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NORTHWESTERN  
UNIVERSITY

global architecture brigades

# health center – el cantón



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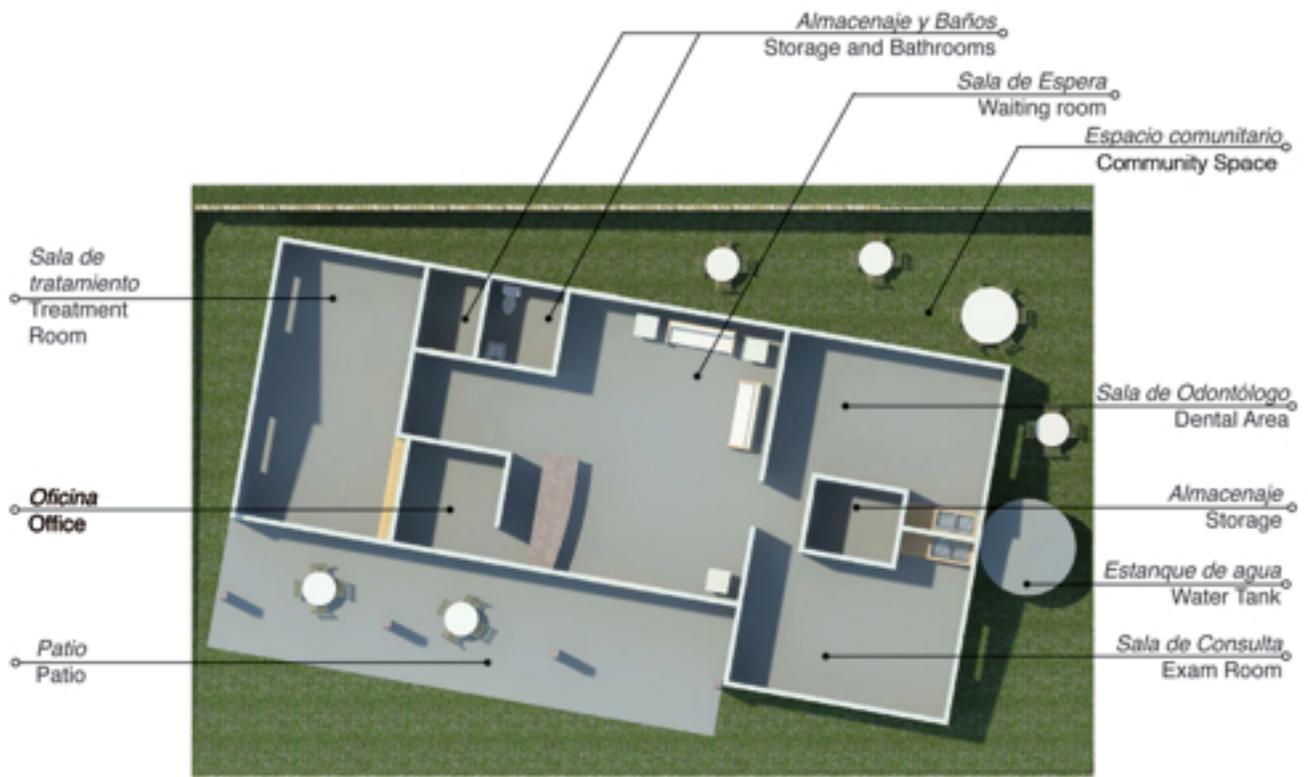
# design concept overview

This document outlines Northwestern University's design concept for the Centro de Salud in El Cantón, Honduras.

Keeping feasibility in the forefront of our minds, we feel that our structure not only meets, but effectively exceeds expectations.

The design is innovative: it collects natural light in unique ways, it harnesses water with efficiency, and most importantly, it has a user-focused layout. We have designed it to require minimal excavation and save materials costs. Moreover, it allows for passive cooling while maximizing airflow. Finally, while being innovative in its structure, the use of local materials balances its uniqueness without being obtrusive; it is prominent, yet familiar.

To reiterate, we were very attentive to human factors. All of these vital touch-points are encapsulated in our structure, and we are proud to present it to both the Global Architecture Brigades review committee, and more importantly, to the city of El Cantón.



