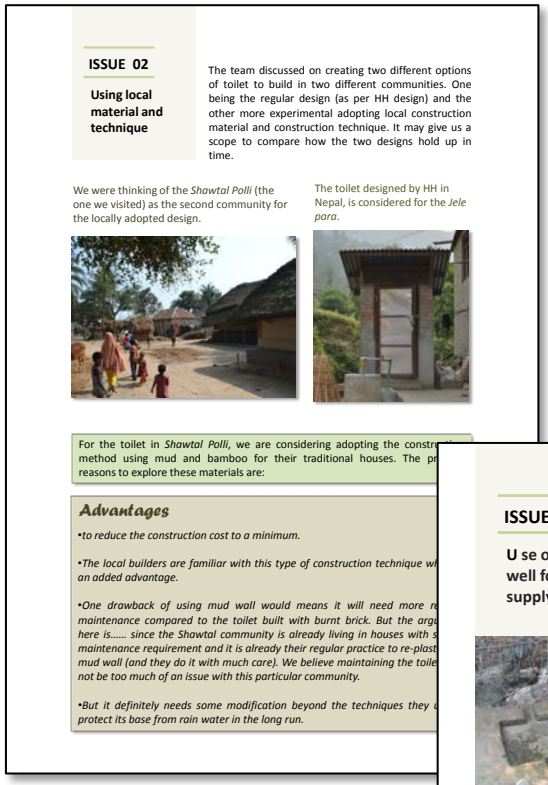
Sanitation Workshop Dinajpur
Bangladesh
12th -16th July , 2013

SAFE / BRAC University / Krom Architecture / Local Villagers / Healthabitat



ISSUE 02

Using local material and technique

The team discussed on creating two different options of toilet to build in two different communities. One being the regular design (as per HH design) and the other more experimental adopting local construction material and construction technique. It may give us a scope to compare how the two designs hold up in time.

We were thinking of the *Shawtal Polli* (the one we visited) as the second community for the locally adopted design.

The toilet designed by HH in Nepal, is considered for the *Jele para*.

For the toilet in *Shawtal Polli*, we are considering adopting the constru... method using mud and bamboo for their traditional houses. The pr... reasons to explore these materials are:

Advantages

•to reduce the construction cost to a minimum.

•The local builders are familiar with this type of construction technique wh... an added advantage.

•One drawback of using mud wall would means it will need more re... maintenance compared to the toilet built with burnt brick. But the argu... here is..... since the Shawtal community is already living in houses with s... maintenance requirement and it is already their regular practice to re-plast... mud wall (and they do it with much care). We believe maintaining the toile... not be too much of an issue with this particular community.

•But it definitely needs some modification beyond the techniques they u... protect its base from rain water in the long run.

ISSUE 03

U se of tube well for water supply

The communities in *Dinajpur* are dependent on the tube well as their source for drinking water. The cost for a tube well is same that of a water tank in *Dinajpur*. Therefore, we decided to incorporate a tube well with our design instead of a water tank. This would also mean that we won't be able to do rain water harvesting as you did in Nepal. Instead maybe we will have a use spout to discharge the water into the ground.

Arubot, Nepal

No rainwater harvesting like in Arubot (top image).

Dinajpur, Nepal

Drainage of water using spout (bottom image).

HH designed toilet with tube well.

Shawtal inspired toilet with tube well.

SAFE adoted toilet with tube well.

Pages from the report of the Bangladesh team visiting the Nepal Sanitation program.

Two of the Nepal visit team present what was learnt

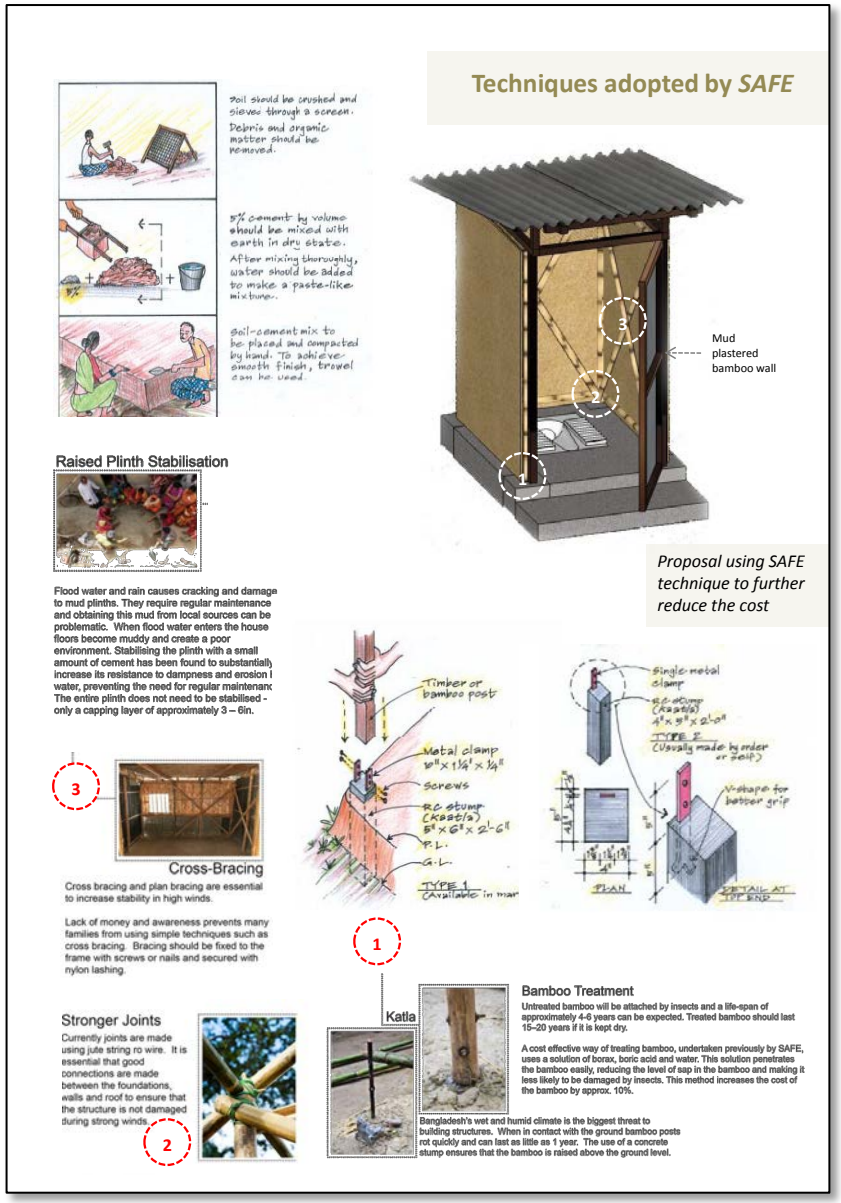
History & background of the project

Following an approach from the Bangladesh High Commission in Australia and the Bangladeshi Architects in Australia (BaA), Healthabitat (HH), an Australian based company acting as a social business, visited Bangladesh in April 2012 and again in February 2013 to try to establish a trial sanitation program.

The Institute of Architects Bangladesh (IAB) and the BaA assisted the first visit. The IAB and the Commonwealth Association of Architects (CAA) helped assist the second visit. Many universities, foundations and individual architects both in Bangladesh and Australia contributed greatly to both visits and all were keen to assist establish a trial program.

Healthhabitat (HH) proposed a program similar in the following ways to that established in Nepal -

- the program will have a health focus
- it will start small by building 2 toilets to test and evaluate the first design ideas
- work with a local partner organisation to develop local capacity
- expand the program based on local capacity.



