Journeyman International: Malawi City Cottage

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This report details the partnership between Journeyman International and City Cottage, to design and construct an educational facility near Lilongwe, Malawi. Journeyman International is a non-profit humanitarian design and construction organization with the mission of connecting top tier CAED students from around the nation to collaborate on philanthropic efforts in the form of senior projects. The proposed project is a 5,800 sqft educational facility built on an institutional land grant; designed to house an auditorium and additional classroom space. The project utilized rammed earth construction methods with steel reinforcement. This report's focus is on the construction management process of this project, and the deliverables that went along with it.

Key Words: Malawi, International Construction, Rammed Earth, Humanitarian, Education, City Cottage

How The Project Came About

This educational facility was originally designed by Xianlong Zheng, an architecture student from Temple University, for another Journeyman International (JI) project located in South Africa. Due to difficulties with project funding, the original building project was never realized, and the plans were put on hold. Fortunately, Daniel Wiens, founder and CEO of JI, was able to connect Zheng with Luke Dolby, another client looking to develop a humanitarian project outside of Lilongwe, the capital of Malawi. Luke Dolby, founder of the client organization City Cottage, has had experience with numerous other projects in this region and was responsible for the fundraising the capitol to back this venture. Wiens and the new client representative, Dolby, worked closely with Zheng to redesign the project concept to more accurately fit City Cottage's needs,this included a new building aesthetic and a more appropriate site design to fit the new, much smaller site provided by an institutional land grant.

Following the redesign of the City Cottage project, JI brought two Cal Poly architectural engineer students onto the project to take charge of the structural system design and calculations. Connor Flora and Alex Remiticado came on board the project in early 2017, and began work on the preliminary design. The two ARCE students were fortunate enough to make it out to the project site in Malawi during the summer of 2017. During their visit they were able to meet with much of the local workforce and on ground management team, as well as tour some of the manufactures and supplier that would be used over the course of construction. This included meeting with Baleke Kaomba, the local architect of record for the project who would be taking on many of the on ground management duties once construction was underway.

My introduction to the project was in the fall of 2017, when Wiens presented about Journeyman International to an audience of construction management seniors at Cal Poly. The company instantly caught my attention was my grandfather had been very involved in both private and Peace Corps efforts in Malawi during the 1970s-90s. After an initial interview with Wiens, I came on board the project in October of 2017 and began working on aiding in subcontractor selection for the rammed earth system as well as general research on the project. It wasn't until March of 2018 that a finalized version of the project drawings were available, at which point I began work on my construction management specific deliverables consisting primarily of preconstruction documents.

Process

Research

A large portion of research was put into familiarization with local regulations, building codes, environmental codes and cost data. Malawi is one of the world's poorest nations and as a result there is a scarcity of information available online regarding the cost data for in country construction, as well as regulatory code. This resulted in the reliance on certain international codes to help supplement in those areas where information was lacking. Certain cost data was more readily available to us via direct contact with the manufacturer, such as our structural steel supplier, Macsteel located in Pretoria, South Africa. From them we were able to get unit prices for a variety of their products. Many line items in the estimate were unable to get reliable unit costs, and as result approximate values of ~33% of US prices were used to ballpark those items. Another factor in regards to pricing out this project is the incredibly cheap labor that is available in Malawi. This is largely due to the struggling economy and large surplus of labor, driving down hourly wages.

Time had to be taken to research the project site, as it was relocated from South Africa. New coordinates had to be established and considerations had to be made for the greatly downsized project site, particularly building orientation and connection to the dirt road.

Quantity Take-Off

The preliminary quantity take off process began in winter of 2018, where the goal was to familiarize myself with the magnitude of the project, as well as to monitor any changes to the building's design. The final version of the structural documents were completed in March of 2018, after which the final quantity takeoff commenced. The main focuses of the QTO were the structural elements of the building; the concrete foundations, rammed earth exterior wall system, and the structural steel roof & interior supports. Other elements that required detailed take offs were building openings & the sparse electrical system that would be provided

Estimates

The estimating process began by establishing a target budget constraint, calculated using the gross building square footage and a cost of construction unit price of $43.25/sqft; using this I was able to produce a reasonable goal price to base my conceptual estimate off of. After setting the target price of 251,000 USD, I allocated percentages to each CSI division, within which the allocated funds were further divided according to line items in the estimate. This created a detailed, percentage based break down that helped visualize where much of the project's budget would go. After the conceptual estimate was completed, I began work on the final estimate, which would be a combination of the percentage based allowances and detailed quantities used either for reference or paired with a subcontractor quote.

