NEPAL EARTHQUAKE RECOVERY

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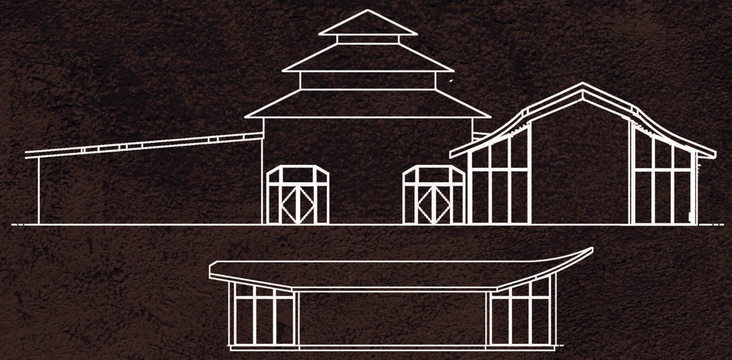
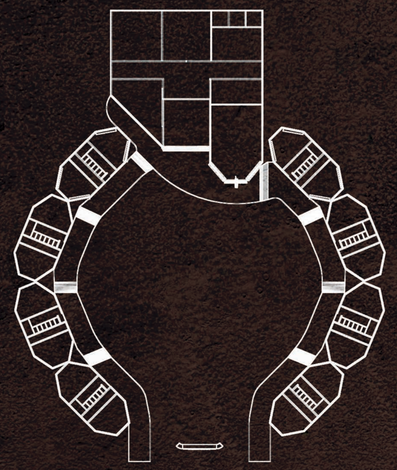
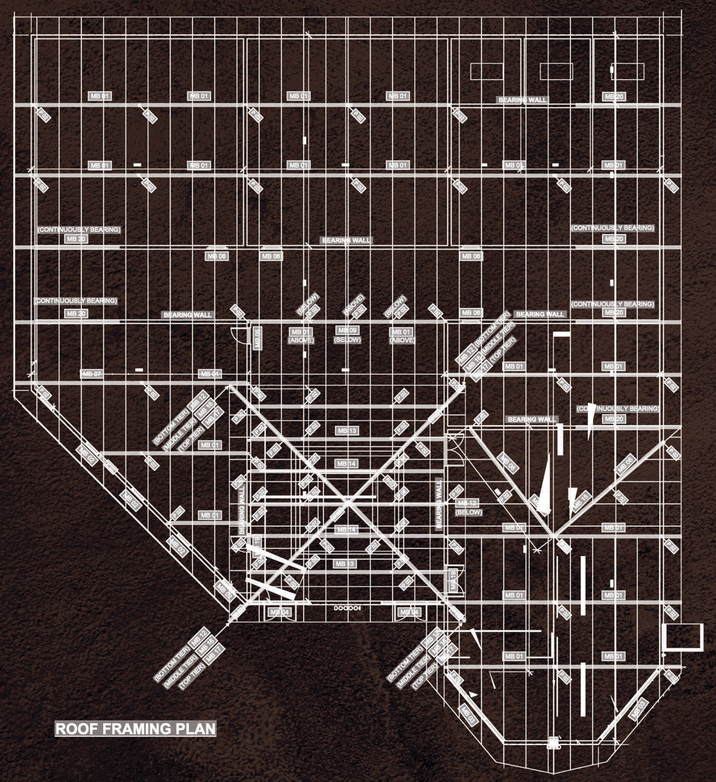
More than half of the world population lives in substandard housing – no running water, no proper sanitation or cooking facilities. There have been many efforts by engineers, architects, and community planners to address the global issue of substandard building quality. Two major reasons for the continuing deficiency are limited building material options and restrictive finances.

There is still a massive reconstruction effort going on in Nepal to rebuild the 2015 earthquake damaged private homes and public infrastructure such as schools, hospitals, and government offices. The recent survey shows that bricks, rock, and unreinforced concrete are the most commonly used construction materials for reconstruction. Few alternative materials are available for structural walls that are both low-cost and seismically resistant.

This capstone team can make a difference through the analysis and application of sustainable alternative building materials.







The design theory behind the school was influenced heavily by Nepali culture as well as local climate.

In regards to layout, the client requested a central building at the head with two lines of classrooms extending to either side. This basic design was modified to resemble the marigold garlands given as honorific emblems in Nepal. Furthermore, the circular shape opened up a large central courtyard for physical activity, resting, and inclusion of the natural environment.

Nepal's temperate climate allowed for construction to be simplified through the use of outdoor hallways. Designing the classrooms as individual units allows for the plans to be scaled to fit the projected number of students. Furthermore, buildings can be terraced cascading up a slope if need be.

Following architectural work, structural plans were developed. Demands and capacities were evaluated using standard structural codes, such as NDS, as well as the Nepal and Indian Building Codes.

Nepal's buildings have long been constructed using mainly brick, stone and concrete. These materials, while sturdy and cheap, are extremely heavy and seismically vulnerable. This posed a massive danger during the earthquake, as the great majority of deaths was due to building collapse.

In order to mitigate this issue, part of this project was centered on determining alternative materials that would be easily accessible, cost-effective, and structurally sound. After a process of evaluating building materials such as recycled plastic blocks, mycelium walls, and rammed earth, bamboo was identified as an ideal candidate for building design.

Bamboo is extremely inexpensive and renewable, especially in Nepal where it grows natively. It is structurally competent, able to withstand large loads, especially when combined into bundles. Bamboo can be treated very cheaply with borax to protect against water and bugs, ensuring a long lifespan.

Basic material analysis was combined with existing literature to estimate the structural capacity of various configurations of bamboo. Structural plans were based around these estimates.

CAPSTONE

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