Page from the report of the Bangladesh team visiting the Nepal Sanitation program.

The Bangladesh program, in design and detail, will differ to suit local resources as well as cultural, geographic and economic conditions.

Whilst Healthabitat cannot promise extensive funds or a long term commitment to a future Bangladeshi sanitation program, we can offer a range of health and design skills, community development tools, documents, links to a skilled Nepali team and some funds to help establish a trial project.

In April 2013, Healthabitat funded a team from Bangladesh to visit the program in Nepal so that CHDS Nepal, (an HH partner) could give detailed information and experience about the program. The team included the head of SAFE, an established Bangladesh NGO and two local architects.

After the visit, the team produced a set of design ideas and questions related to the Bangladesh program based on Nepal experience. (*see pages left*)

This report documents the next phase in the project – the **Sanitation Workshop**. The final results of this workshop will be the design documents to complete the building of 2 toilets by the end of 2013.

DRAFT 2	Bangladesh Sanitation Workshop July 2013	PROGRAM
Time	Activity	Notes / things required
11th July approx. 4pm	Paul P. arrives Saidpurr airport in the afternoon (maybe with BishnuShrestha)	Will send flight details
5pm	Find accommodation and prepare for dinner	
6pm	Dinner and informal discussion about the workshop program	
7.30pm	Early night after travel, rest	
12 July 8am	Commence workshop with full design construction team - Healthabitat describes context from our perspective and what we can offer the workshop and project - SAFE and design team respond	
9-11am	Assess existing toilet design and waste system design: Review of Nepal study tour - Lessons learnt (go through report produced) - The SAFE toilet design (on site) - The SAFE waste water system (on site)	Can we access the waste system chambers and have the lids removed for inspection?
11am	Tea	
11.15 – 1pm	Detailed discussion of the toilet design and lessons learnt The toilet unit - size - toilet system - water use and availability - materials availability - materials costs - local labour skills and costs - insects and pests - privacy(feet, noise, door opening direction)? The waste water system - waste water system size and treatment capacity - maintenance and cleaning waste water system - flooding Siting - relationship to the house/s - privacy issues (proximity to house, neighbours)? - link to water for hand wash and flush - flooding issues ? - security, locking ?	

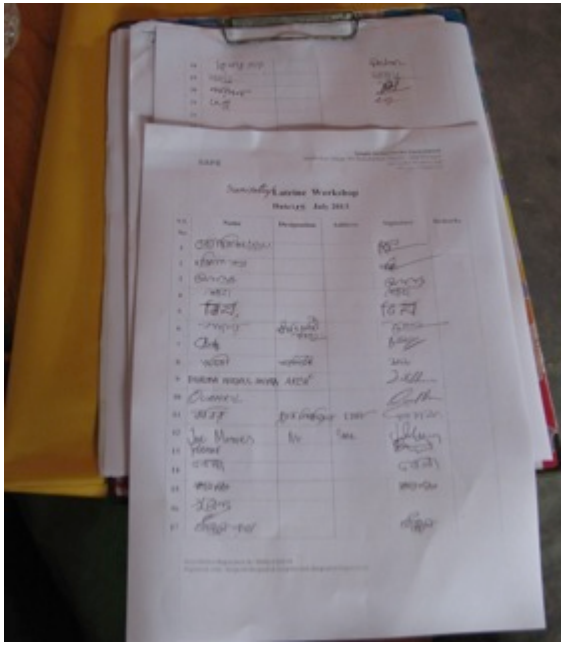
The program for the Sanitation Workshop in July 2013

The aims of the Sanitation Workshop were to -

- Introduce the health issues related to washing and removing waste safely to the local communities and work teams
- Involve the SAFE construction team, local villagers and a range of Bangladeshi professionals in the workshop.
- Develop local designs for toilets, wash areas and safe waste water disposal, relevant for the wet season conditions of Bangladesh
- Use the local skills and knowledge of the NGO SAFE to select suitable materials and construction techniques
- Build on the significant experience of SAFE in design and construction
- Mock up and test construction methods and alternatives
- Select 2 trial sites and discuss the proposals with the families
- Complete designs for the 2 sites
- Complete a detailed costing for the construction work on the 2 selected sites

Azit Roy - SAFE (Simple Action For the Environment)

1-2:30pm lunch	Lunch and Friday prayer	
2-5pm	Discussion of the trial project and start defining the scope. - where should it be done ? - how many families involved (suggest 2 max) ? - population of each family ? - specific requirements toilet waste system and hand washing - clothes hanging - privacy - cleaning - water supply - drainage - wet season waste disposal - local insects, pest and hazards - linkage to the house/living environment site area, flooding, site specifics (from existing knowledge of the local team)	
13th July (Saturday) 8am – 11am	**Village issues** Discuss where the trial should be run and why. Details: Is there a village committee to be consulted? Who gives approval for the project? Who will own the toilets? Local government regulations, restrictions ?	NOTE Team to advise day off for weekend and religious / family observances
11-11.15	Tea	
11.15-1pm	Review toilet and waste water system design and arrive at a summary ready for village community meeting	
1-2pm	Lunch	
2-5pm	Village meeting and discussion - scope of project - what we (the SAFE/design team) are offering What we need from them - families - sites - contribution? (labour cash) - approval to proceed	
14th July (Sunday)	Develop the designs during the day May divide into teams to address various issues Develop design details Material search, discussions and testing Site specific design work	NOTE Team to advise day off for weekend and religious / family observances
15th July	Develop the designs during the day with the aim of a final design by evening.	
	Costing of the full design Design prepared for village presentation (next	
	The local singing team will summarize the activities and outcomes and/important messages through songs. Dinner for whole team and village representatives by HH	
16th July		
9am	Presentation of design ideas to village committee/families Workshop ends Lunch with SAFE team and all design team	(local team to confirm this is the best time for this exercise with village chores and work ????)
3pm	PP(and BS) fly out to Dhaka	



There were a total of 32 workshop attendees including architects, villagers SAFE staff, carpenters, masons, film maker and singing team

Setting the scene

HH outlined the links to CHDS Nepal and how the program was started in Nepal.

Healthabitat described what it brings to the Bangladesh project:

- Ideas from past projects
- Design skills and health focus
- Resources to run the Sanitation Workshop

Then a discussion was held about what SAFE, the Bangladeshi professionals and the local villagers bring to the project:

- Ideas and local knowledge
- Informed site and family selection
- Technical skills and experience
- Accurate costing skills

1 2 3

The program will have a health focus

The Nine Healthy Living Practices
and the 3 highest priority practices that will form the core of the Bangladesh Sanitation Program

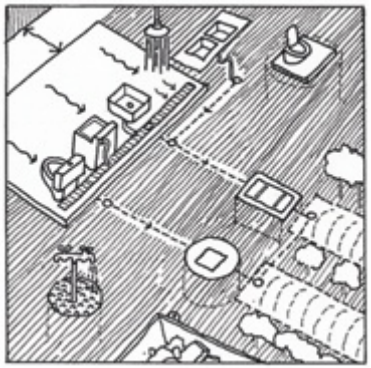
1) Washing people, particularly children, once a day
2) Washing clothes and bedding
3) Removing wastewater safely

Washing people, particularly children, once a day

Diarrhoeal and respiratory diseases, in particular, are the major causes of illness among children and also play a major role in malnutrition in the first three years of life.
Skin infection is one of the most common problems of Indigenous children and causes chronic illness and discomfort.
Recurrent or persistent skin infection is known to increase the risk of developing kidney disease and rheumatic fever

Washing clothes and bedding

Regular washing of clothes and bedding, which helps to remove any bacteria, dirt, fleas, mites and other irritants or infection.
Washing of clothes and bedding can help reduce the incidence of infectious diseases, such as diarrhoeal disease, respiratory infections, scabies and other skin infections.