**Figure 1: Floor Plan**



**Figure 2: View Looking East**



**Figure 3: View Upon Entry**



**Figure 4: View of Western Interior Wall**

# design rationale

## FLOOR PLAN AND USER PATH

### ▶ **foyer & reception area** —

For the entrance, our goal was to create an area that did not feel like an intimidating hospital, but instead had a cozy and inviting atmosphere. We accomplished this via the following features:

- ▶ **bright natural lighting** – ample sunlight from skylights and large windows on two adjacent walls bring in warm sunshine
- ▶ **natural elements** – windows across from entrance face back courtyard, which will be landscaped with plants and ivy on the structural retaining wall, making for a beautiful aesthetic upon entering the building
- ▶ **exposed wood trusses** – introduction of wood through the exposed structural trusses on the interior makes for a natural and pleasant feeling

### ▶ **treatment area** —

When designing the treatment area, we envisioned a space that is brightly lit, of a comfortable size, and flexible for multiple uses. We have integrated the following features to accomplish this goal:

- ▶ **bright natural lighting** – treatment area has the most southern-facing windows, and since the treatment area will be very frequently used for multiple procedures and surgeries, we believed that having a brightly lit room was an important element for this space
- ▶ **flexible privacy screens** – since the use of the facility may change depending on events such as medical brigade visits, we placed room separators into this 360 square foot area.

## ▶ **examination & dental area**

In our design, we made the examination and dental rooms more open and inviting for the visitors. This reflects our desire to establish a welcoming atmosphere within the health center. In order to accomplish this goal, we have incorporated the following features:

- ▶ **open entrance** – eliminating typical closed doors, this design emphasizes the welcoming feeling that we sought, while maintaining patient privacy
- ▶ **easily-installed sinks** – sinks share a common wall and add functionality to the rooms, while maintaining ease of construction
- ▶ **centralized storage** – the storage closet provides easy access to medical supplies for both adjacent rooms

## ▶ **office**

The centrally-located office has a walk-in layout and features a cutout portion in the wall, which allows for the greeting of visitors as they enter the health center. Additionally, it is located directly behind the welcome desk for easy access.

## BUILDING ORIENTATION AND FEATURES

We elected to rotate the health center by ten degrees to allow for more sunlight and better airflow through the structure. A passive air ventilation system was envisioned to keep the building cool in the summer period.

- ▶ **maximization of natural light** – placement on 10 degree angle creates Southern facing wall and roof design that allows the most natural light
- ▶ **comfortable airflow** – windows and the one foot opening between the walls and roof enable good cross ventilation in all seasons
- ▶ **natural community space** – angle of building and retaining wall creates courtyard behind building; building angle sets up community space to be utilized between the health center and future community center
- ▶ **easy access** – walkway slope less harsh due to angle to entrance
- ▶ **minimal excavation** – 27,376.88 cubic feet; 775.23 cubic meters

## EXTERIOR DESIGN DETAILS AND MATERIALS

### ▶ **materials** —

We chose local materials, familiar to the region, to make our design easier to construct and financially feasible.

- ▶ **walls** — CMU blocks
- ▶ **roof** — Corrugated aluminum
- ▶ **truss & pergola** — wood beams

## ▶ **roof** —

Considering frequent northeastern trade winds as well as southern sunshine, we elected to make an “open” roof to allow light and air to flow into the structure. We chose corrugated metal because of its affordability, ease of maintenance, and strength to weight ratio.

