Affordable Solutions to Pit Latrine Collapse  
Affordable Sanitation Team  
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Background
The issue of open defecation has become a universal problem in sanitation. Although pit latrines provide a low-cost remedy in rural areas such as Northern Ghana, their performance proves unpredictable in conditions of soil collapse.

Definition of the Problem:
- Sandy soil collapses when saturated if the pit is not lined
- People are deterred from using pit latrines because they are afraid the hole will collapse
- Because people are afraid of the latrines, they resort to open defecation which leads to health hazards

Solution
Four liner designs were evaluated based on the criteria outlined in the table below. This table served as a guide and reference for the team when considering and testing each liner design.

<table>
<thead>
<tr>
<th>Liner Design</th>
<th>Requirements Met</th>
<th>Permeated Criteria Met</th>
<th>Perforated Quality</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Bag Liner</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Unknown</td>
</tr>
<tr>
<td>Rebar reinforced fabric</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Accept</td>
</tr>
<tr>
<td>Ferro-Cement</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Accept</td>
</tr>
<tr>
<td>Plastic Tub Liner</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Accept</td>
</tr>
</tbody>
</table>

Future Work
- Make decisions on the Ferro-Cement and Rebar-Reinforced Liners
- Finalize development of liner designs which meet the criteria
- Prepare for a site team trip to Ghana in January of 2018
- Travel to Ghana and implement potential liner designs

2016 Site Visit
In the summer of 2016, the Affordable Sanitation team travelled to Ghana to implement a rebar-reinforced liner design. The adjacent picture was taken eight months after the liner was implemented, showing that the liner has withstood soil pressures, even during the rainy season when the soil was completely saturated.

Project Objective
The objective of the Affordable Sanitation team is to develop a liner that will be resistant to the forces of the soil and the structure above as well as affordable to local people. The team has been allotted 150 GHC for this project, or approximately 40 USD.

Sand Bag Liner
This image shows the sand bag liner constructed of small sandbags prior to a permeability test.

The decision has been made to accept this liner design as a potential solution.

Plastic Tub Liner
This image shows the plastic tub liner in the ground. Holes drilled in liner are to ensure permeability of the liner.

The decision has been made to discontinue development of this liner as it does not meet the necessary criteria.

Ferro-Cement
Mold Application Method
Direct Application Method

A decision has not yet been made on this liner. The team is in the process of conducting research and tests to determine the status of the liner.

Rebar-Reinforced Fabric Liner
This rebar-reinforced fabric liner was constructed in 2016. The team is currently in the process of modifying this design to reduce its cost.

A decision has not yet been made on this liner. The team is in the process of conducting research and tests to determine the status of the liner.

Partner and Funding
World Vision is a Christian humanitarian organization dedicated to helping children, families, and their communities worldwide reach their full potential by tackling the causes of poverty and injustice. The team’s primary contact with World Vision is Mr. Bismark Norgbe.

Acknowledgements
Project Manager: Dr. Tesfa Yacob, tyacob@messiah.edu
MVP Panelists: Dr. Michelle Lockwood, Dr. Thomas Soerens, Mr. Bob Hentz, Mr. Murray Fisher, Mr. Doug Flemmens, Mr. Dereck Plante
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