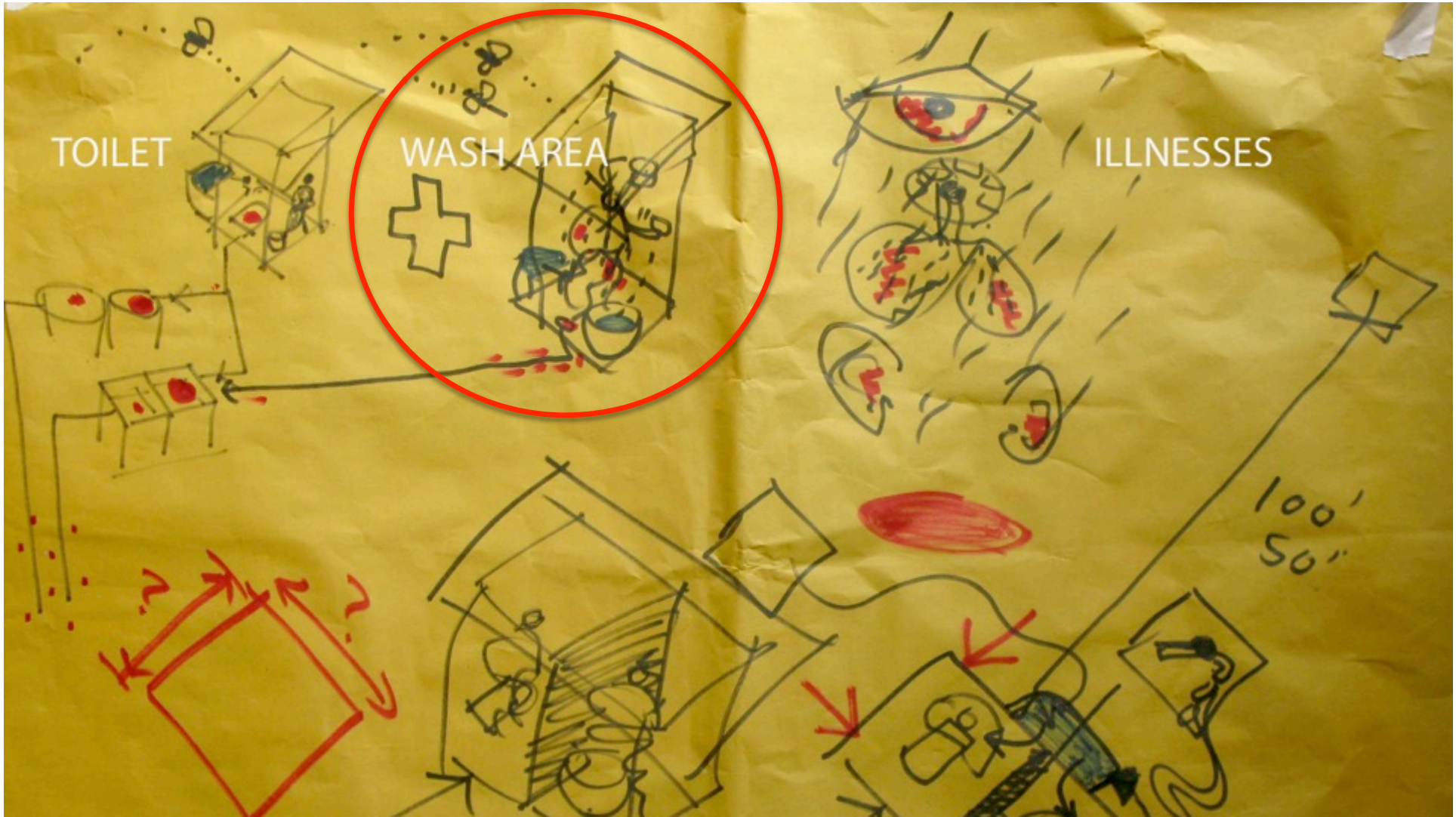


Removing wastewater safely

Wastewater in the living environment can make people sick.
If people come into direct contact with waste water, or if their water supply is contaminated with wastewater, there is a greater risk of transmitting bacteria and viruses that cause disease.
These risks are also increased if animals, vermin or insects that have been in direct contact with waste water can pass bacteria on to people.

The wash area

Washing people, particularly children, once a day and
Washing clothes and bedding