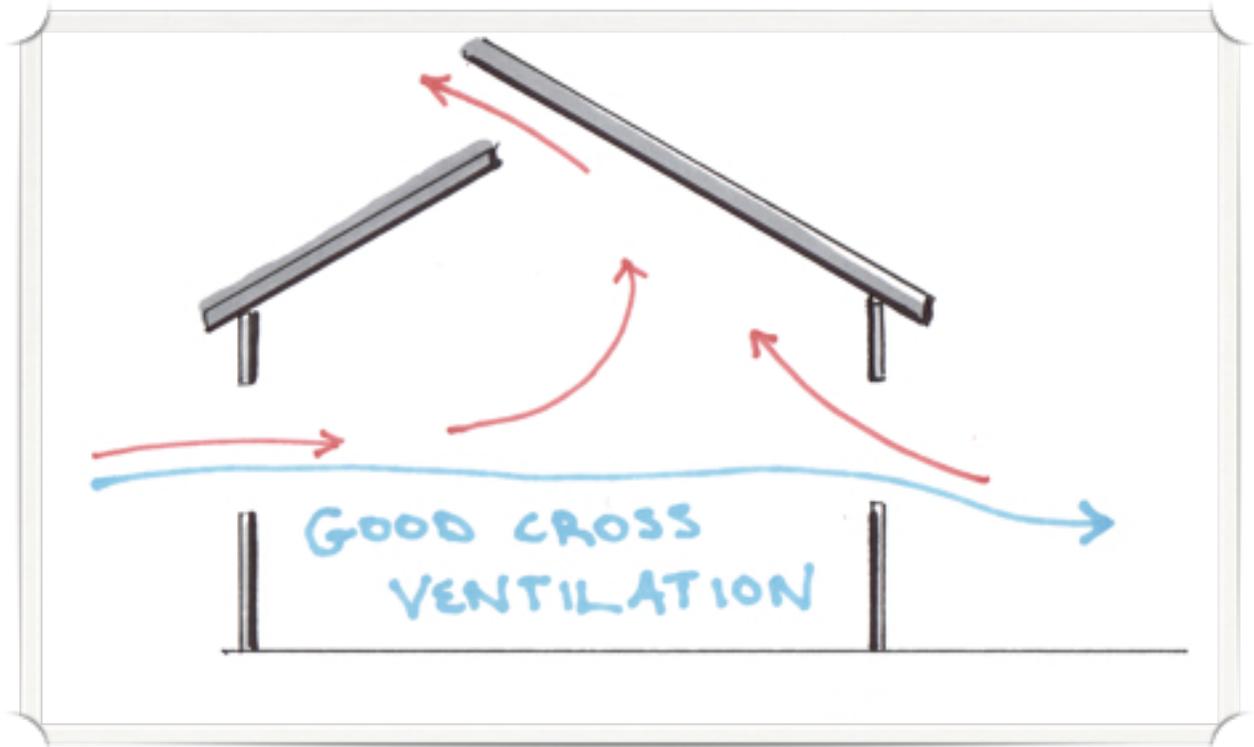
Furthermore, we have incorporated an innovative mechanism to prevent rain from entering: this will be discussed later.

## ▶ **landscaping & courtyard** —

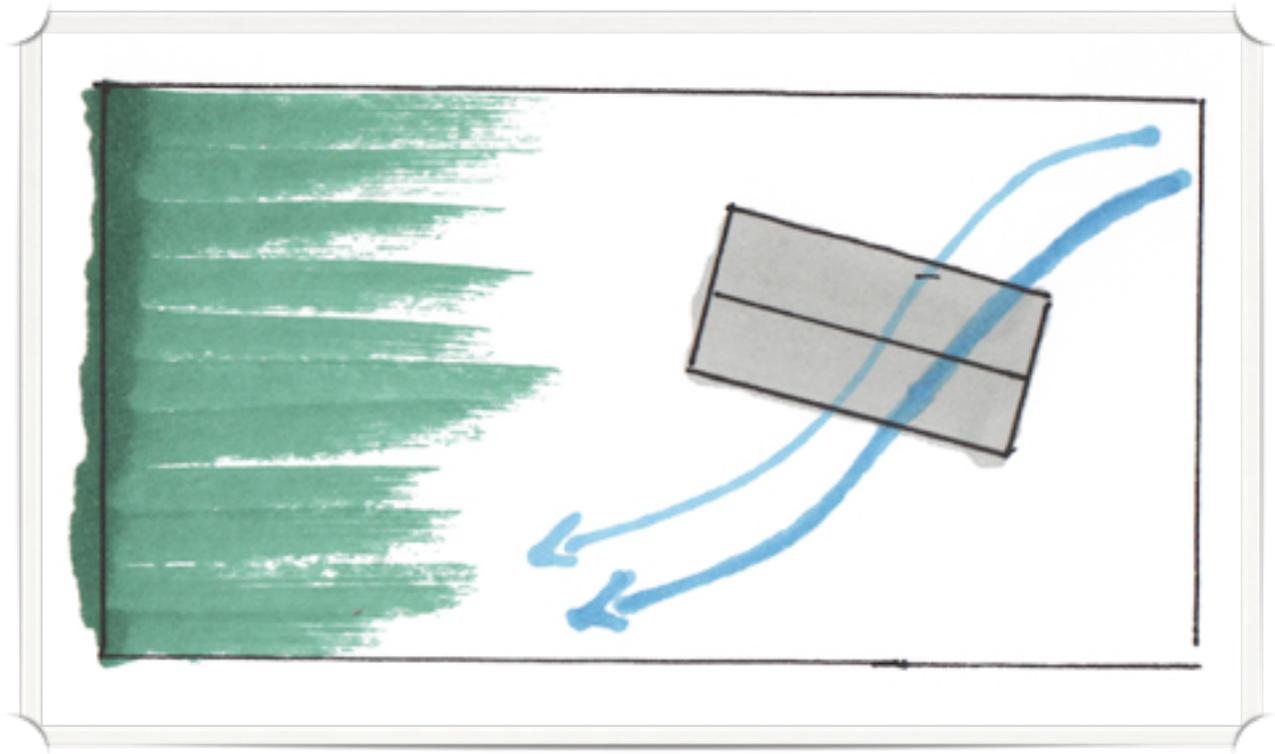
We wanted to increase the aesthetic and tranquility of the space, so we incorporated a landscaped courtyard – with tables and chairs – behind the building as to allow for communal gathering and a more peaceful waiting space for family members and friends.

