

Journeyman International Construction Services Brazil Elementary School

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This project-based senior project is a partnership with Journeyman International (JI), an interdisciplinary, non-profit organization that is based in downtown San Luis Obispo. JI matches students and volunteers with humanitarian projects all over the world. For the purpose of this project, students from the College of Architecture and Environmental design were paired in order to compile both design and construction service documents for an elementary school in Brazil. The Elementary School, which will be called Nossa Escola de Terra, will be built in Cabo de Santo Agostinho, a small town located in the state of Pernambuco, Brazil. This paper highlights the preconstruction package, which highlights deliverables required by JI students and were included in the Nossa Escola de Terra submission. These deliverables include the following: conceptual and final estimate, preliminary and final construction schedule, site utility plan, site logistics plan, hazard and risk mitigation plan and safety plan.

Keywords: Journeyman International, Cabo de Santo Agostinho, Nossa Escola de Terra, deliverables, interdisciplinary

Introduction

Journeyman International (JI) is a non-profit organization that connects volunteers and students with organizations and clients all across the world. It allows students, a majority graduating seniors, to test their knowledge and skills to create a comprehensive design and construction document in hopes that the international partners will execute on the project. The Nossa Escola de Terra project is located in a small town in the state of Pernambuco, Brazil. This region is in great need for a quality educational system and a facility to go with it. The Brazil team hopes to create a detailed estimate, schedule and design for our client Mauro Cabral in hopes that he will execute on this project; Nossa Escola de Terra. This school will enrich the next generation, helping them rise from poverty and better the community around them.

Process

Ji runs its program in many different angles to meet the context and needs of their international partners. The Nossa Escola de Terra project was designated to our architect and from there, reached out to each department in hopes of adding to the team. Few weeks later we had an architect, architectural engineer and myself as the construction manager. Those who join Ji have a choice of going to the country they are assigned to and physically meeting their clients. I chose to see and experience the people of Cabo de Santo Agostinho in order to grasp a better understanding of my project. The architect and I spent 10 days in Cabo de Santo Agostinho and gained insight on construction techniques, material and regional socio-economic climate.

After returning to the U.S, the design team went to work. This took around twenty-three weeks to finalize and was passed onto myself to create a preconstruction package which included several deliverables: conceptual and final estimate, preliminary and final construction schedule, site utility plan, site logistics plan, hazard and risk mitigation plan and safety plan.

Learned Knowledge

Brazil is a country rich in resources, rich in culture and rich in people. The state of Pernambuco that lies just south of the Amazon along the coastline is representative of this wealth. The area was originally a heavily arborous region but in the last century has been heavily deforested in order to make room for sugarcane plantations. Without the use of crop rotations, this has left much of the topsoil in the region unsuitable for new vegetation. The area is rich in granite and clay, making tile and granite slabs accessible and affordable to common citizens of the region.

Large forests of bamboo are seen in spots throughout the terrain. Bamboo is commonly used for “taipa” walls, which is a common technique that natives still use to this day. This entails weaving bamboo and covering it in mud and with horse or cow feces. Interestingly enough, when the feces are fermented with mud for several days, it creates a plaster-like substance and is extremely water resistant. Some, who have enough time and resources, will add several handfuls of clay from anthills. This creates an even smoother finish to the outer walls.

Many of the residences in these areas allow direct contact between wood and concrete. When inquired about it, the residents said that the wood is called “macaranduba” and is a hardwood. Once dried, moisture will not enter the wood and insects stay away allowing it to have direct contact with concrete. Since it grows at a rapid pace, it is an accessible and an affordable construction material.

Brazil is in a low seismicity zone and much of the construction techniques and standards differ greatly with California codes and regulations. Rebar used in concrete is limited to a #3 and concrete forms span debatable lengths. Local construction knowledge plays a significant factor in local construction quality.

Construction techniques that will be implemented into the design consist of rammed earth walls. This entails filling three-meter bio bags with wet Brazilian clay. These bags will be evenly

tamped and stacked to create two and a half meter walls. It will then be covered with mud and fermented feces to create a plaster like exterior. It will be important to curve these walls in order to deal with horizontal loads.