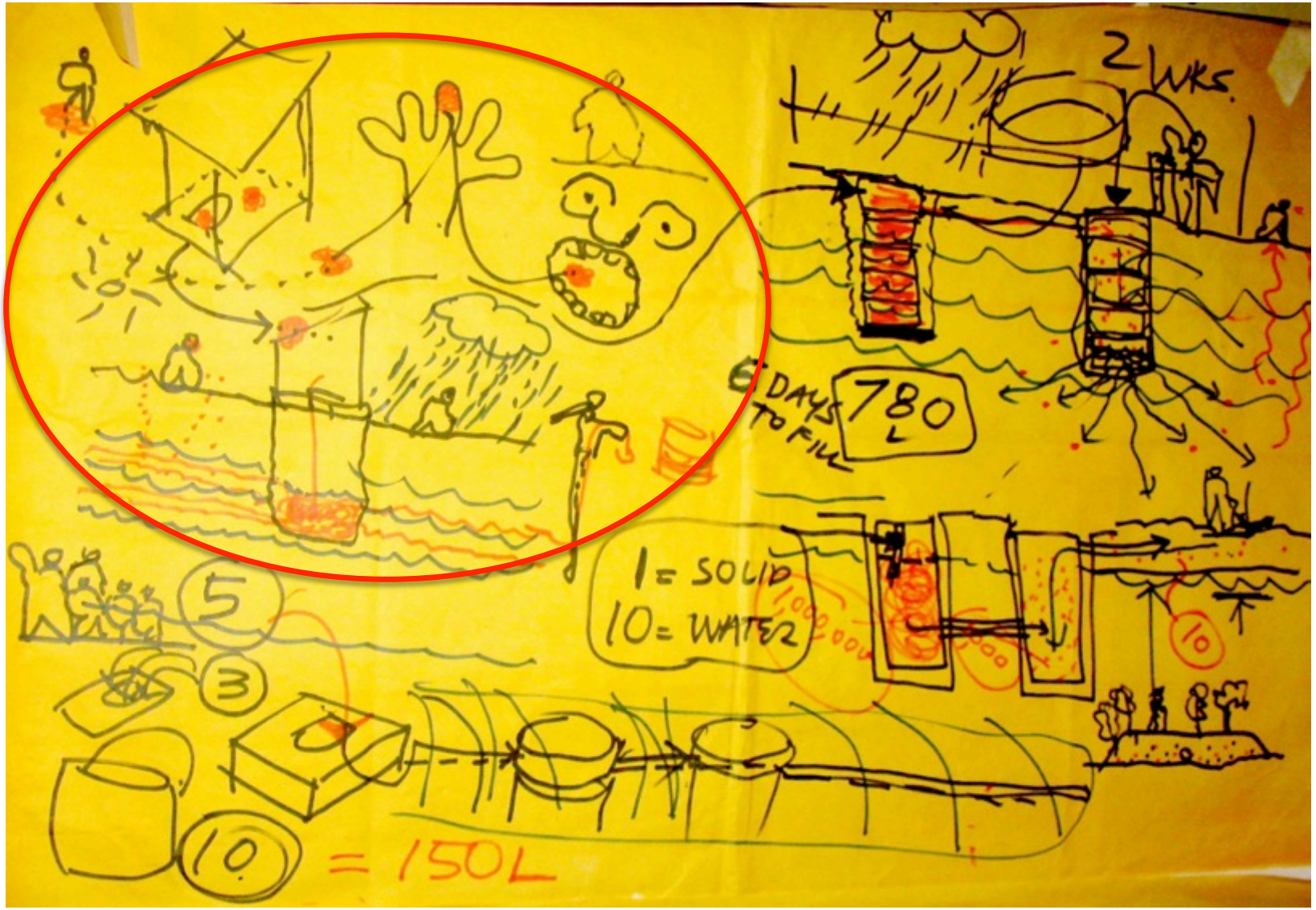


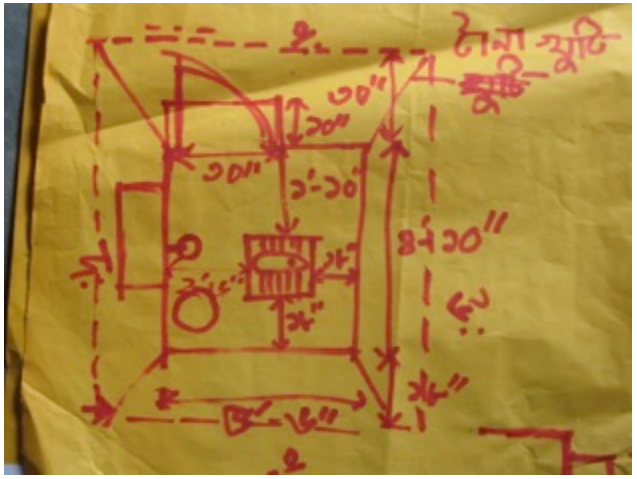
Teams built the wash area and toilet areas full scale to test size and layout

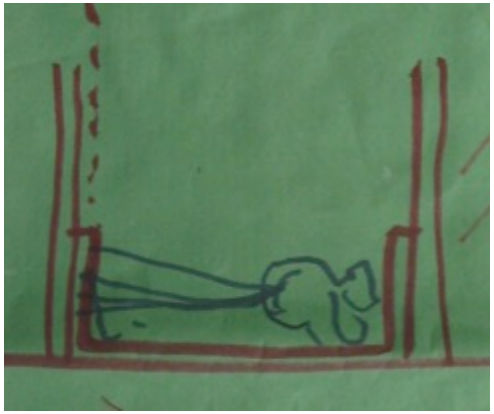
Wash area design criteria developed at the workshop

- Dip style washing from bucket filled whilst inside the wash area
- Insect protected
- The area should also be seen as being used for teeth cleaning and some clothes washing
- Storage for soap, shampoo, tooth brushes, some detergent products and mirror
- Privacy essential
- Wash area must drain to wastewater treatment system NOT into fields directly
- Size to enable one person to assist a child of older person in a chair (internal dimension of 4’6 x 4’6 (1350x1350mm) agreed for trial size
- Dip washing requires minimum height of 6’6” in at least part of the wash area (1940mm)
- The walls should be cleanable (up to 2’ or 600mm) and wall / floor junction continuous to aid cleaning
- All wastewater generated from cleaning the floor / walls should drain to a wastewater outlet with S/P trap fitted
- Estimates of use were discuss and 3 times / person per day using 10 litres/person/use for flushing washing and cleaning the area was agreed. For a family of 10 this would required 300 litres per day. This volume should be assessed in the trial.

Toilet area and the safe disposal of wastewater







Kids with stomach illness can cause a mess in the toilet area and walls and floors should be easy to clean

Toilet area design criteria developed at the workshop

- Asian type pan
- Dip flush
- Insect protected
- Hand washing nearby essential
- Privacy essential
- Pan orientation should not face person to west (Mecca)
- Hand washing point to right hand side of the pan
- Size required varied but essential to have space and layout to enable one person to assist a child of older person (internal dimension of 4’6 x 4’6 (1350x1350mm) agreed for trial size
- Washing pot and possibly bucket required on floor
- The walls should be cleanable (up to 2’ or 600mm) and wall / floor junction continuous to aid cleaning
- All wastewater generated from cleaning the floor / walls should drain to pan
- Estimates of use were discuss and 3 times / person per day using 10 litres/person/use for flushing washing and cleaning the area was agreed. For a family of 10 this would required 300 litres per day. **This volume should be assessed in the trial.**