## ▶ **pergola** —

In addition to the communal space in the back, we wanted to incorporate a shade structure in the front to allow a comfortable place for guests and family to gather. Pergolas are incredibly easy to build and offer wonderful shade if accompanied by vines or other climbing plant life.



**Figure 5: Illustration of Ventilation System**



**Figure 6: Illustration of Usual Wind Patterns**

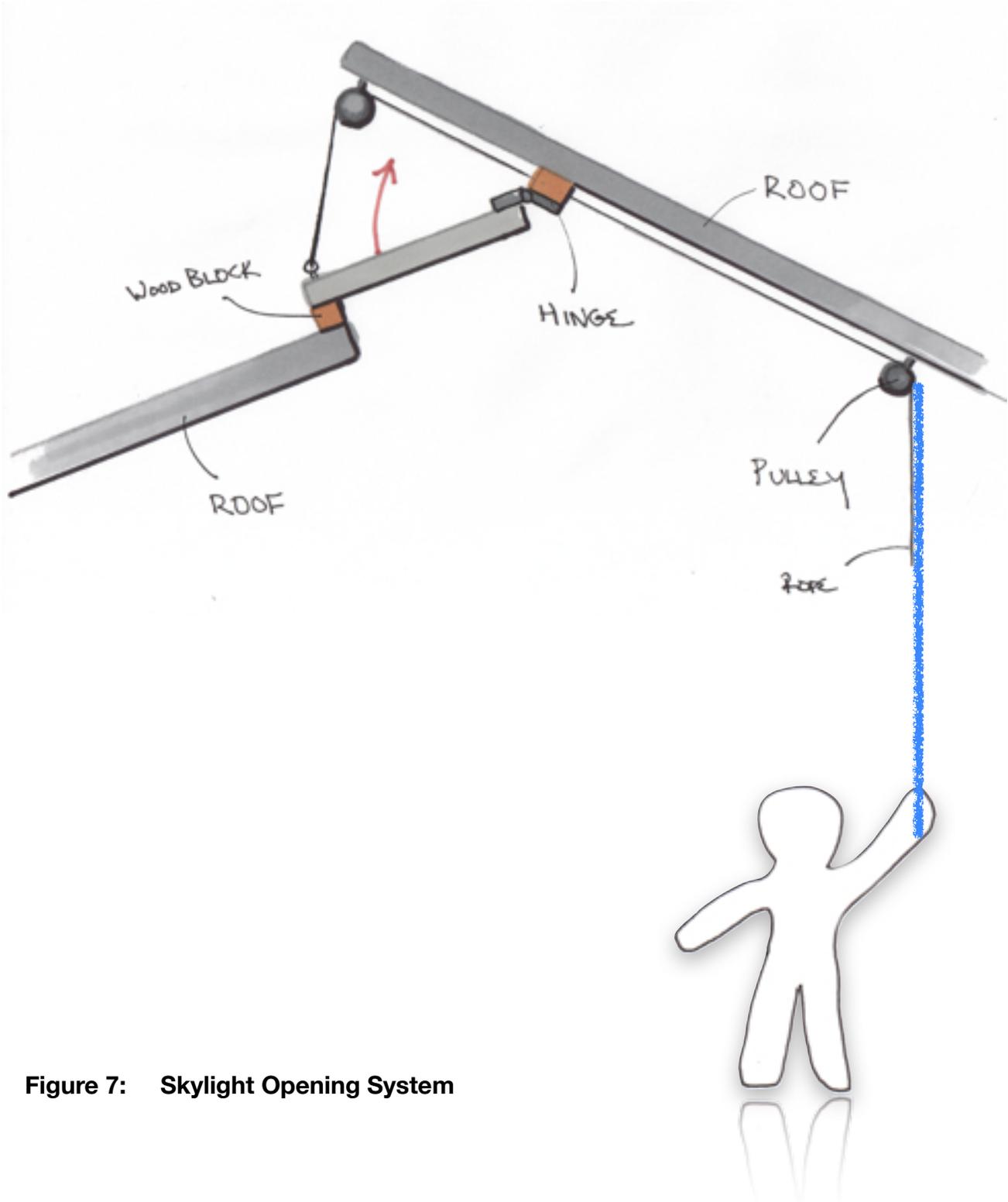
# skylights

We have kept the use of natural light in clear focus throughout the design process, always pushing ourselves to include more. After thinking of what patients might look for in a visit to the health center, we began by including a plethora of windows and progressed with the idea of adding skylights as to provide diffuse sunlight during the daytime.

Since the site is somewhat constraining in terms of its ability to be excavated, we were forced to build into the side of the hill. As a result we came up with an innovative way to increase the perfusion of natural light. Using a system of pulleys, one can easily raise or lower a flap of the roof and let more light and airflow into the structure.

On hot days, the skylights enable hot air, entering through the windows, to exit from the ceiling; this increases the circulation inside the building. On colder days, the skylights can be closed through the simple mechanism and hot air can be trapped inside.

This would cost around \$100 USD in additional hardware, but would provide security against the wind and rain, while again, allowing for additional light and fresh air into the reception area.



