

Sanitation Improvement Project: Santa Rita, Peru 2004: Ann Campana Judge Foundation Project Report

Engineers Without Borders- University of Colorado Chapter

Project Director: April Tumey, ECOT 441, UCB 428 Boulder, CO 80309 tumey@colorado.edu

This project completed in July, 2004 consisted of the installation of pour flush toilets for an elementary school in the impoverished rural town of Santa Rita, Peru. This project was conducted by the University of Colorado chapter of the organization Engineers Without Borders, whose goal is to provide engineering assistance to developing communities. As a result of contacts by the NGO P.E.R.U (Peruvian Ecosustainable Research and Understanding), the village of Santa Rita, Peru was identified as needing engineering assistance to improve their quality of life. The town of Santa Rita had a fresh water supply system but no facilities for in-home bathing and wastewater removal. On an assessment trip to Santa Rita in 2003, the people expressed that their first priority was to install a sewage collection and treatment system so that the people could install flush toilet and bathing facilities in their own homes. Due to a limited water supply and limited land availability, an alternative sanitation system was deemed necessary. Pour-flush toilets were selected as an appropriate and sustainable alternative to conventional flush toilets. These toilets use a third of the water needed for conventional toilets, and still dramatically improve the sanitary conditions. These toilets limit the people's exposure to harmful germs present in the unsanitary outhouses. Information gathered on the 2003 assessment trip allowed us to design individual waste disposal systems for the school and homes. These systems are ideal for the remote location because they are individual systems without community-wide infrastructure needing maintenance and management. This technology can also be extended to surrounding communities. The village contributed to the project in the form of manual labor and personal funds to provide in-home bathroom fixtures. A complete engineering report of this project can be found at www.ewb-usa.org.

Project Accomplishments

EWB-USA together with the help of the village of Santa Rita and the NGO P.E.R.U. implemented a sanitation upgrade project, which built a toilet building for the elementary school that housed four pour-flush toilets. This building utilized traditional adobe and masonry brick style construction coupled with an innovative Nez roof design. A sustainable, appropriate sewage disposal system was built on-site for the school toilets. Education was also a focus of the project. Both supplemental health education for the school children and educating the townspeople on the construction and maintenance of the pour-flush toilet facilities were conducted.

Assessment trips and drinking water system improvements conducted in 2002 and 2003 laid the groundwork for the 2004 sanitation upgrade project. Initially the project focused on evaluating alternatives available for sanitation upgrades. Alternatives included modern flush toilets, VIP latrines, composting toilets and pour-flush toilets. A solution using pour flush toilets was selected based on cost, availability of materials, constructability and sustainability. The members from CU-Boulder designed the sewage disposal system based on site characteristics gathered during the 2003 assessment. The superstructure was designed by CU students to minimize cost, maximize ventilation and light and to introduce the Nez roof technology to the people of Santa Rita.

The project was successful due to major funding provided by the Ann Campana Judge Foundation, as well as funding from an EEF grant,



Discussing health education at the school



A resident demonstrating the use of the new pour-flush toilets

local businesses and private donations. The evaluation of design alternatives, flexibility to accommodate site conditions, support of the NGO P.E.R.U, and support of the people of Santa Rita and the surrounding communities contributed largely to the success of the project.

This project offered a unique educational experience for students to study a real-world problem hands-on, learn the techniques of engineering design within the constraints of a limited budget, develop a sustainable system in the third world, and design a system to utilize locally available materials and labor. This project also gave students an amazing engineering experience overseas, allowing them to give back to the world community by using their engineering knowledge to help those who are less fortunate. The project also allowed students to gain leadership and teamwork skills while following a project as it developed from simple ideas to an implemented system over the course of 9 months.



One of the EWB volunteers with some of the children of Santa Rita.

Accomplishing Objectives

The primary objective of the project was to improve sanitation. This was accomplished by building a demonstration pour-flush toilet facility for the elementary school, which serves 88 students from Santa Rita and surrounding communities. The construction of a demonstration facility was chosen in order to provide a medium for teaching the townspeople about this sanitation improvement technology, while directly affecting the large at-risk demographic of children ages 5-12. Additionally, children attending this school who lived outside of the town of Santa Rita could benefit from this technology and spread the knowledge of the benefits of the improved sanitation to other communities. Time and financial constraints prevented our group from directly implementing more extensive installations of this pour-flush technology.



Pouring concrete around the pour-flush toilet bowls

Another objective of the project was to educate children about the importance of sanitation, including why it was important to go to the bathroom in a latrine, and the importance of washing their hands. This objective was accomplished by distributing instructional posters in Spanish, performing skits in the school, and conducting a demonstration of the new pour-flush toilet facility.

A third objective of this project was to teach the townspeople how to build and maintain pour-flush toilets for use in their homes. This was accomplished by involving villagers in each step of the construction of the demonstration project and distributing construction and maintenance manuals in Spanish describing in more detail how to build individual pour-flush systems for their homes.

Overcoming Obstacles

During the excavation of the seepage pit, many large boulders were encountered. These required the ingenuity of the volunteer workers and the use of pulleys and levers to remove them. These large boulders also required that the piping from the toilet building be diverted around the rocks. The bricking of the seepage pit wall was also modified to accommodate the protrusion of these rocks from the side walls.



Demonstrating the flushing of the toilets during building and disposal system construction.

compensate for the loss of pit volume taken up by these rocks protruding into the pit, and to extend the life of the pit before desludging will be required.

The final design of the building was also modified during the construction phase. The building was modified to cut down on the amount of materials needed for construction, and to allow more light and ventilation into the toilet stalls.

Initially, the design was created to utilize pour-flush toilets that would be cast in concrete by the townspeople from a metal mold. A mold was created in the US following guidelines provided by documents from the World Health Organization, and was brought to Peru. High humidity in the area required much longer concrete drying times than anticipated following preliminary toilet casting performed in Colorado, thereby prevented the making of pour flush toilets within the timeline of the project. The design was then modified to utilize taza turcos, which are pre-cast concrete toilets with a faux granite finish. These taza turcos were fortunately available in the plumbing stores in the nearby city of Trujillo for a very low cost (6 USD), making this a very sustainable solution.

How the ACJF funds were expended

Prior to leaving the US, the project had \$6500 to cover all airfare and materials necessary for construction. Our major source of funding (\$4000) was granted by the Ann Campana Judge Foundation. The project was completed just under budget, spending \$6400. Each team member agreed to pay for food during the trip, and the housing for the team was donated by the P.E.R.U group. Below is a summary table of the major expenditures during and prior to the trip.

Categorized Expenditures	Cost
Materials purchased for Building/pit--Total	\$1,684.69
Tools	\$116.99
Team associated expenses (medical kits, airfare etc)	\$4108.67
Pre-trip project preparation expenses	\$354.72
Materials purchased for water system repairs	\$37.89
Materials purchased for San Leon medical post	\$90.31
Materials purchased but not used (see explanation below)	\$135.74
Total used for buildings	\$1,905.21
Total Spent	\$6,393.27

After the project was completed, all tools and materials not used were donated to individuals from Santa Rita and the surrounding communities that volunteered with the project and to the water committees of Santa Rita and the nearby community of San Leon for general use.



A view of the nearly completed toilet building from the front.



Placing concrete cover sections over the seepage pit