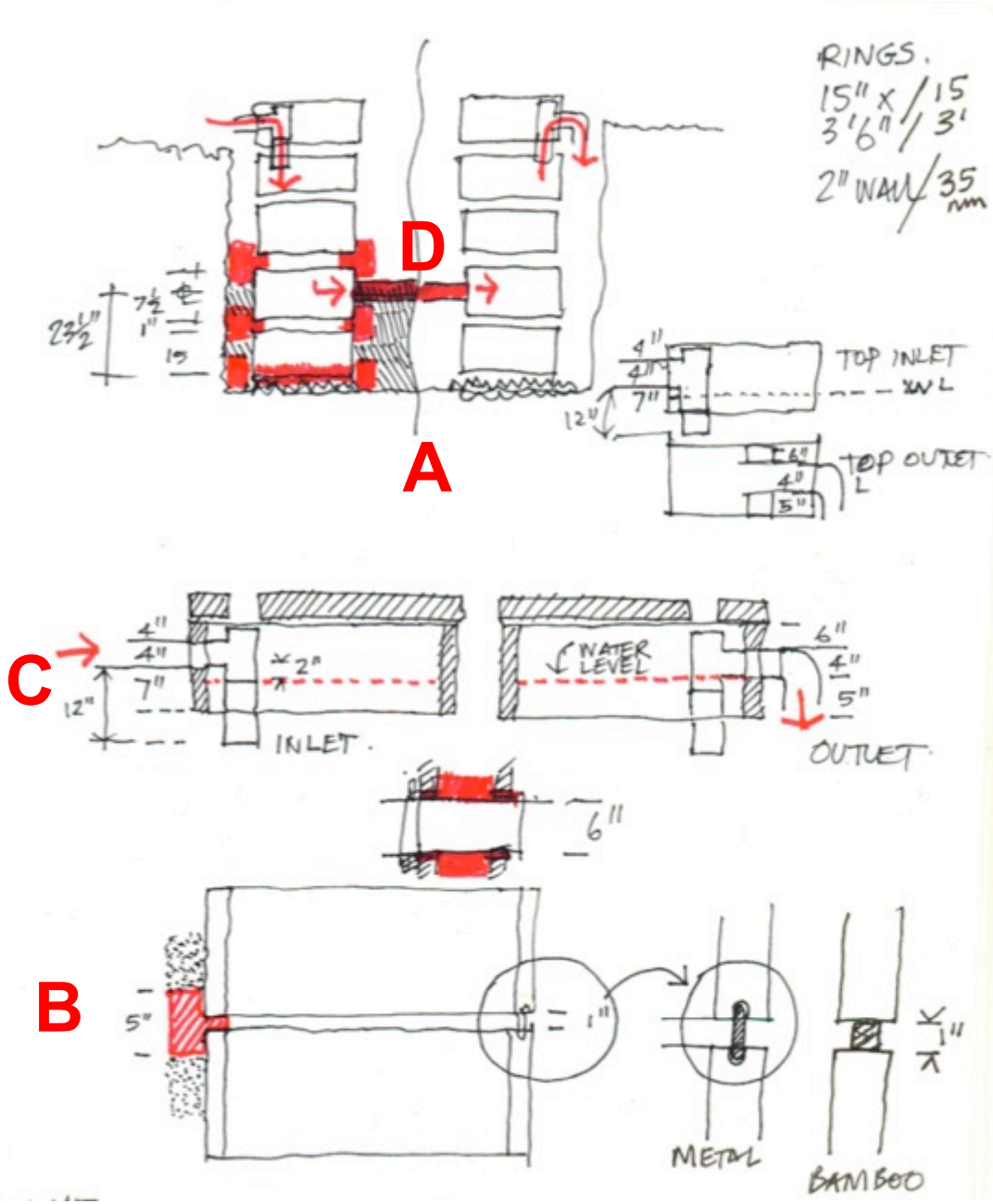
The existing septic tank system

The existing systems are made up of the following

- Two vertical chambers made from 5 x 15” high 3’ diameter concrete rings (total height = 1875 x 900 mm)
- The primary chamber has a sealed base
- The secondary chamber has an ‘open’ base to allow waste to ‘disperse into the ground’.
- The inlets and connections between the tanks are all 4”(100mm) pipes and are all placed at the top of the chambers.

On inspection, the following was observed:

- No crust had formed in the primary or secondary chamber as the new waste water inlet (A) and outlet (B)were at the top of the chamber, flushing waste across the top.
- There was approximately 6” (150mm) of sludge in both tanks (C).
- There was no sign of soakage into the surrounding ground but there was evidence the water table was filling the tanks.
- Corrosion of the thin concrete ‘paste’ of the tank walls revealed the low strength brick aggregate used in the rings.(D).
- The system was not providing waste treatment and needs to be regularly pumped out/ emptied. It is acting as a waste ‘bucket’.



New septic tank system OPTION 1 - using precast concrete rings

The system

- Two vertical chambers made from 5 x 15” (5 x 375mm) high 3’ (900) diameter concrete rings (total height = 1875 x 900mm) (A)
- There are a variety of ring sizes and qualities. Each chamber should hold at least 1000 litres (see calculation below).
- Both chambers are sealed at the bottom and all joints between the rings are sealed with grout grout to prevent leakage *and* water entry in the high water table, wet season conditions
- The rings will be spaced during construction to ensure grout can seal the junctions (B).
- Inlet and outlet 4”(100mm) pipes are fitted with T junctions to ensure new wastewater does not disturb the crust from forming.
- Tank connection is towards the base of the chambers and final outlet goes to 20’x3’ (6x1m) soakage trench with top made above natural ground level.

Volume of one chamber
3.12 x (.45x.45) x 1.625 (H allows for entry point)
= 1,000 litres
2 x chambers = 2,000 litres
Inflow calculation (workshop) = 600 litres per day
Detention time in the system
= 2,000 (capacity) / 600 (daily load) = 3 days +

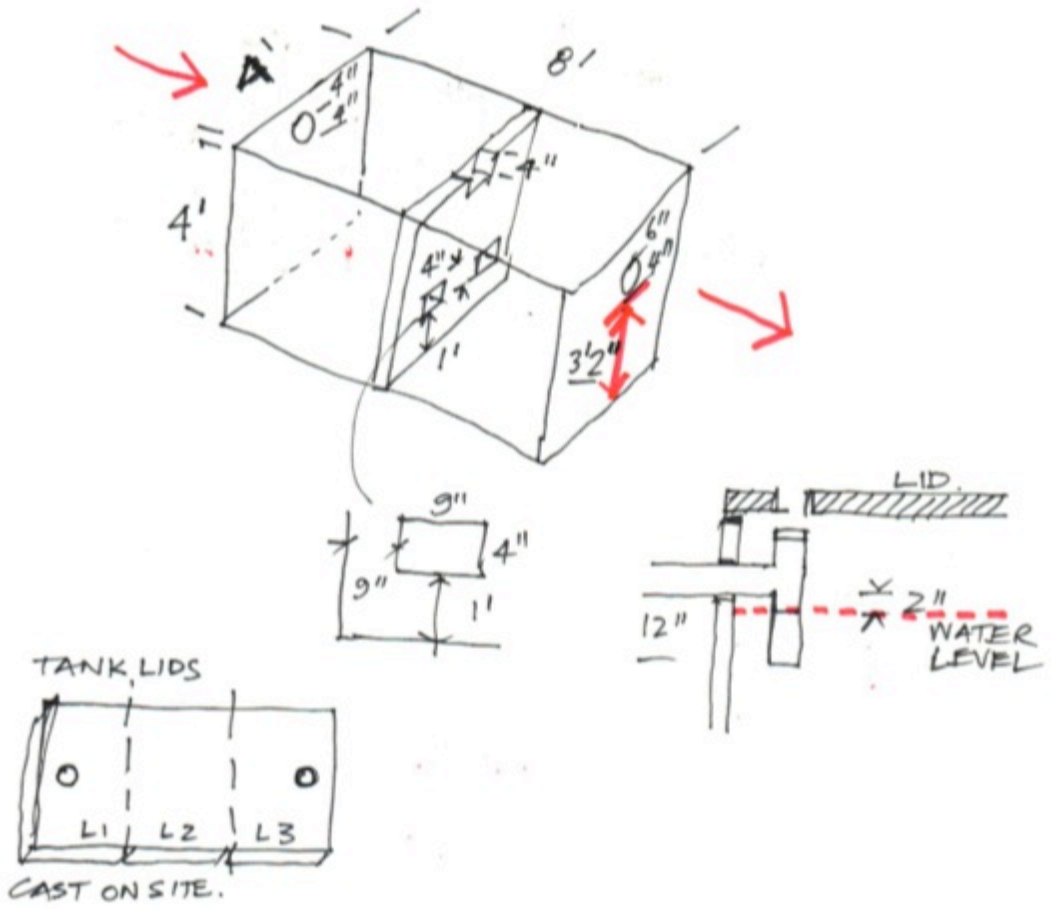
Mock up of septic tank system OPTION 1 precast concrete rings

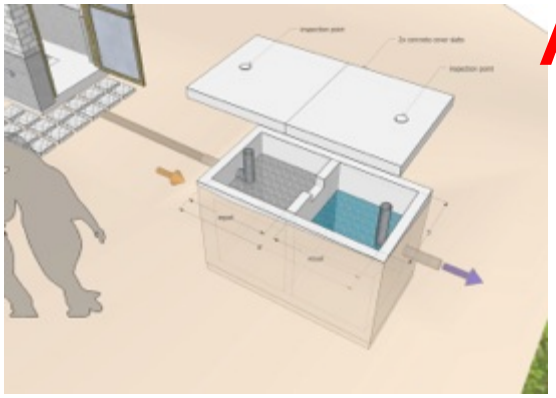
The mock up

- Two rings 15” (375mm) high x 3’ (900) diameter concrete rings were placed on a concrete slab base founded on crushed brick and at water table level (2’ or 600mm below ground) (A)
- The ring quality chosen was poor and meant size variation and little if any reinforcement. The second ring collapsed under its own weight during careful handling. (B)
- Base and first joint connections were sealed between the rings with grout to prevent leakage and water entry in the high water table, wet season conditions
- The rings were spaced with bamboo wedges during construction to ensure the grout sealed the junctions (C)
- The broken ring was replaced during the trial
- The system was filled with water and is being tested to see if leakage occurs.