**Figure 7: Skylight Opening System**

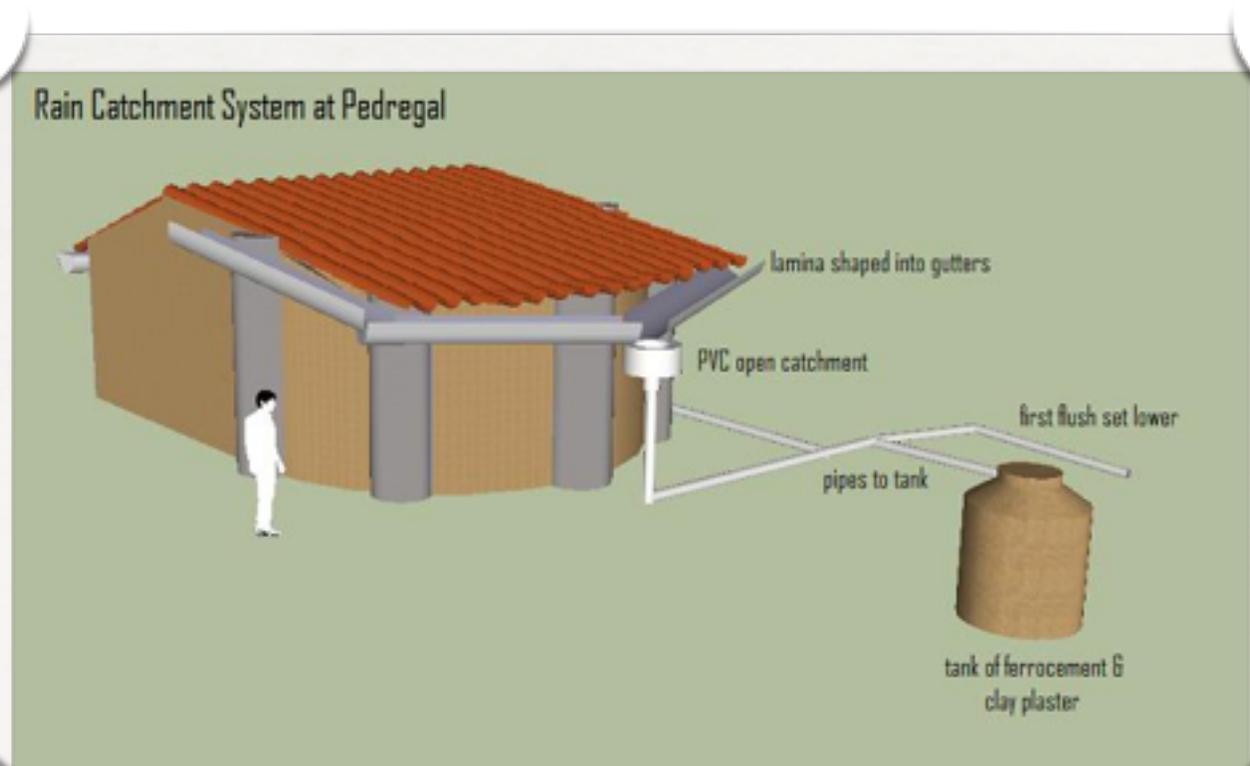
# water collection

Our group felt that it was tremendously important to make a well-rounded design proposition to the community of El Canton. We believe that since a health center is to be erected, the surrounding community would benefit tremendously from a water delivery system as well.

We considered a number of designs for the shape and structure of the roof as to optimize water collection. To incorporate a rainwater collection system for our roof design, we utilized the angle of the two roof panels to collect water into two side gutters along the long faces of the building. These gutters are positioned such that water can naturally flow down into two side gutters on the short side of the building. These shorter gutters sit directly beneath the long gutters and guide the rain water into a central pipe; this pipe then carries the water into a storage tank.

To combat the natural accumulation of dirt and other unwanted debris in the water supply, we incorporated an existing collection system from Pedregal, Mexico. The idea is that the main water pipe would