

Design of Shelter for Under-privileged Children in Colombia

Abstract

Project Description: A Non-profit Foundation (NPF) from Colombia in South America requested help with the design of an educational/residential facility for 40 at-risk children who are in neighborhoods vulnerable to drug use, delinquency and prostitution. The NPF had a vision of what features the facility should have which included, classrooms, nurse's room, meditation room, bedrooms, kitchen, office spaces, living space for staff - all on a two-story facility of 400 sq m/floor. This was assigned as a year-long capstone project to a civil engineering team.

The team met with a US architect to refine the client's vision such that the layout met all functional and safety requirements of the facility. Based on this discussion, the team developed professional quality architectural drawings using Autodesk Revit®. The team then researched the construction materials, local practices and design codes and carried out the structural design of the building. They sized all the structural members and determined the required reinforcements and detailing to ensure adequate strength and serviceability. Along the course of the project, the students learned how construction materials and practices differed between Colombia and the US. The design team prepared a calculation package and set of construction drawings.

Recognizing the favorable environmental conditions of the site, the team incorporated appropriate sustainable features to its design such as, solar panels, wind turbines and gray water reuse. The team prepared a fly through video of the facility so that the client could use it for fund raising to bring their vision to fruition.

Collaboration of Faculty, Students, Licensed Professional Engineers and Allied

Professionals: A team of five students worked under the supervision of a faculty member (an SE) and two US engineers (both PEs). A licensed engineer from Colombia guided the team on local practices and construction materials. An architect from the US helped the team in the early stages to improve the preliminary layout. An industrial engineer who is the Executive Director of the NPF served as the owner representative.

Knowledge and Skills Gained: This project exposed the students to the challenges of working for an international client: awareness of different construction materials and practices, comfort in working with SI units, and cultural and language related issues. In addition to applying their technical knowledge to a real-life problem, the students also honed their communication skills, ability to work as a team, time management, interaction with an international client. The students learned how to interact with individuals outside their major to complete the project: a US architect for advice on facility layout, and an industrial engineer from Colombia who is the owner representative.

Benefits to Public Health, Safety and Welfare: The health, safety and welfare of the 40 vulnerable children in Colombia was the motivation for the project. Through this project the team was made aware of global and societal issues. At the architectural design phase, the team ensured all safety requirements are met in terms of entrance/egress in case of emergency. In the structural design phase, the team incorporated elements of fire safety. The design also took into account that the site is in a region of moderate seismic risk.