Cabo de Santo Agostinho and its surrounding towns are impoverished favelas and many of the residences lack electricity or potable water. However, the people were hospitable and more than eager to show us their way of life. Much of the people who lived in the surrounding neighborhoods and towns make their living by selling produce on the streets or working blue-collar jobs. When travelling deeper into the countryside, the majority of the jobs come from the local sugar cane factory.

Deliverables

The following is a list of all the deliverables that are required from Journeyman International students and were included in the Nossa Escola de Terra submission.

Schedule

The schedule for Nossa Escola de Terra represent a basic schedule with around 100 items listed. These include both preconstruction and construction activities. The schedule is broken down into three phases. Due to the nature of the project and its fundraising plan, the site work and utilities are clumped together with each phase.

Estimate

The Journeyman International estimate delivers two estimates to the client and the construction team. In JI, they call these Conceptual Estimates and Final Construction Estimate.

Conceptual Estimate

The Conceptual Estimate is conceived before the design is finalized and there are many assumptions and unknowns. Usually, the larger the project, the more conceptual these estimates become. JI estimates begin with a target price per square foot, which is typically around 30-35\$. This is multiplied by the square footage of each building, giving us a target price per building. CSI divisions are listed out and each line item is allocated a percentage of the cost.

Final Construction Estimate

The Final Construction Estimate formatted to a 1963 CSI MasterFormat Division, which consist of 16 divisions. Each line item is either an estimated or allowed costs. The estimated cost is

based off the quantity take-off and the allowed costs are estimated costs based of client or professional advice.

Site Logistics

A Site Logistics diagram is created for each phase of construction. Using a topography map and a rendered birds-eye view of the site, a conceptual plan for site logistics was conceived. This plan it shows the location of front and back entrance as well as the client's residence. On site, for each phase, there are temporary bathrooms, temporary water, dryshack, PPE/medical equipment, concrete wash and staging area. Each phase has it's own site logistics plan since there may be several years between each phase.

Risk and Hazard Mitigation

Major risks for Nossa Escola de Terra are listed under the Risk and Hazard Mitigation. Each risk has a mitigation plan in place. These risks include jobsite injury, local labor quality, crime and corruption.

Safety Plan

Construction Safety Plan underlines certain protocol and mannerisms that are expected on the jobsite and are specifically construction related. These expectations are broadly based on basic OSHA requirements and guidelines from prior internships. In Brazil they did not have a safety plan in place, especially in rural areas. Therefore it is necessary to write up a basic safety plan loosely based off U.S standards.

Utilities Plan

There is an extensive plan for utilities on the Nossa Escola de Terra project. The site does not have any existing electricity or water connections. Since the client works at a water treatment facility, all water connections will be our client's responsibility. There will be no gas connections. The only gas used on site will be propane tanks for kitchen appliance.

Lessons Learned

There are many obstacles when trying to put together a preconstruction package for an international project. The first of many obstacles was communication. It is important to create a history of decisions tablet, which includes what should be talked about on a specific calendar date. This is incredibly valuable because there is a limited amount of communication with a client or organization that is overseas and therefore each Skype meeting or phone call must count.

Another obstacle was working with the team. An architect has been conditioned to think about grand designs and structures. Many of these ideas are unrealistic or just not constructible. Its important to be able to communicate these inputs to the architect so the project has a higher likeliness of being built.

Finally, the most important lesson learned was the conceptual estimate. The bigger the project, the more conceptual the estimate becomes. The project itself was 1.2 million dollars and sitting on five acres of land. There were many assumptions being made in the estimate and the likeliness of the preconstruction package being utilized is slim.

Industry Contribution

Future JI and other humanitarian projects will gain insight on the variables for a project this size. The collaborative aspect of JI projects will also give insight to how the industry works and how communication is paramount to success. It is important that these values and lessons will be translated into the industry both in humanitarian and non-humanitarian projects here on out.