branch off into another auxiliary pipe which is slightly declined. This slight decline would cause the first flow of water from a rainstorm to flow into this auxiliary water pipe first. The first ten gallons – a value which is subject to change depending on the volume of the auxiliary pipe – will flush contaminated water into the auxiliary tube. This tube will be open at the bottom so that the contaminated water from the initial flush can continuously flow out of the bottom, rather than back up into the main pipe where the subsequent gray water will be flowing past the full auxiliary pipe and into a water storage tank.

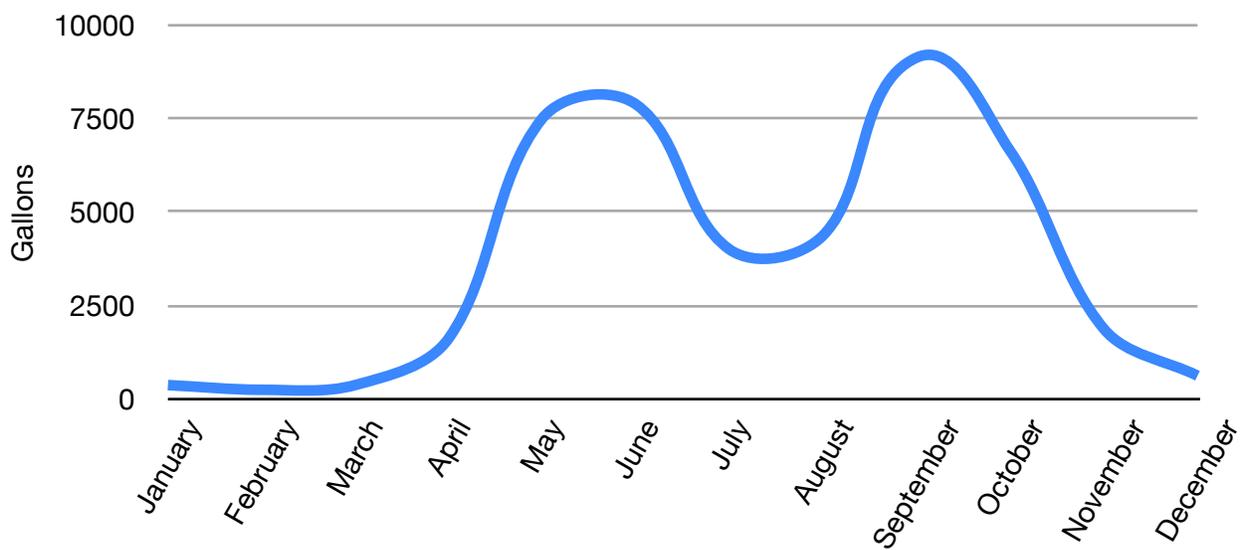
Placement of the water collection device can be determined at a later date. We propose that a water tower is included so that an electric pump can periodically move water into the water to provide gravity-fed pressurized water to the health center. This would require the construction of a water tower, in addition to the purchase of an electric pump: we believe both requirements are feasible and low cost. This design would end up saving as many as 44,676 gallons of water every year.