What was learnt

- Find **high quality rings** or SAFE should **fabricate** larger units with integrated chamber bases
- This work can only be done in the **dry season**
- To achieve a good result with rings, a high level of **quality control** will be essential





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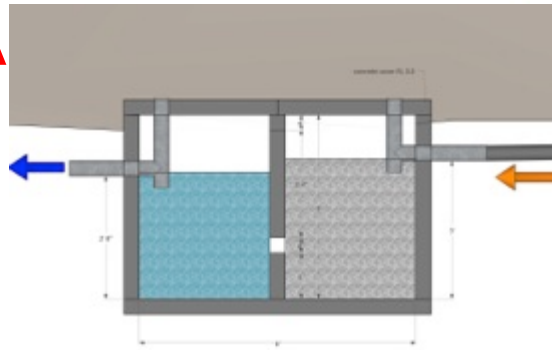


New septic tank OPTION 2

using fired brick and rendered rectangular tank construction

The system

- One fired-brick, rectangular structure similar to that used in Nepal (A) (see volume calculation below)
- Both chambers are connected near the bottom by a central baffle wall
- Inlet and outlet 4”(100mm) pipes are fitted with T junctions to ensure new wastewater does not disturb crust forming
- Tank lids can be cast on site (as per Nepal)
- Final effluent to go to 20’x3’ (6x1m) soakage trench with top made above natural ground level.

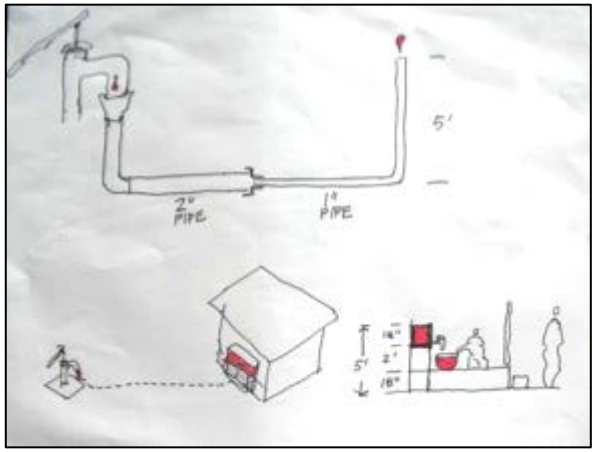
Discussion

- Will need to be built in the **dry season**
- **Less junctions and joints** to seal (Option 1)
- **Increased volume**
- Need to **check cost implications** carefully during the trial program.

Volume of the tank (both chambers)
2.4 (8’) x 1.2 (4’) x .95 (3’2”) (H allows for entry point)
= 2,700 litres
Inflow calculation (workshop) = 600 litres per day
Detention time in the system
= 2,700 (capacity) / 600 (daily load) = 4.5 days

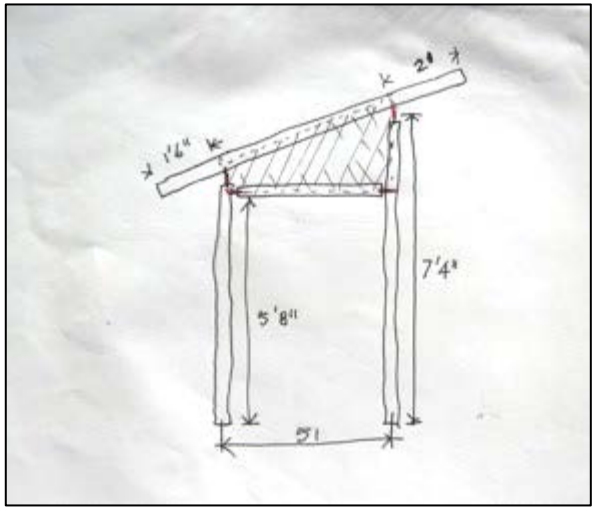
Sanitation Workshop
Dinajpur July 2013

some of the activities

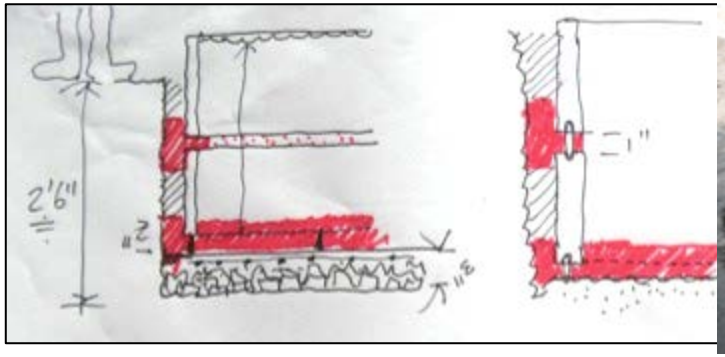


Workshop testing

1. The transfer of water from tube well via hand pump to wash/toilet water reservoir / tank. The head of the tube well pump will have to be adapted to ensure water can be pumped up to 5’ (1500mm) head.



2. The bamboo frame with grout filled joints was built to assess rigidity of joints and ease of insect meshing with flush frames. This was built quickly and accurately by the teams.



3. The redesigned waterproof construction using concrete precast rings (see details of the process)

Products purchased for full scale mock up accuracy

Villagers, tradespeople and architects combined to design wash and toilet areas

Treated bamboo frame was assembled using grouted pinned joints (not bolts)

