancy. The analysis was done off historical data while remaining site specific.

#### *Material Take Offs*

The material take offs (quantity take offs) for the Canopy Life school complex were done by examining each building and utilizing the architectural and architectural engineering plans developed

by the ARCH and ARCE students. The take offs were produced using Bluebeam by counting and measuring each component in every building so that the proper amount of material was identified for the whole complex.

#### *Storm Water Pollution Prevention Plan (SWPPP)*

The SWPPP was produced by obtaining information on the soil on site from the client as well as using the Environment Protection Agency's (EPA) reference document for small commercial construction.

#### *Site Utilities Analysis*

The site utilities analysis for the Canopy Life school was composed based off a site visit by the client as well as information obtained through the pre-design client questionnaire. The client found some means to have access to some utilities including but not limited to large rain barrels, electricity which can be used from neighbor, and water stored above ground.

#### *Site and Safety Plan*

The site safety plan for the school complex includes all precautionary safety measures during and after construction is completed. General safety requirements are listed and will be shown to all future workers on-site. Some of the general safety requirements include but are not limited to having proper personal protective equipment on the jobsite for all trades, harnesses and lanyards must be used for fall protection, focusing on each individual's work (no horseplay on the job), no use of illegal drugs or alcohol or being under the influence on the jobsite, no entering an area which has been barricaded, and defective equipment must be properly tagged and removed from service. In addition to the general safety requirements, it was important to mention SWPPP as the site is on a hillside as well as proper trenching and shoring requirements.

#### **Lessons Learned**

One thing that I learned early on while working on this project is the importance of communication. Especially during the design process communication was very essential as the school complex design was being manipulated on a regular basis. I learned to check in with the architecture and ARCE students at least once a week to discuss any changes which were made as well as to address any questions or concerns. I found many challenges while developing a plan to complete all my work as the construction manager. The main challenge I had to overcome included waiting for the architecture and ARCE students to finish their work involving mainly their plan sheets. I was hoping to complete all my work by the end of the Winter quarter, however, I found out the hard way that I cannot do much of my work before the architecture and ARCE students finish theirs first. I ended up having to wait until halfway into Spring quarter for the final designed plan sheets so I could start all my work. This project taught me a lot in how to communicate with an architect and ARCE in a polite but stern fashion to receive necessary deliverables in a timely manner.

Working with Journeyman International, Take Heart Africa, and Canopy Life International has taught me so much about how construction is done all over the world. Although I have been learning about construction throughout the last four years of college, this JI project revealed firsthand experience regarding how construction must be managed in a remote location. I am so grateful for Daniel, Janelle, and the rest of the JI team for allowing me to participate in a project so



much bigger than myself and my senior project. It has truly been a once in a lifetime experience where I can utilize what I have been learning in college while studying construction management and implement it to help a project which will have such a great effect on children in the future. Learning how differently buildings are constructed in Africa was not an easy task. Going from building codes in the United States which are some of the strictest in the world, to the standards of a third world country was tricky to say the least. A lot of the precautionary measurements I addressed including the SWPPP and safety plan were necessary in my eyes but may not end up being used or even looked at as it is not typical or necessary to execute when constructing in Africa. Ultimately, this project gave me valuable experience in doing something different and I am beyond grateful to have been given this opportunity as I will remember it for the rest of my life.

### **Appendix**

I would like to say a big thank you to the following people:

Daniel Weins – Journeyman International

Carly Althoff – Journeyman International

Heather Ryan – Take Heart Africa

Brian O’Neil – Third Lens Ministries



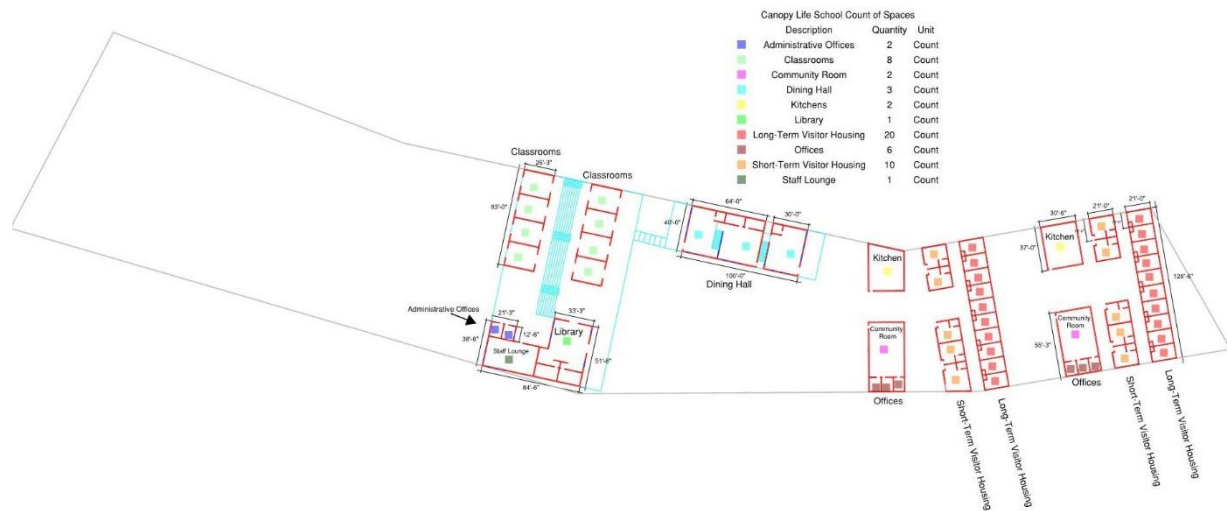
*Picture of property from top of hill*



*Picture of property from bottom of hill*



*Picture of property from bottom of hill #2*



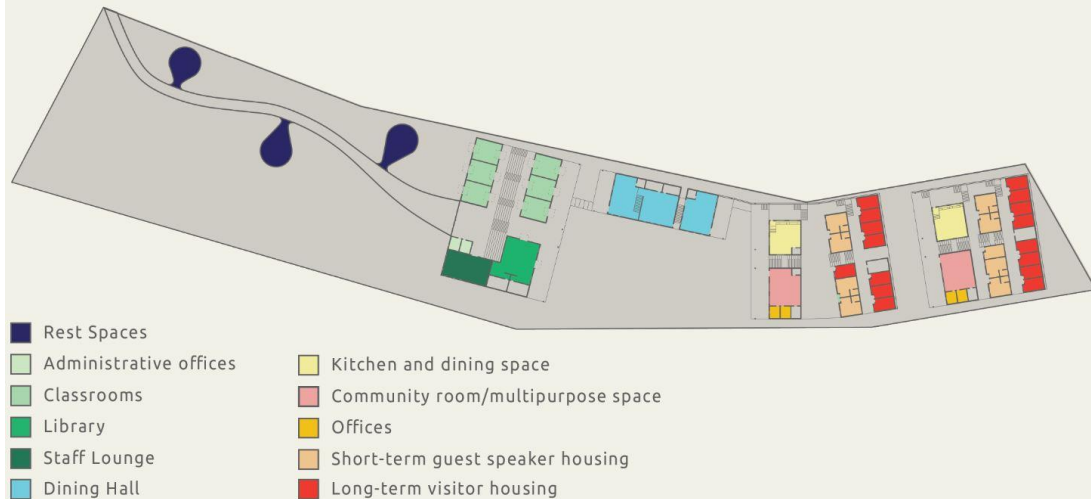
*Canopy Life school complex site plan with labeled buildings and legend*



*Entry into the school complex*



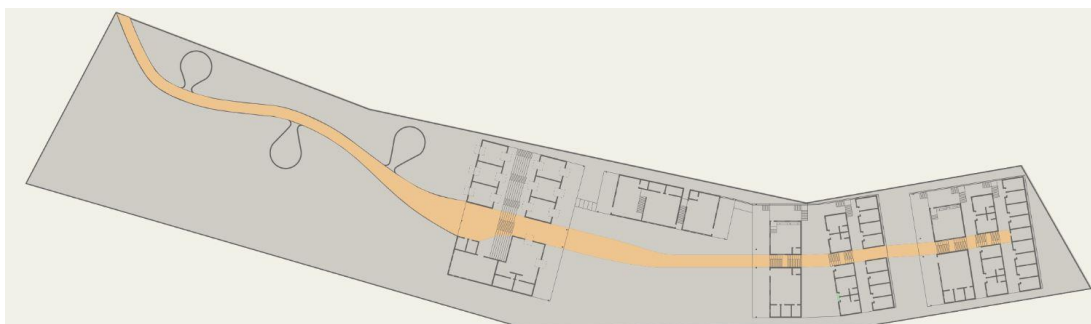
## WHAT'S INSIDE . . .