Schedule

The schedule was executed in Microsoft project due to it being a more affordable and accessible software. I began by creating a work breakdown structure to categorize and organize my activities. This allowed me to tackle the project one level of detail at a time; I found it to be a more comprehensive approach when compared to simply going start to finish. A major challenge that arose with the scheduling was trying to factor in the completely foreign work environment, which differed in most every manner (availability of labor, equipment, supplies, method).

Phasing, Site Logistics, and Safety

A set of site specific plans were produced for the project, these included: phasing plan, site utilization plan site safety plan. The phasing plan corresponded with the milestone events on the schedule, and detailed best practices to go along with each phase in the form of phase specific site utilization plans. This was included due to the significant site disturbance that will come along with the rammed earth construction. Considerable formwork reinforcements will be needed, as well increased site space for vehicular traffic. Finally, a site safety plan was included to minimize risk to local construction crews.

Deliverables

Quantity Take-Off

The quantity take-off process was done primarily in Bluebeam Revu, based off of a set of revit drawings produced by the Architectural Engineer students on the project. The plans were scaled digitally, after which on screen takeoff tools were used to measure, count and report quantities associated with the various components of the project.

Conceptual Estimate

Journeyman International prefers relying on percentage based conceptual estimates for many of their projects due to the unreliable nature of cost data in third world countries, and many material prices may be subject to intense fluctuation. Hence the initial estimate was done based off a target cost per sqft of construction, after which it was subdivided amongst the 16 CSI divisions introduced by Masterformat in 1963.

Final Construction Estimate

The final construction estimate was the resulting combination of the quantity take-off and the percentage based estimate. Material quantities for which we were able to obtain accurate price data produced realistic cost estimates (these were largely the concrete & steel elements of the building), whilst other line items relied more heavily on percentage based estimates even when quantities were available. In the long run this would provide reference quantities for the on ground construction team so that rough order of magnitude estimates could be produced on the spot by local contractors.

Project Schedule

The project schedule was created following the QTO and estimate, and was done in Microsoft Project. Many durations were based off of similar JI projects in the area, whereas others had to be logically calculated (accounting for factors such as labor surplus, lack of proper equipment and technical complexity).

Project Phasing & Site Logistics Plan

The project's phasing plan was broken up into three major components; site work, foundations and rammed earth systems, and building finishes. Site work finishes were excluded due to no existing landscape design

Safety, Risk & Hazard Mitigation Plans

The safety site plan outlined some basic construction safety efforts that should be made on site to reduce injury rates amongst the local workforce. The plan was tailored to address the variety of construction hazards that are specific to this project, with a particular focus on working with pneumatic tools, dust control and fall hazards. The risk and mitigation plans address the environmental hazards posed to the area, as well as geographic and site specific challenges posed by the community.

Lessons Learned

Over the duration of the project I learned the importance of communication and establishing a precedent early on in the project. When working in an interdisciplinary group on campus it can be easy to lose track of each other and the overall project progress if lines of communication are not active; therefore it is important to set the baseline communication standards. Which may involve setting routine weekly in-person meetings, or even just routine, virtual progress check-ins with all team members. Another lesson learned came from one of the greatest challenges on the project which was coming up with an estimate that would produce an accurate project budget. Going into the project, I was used to relying on a superfluous amount of cost data to backup my quantity take-off; however, this was not the case with regards to construction in Malawi. Little to no data was available on the subject, and as a result the project estimate relied heavily on a construction budget based off a target $/sqft price. Line items were assigned a percentage of total construction costs, from which reasonable values were derived. A list of assumptions had to be made to produce this estimate, but after careful review it was satisfactory for international construction.

Construction Industry Contribution

The goal of this project narrative is to provide insight on international construction methods, considerations and planning; particularly when working on humanitarian efforts in sub saharan Africa. The Malawi City Cottage project was particularly unique due to the chosen exterior building system (rammed earth), as well as the end goal of providing fiber optic capabilities to the venue. These unique aspects resulted in costly considerations that had to be made, and outline the process that went into managing these considerations. Upon reflection, the overall process left me with a better understanding of collaboration between the A/E and the general contractor; and how despite collaborative efforts each traditional silo had their own deliverables that could be completed with little input from the other, but to achieve a high quality result interdependency of deliverables had to be achieved. Overall, this narrative aims to communicate the efforts that went into planning an international project of this scale, including the wide range of backend process that are rarely depicted in the construction process such as; historical, geographical and political research of the project site, and applications of lessons learned to create best management practices on site.