Mixing concrete for septic tank testing

Mocking up the wash and toilet areas full scale

Assessing the performance of existing septic systems

Presenting the design ideas, details and cost estimates

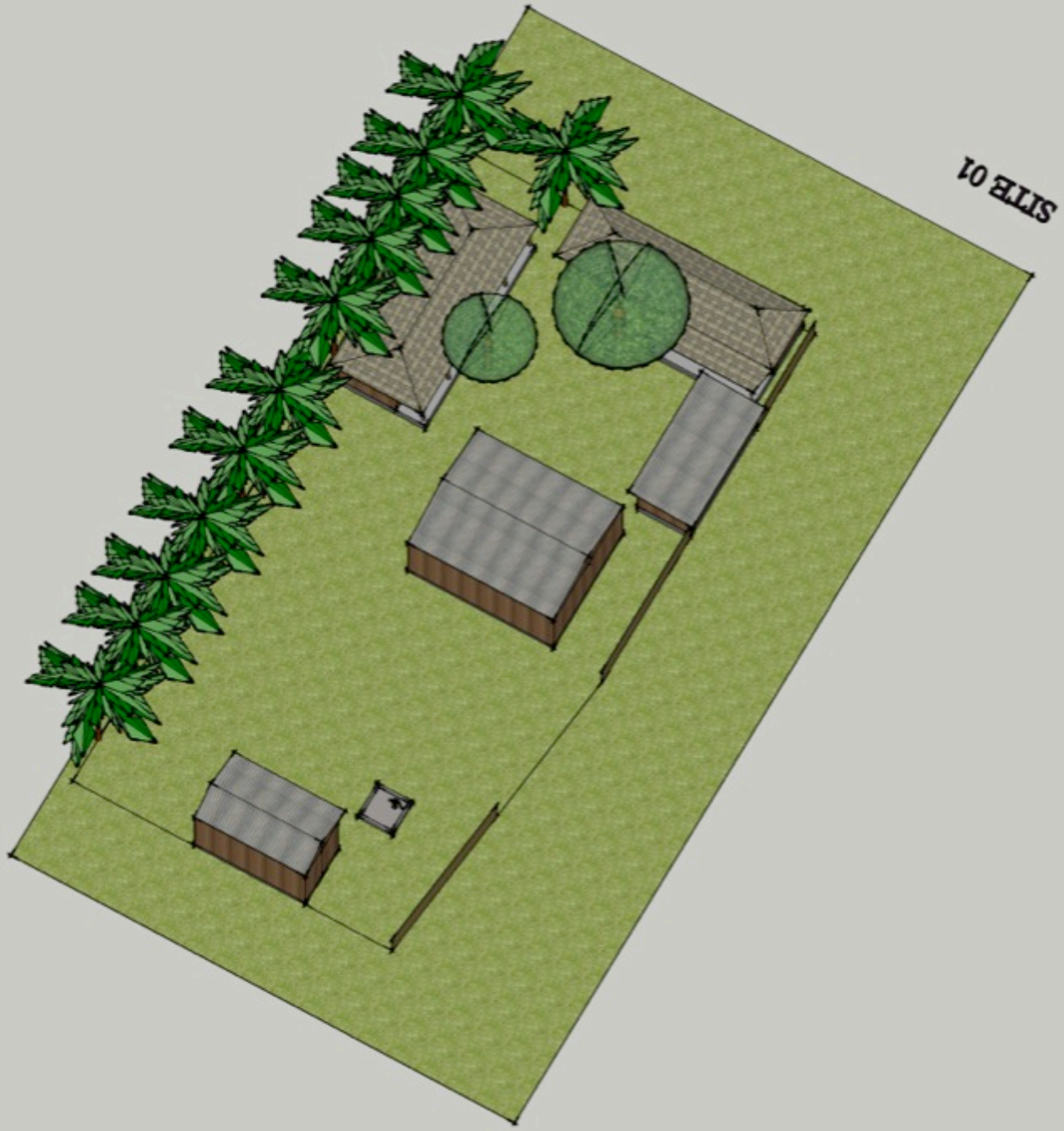
The singing team

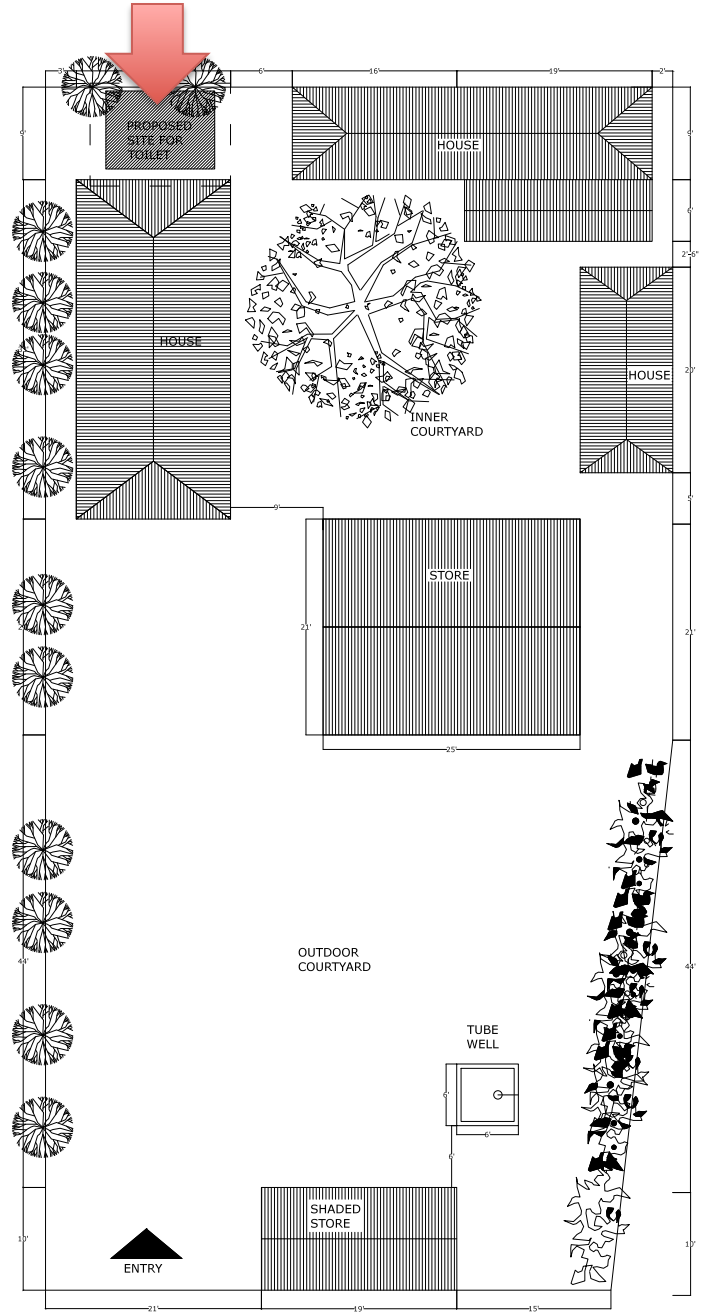
Coming on the last full construction day of the workshop the singing team crafted songs related to the ideas and principles underpinning the Sanitation Program.

The songs will engage local people in stories about why toilets are needed, how they work, why treating waste safely is as important as collecting the waste, the importance of washing and the illnesses prevented by having working wash areas and toilets.

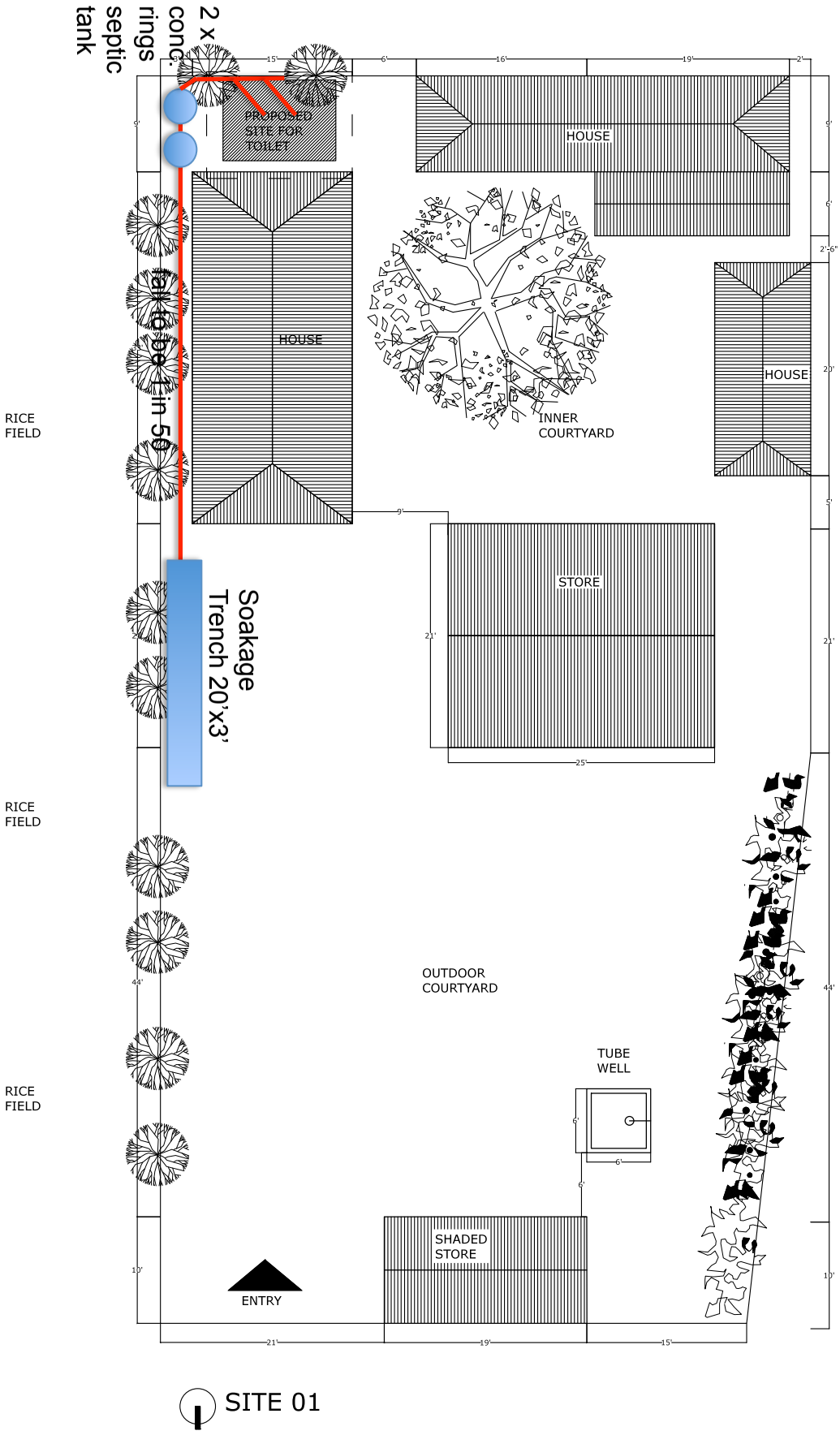
The songs had humour, local quirks and spoke in a language and form known to the villagers.