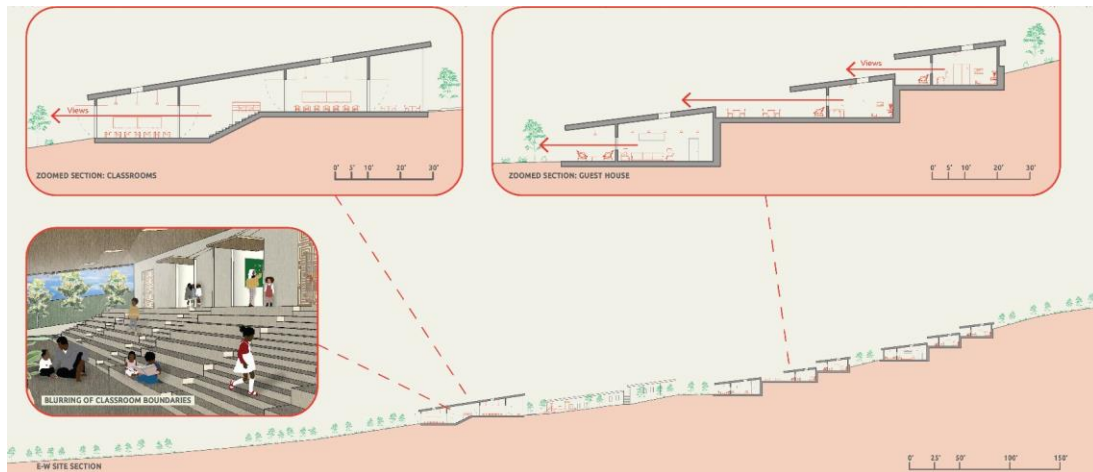
*Second proposed site plan with labeled areas and legend*



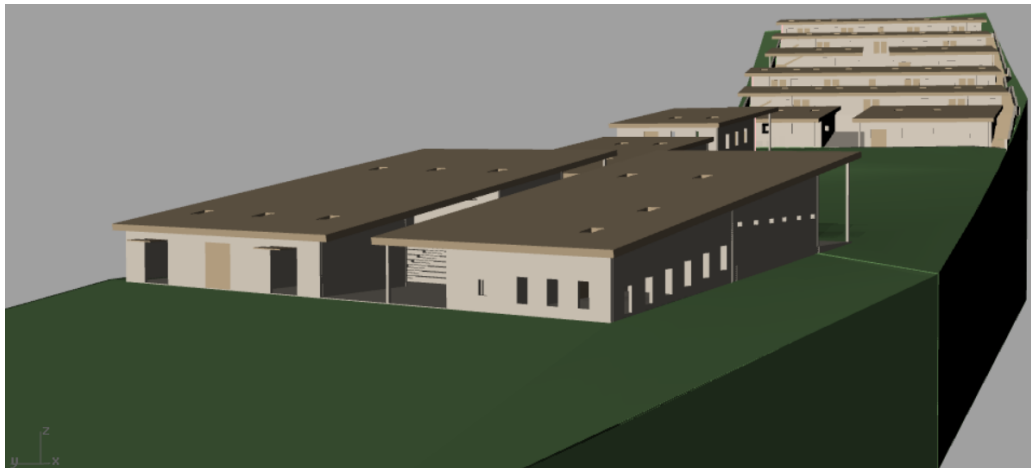
*Second proposed site-plan with indoor/outdoor areas labeled*



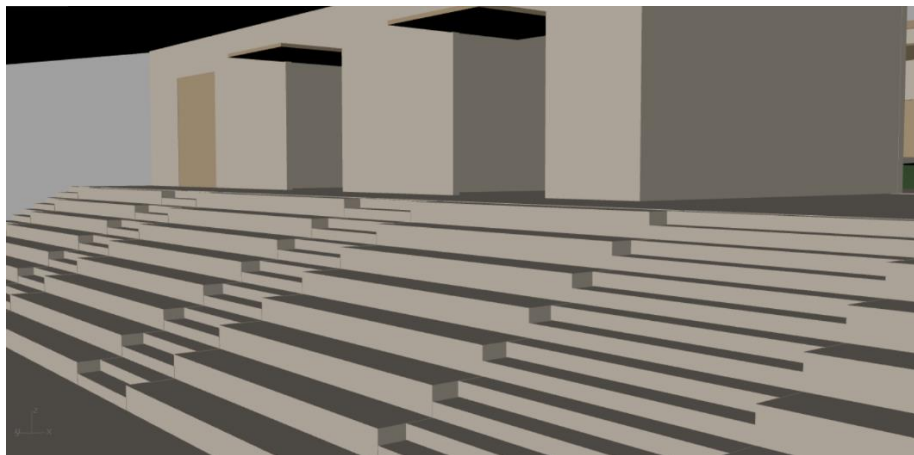
*Proposed property with highlighted central axis for walkway circulation*



*E-W Site Section view of complex*



*3D model of the full school facility which will be constructed on the hillside*



*Closeup view of the 3D modeled entrance stairs*



*Backside view of 3D modeled building consisting of 8 classrooms*



*3D model of dining hall from sky-view*



*3D model of dining hall from ground-view*



*3D model of middle portion of facility from sky-view*



*3D model of middle portion of facility from ground-view*



*3D model of upper portion of facility from sky-view*



*3D model of Upper portion of facility from ground-view*

### **References**

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*Our Work.* Canopy Life International. (2021, May 17). <https://canopylife.org/our-work/>.