**Figure 8: Similar Water Collection System**



**Figure 9: Conceptual Water Collection System**



**Figure 10: Average Volume of Water Collected per Month**

# education

Our group firmly believes in maximizing the utility of the health center for the people of el Canton. As a result, we designed the rainwater collection and skylight systems to be transparent and easily observed. This affords anyone the opportunity to use the system as a means for teaching and learning.

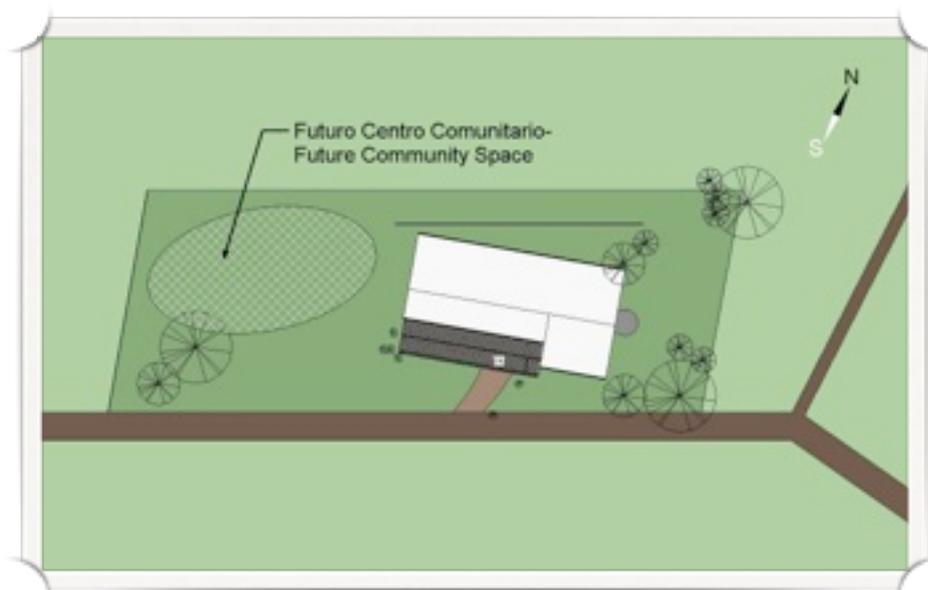
Educational diagrams explaining how rainwater is passively collected and recycled could be illustrated on the exterior of the water storage tank. Likewise, in the future event that photovoltaic solar panels are installed on the pergola or if a water tower were to be added, concepts such as solar power and other means of harnessing renewable energy can all be depicted at their respective locations.

This could potentially inspire the people of el Cantón to be more methodical in their approach to saving water and energy for their future consumption.

## NEXT ADDITIONS

### ▶ **community center** —

Our vision of the community center layout is best described as a mirror image of the health center. The space in between these two buildings could then be used for recreational purposes.



**Figure 11: Future Site for Community Center**

### ▶ **future efforts** —

- ▶ **solar panels** — the pergola provides the perfect place for photovoltaic cells to catch sunlight and harness energy for the health center
- ▶ **windows** — with budgetary constraints in mind, the windows could be covered with various materials – ranging from netting to glass
- ▶ **roof structure** — while we chose corrugated aluminum as our roofing material, we might suggest using clay tiles in the event of sound from rainfall becoming an issue

# concluding statements

The Northwestern University's Global Architecture Brigade began as a group of three engineers in the Spring of 2009. We have since traveled to Honduras in December of 2010 to build a secondary school, and over our three years of existence, have grown to a group of over twenty active members.

We would consider it a sincere privilege to have you, the community of El Cantón choose our design. We are absolutely thrilled with our end product and hope that you will find our structure to be the right fit for your needs.