Site 1


SITE 01

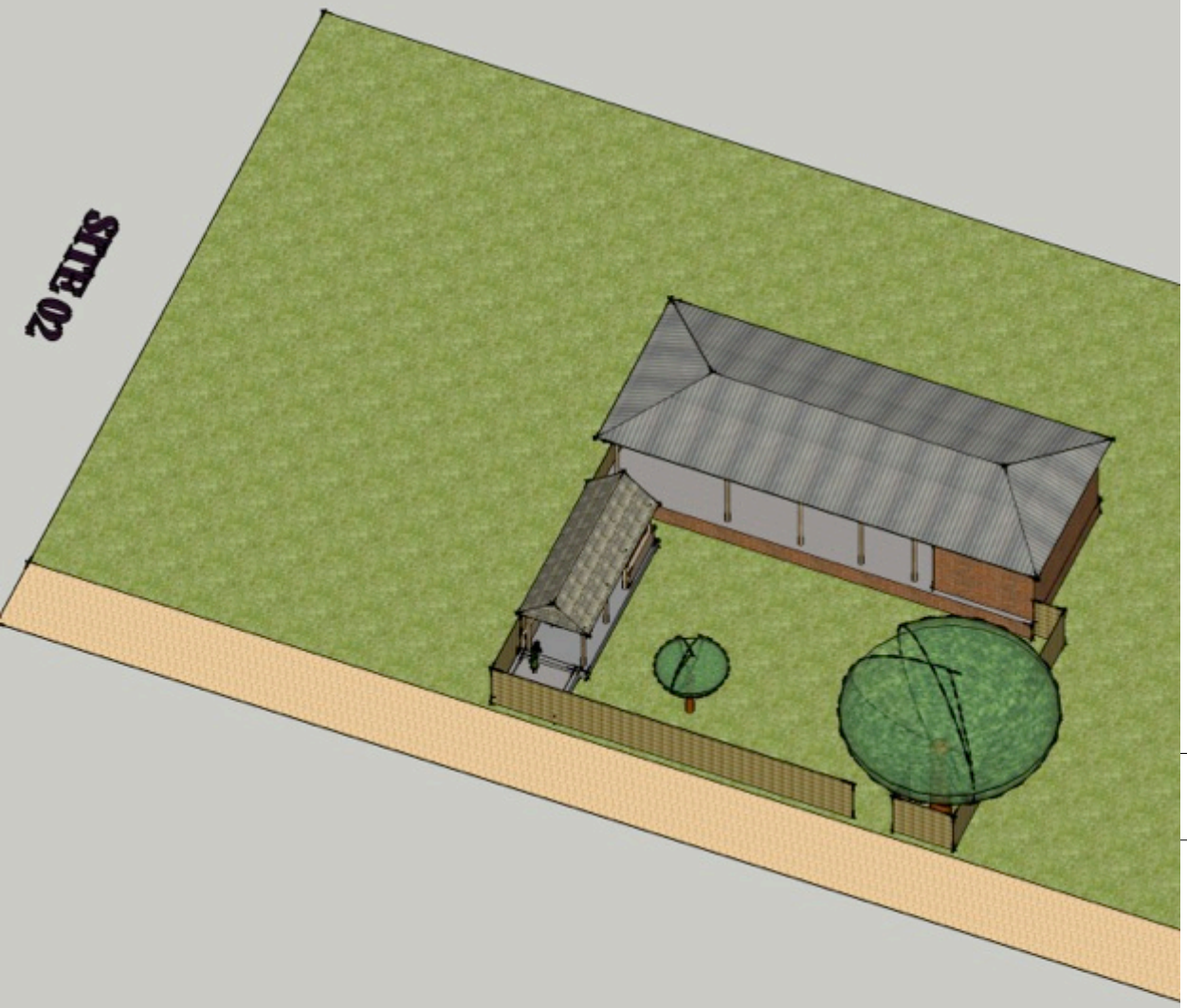

PROPOSED SITE FOR TOILET
HOUSE
HOUSE
HOUSE
INNER COURTYARD
STORE
OUTDOOR COURTYARD
TUBE WELL
SHADED STORE
ENTRY

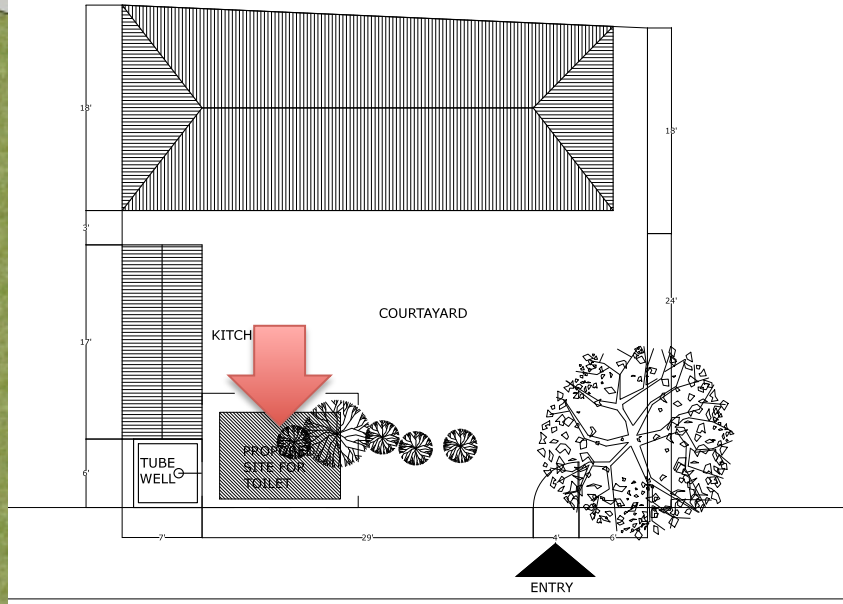
SITE 01


2 x conc. rings septic tank
fall to be 1 in 50
PROPOSED SITE FOR TOILET
HOUSE
HOUSE
HOUSE
INNER COURTYARD
STORE
Soakage Trench 20'x3'
RICE FIELD
RICE FIELD
RICE FIELD
OUTDOOR COURTYARD
TUBE WELL
SHADED STORE
ENTRY

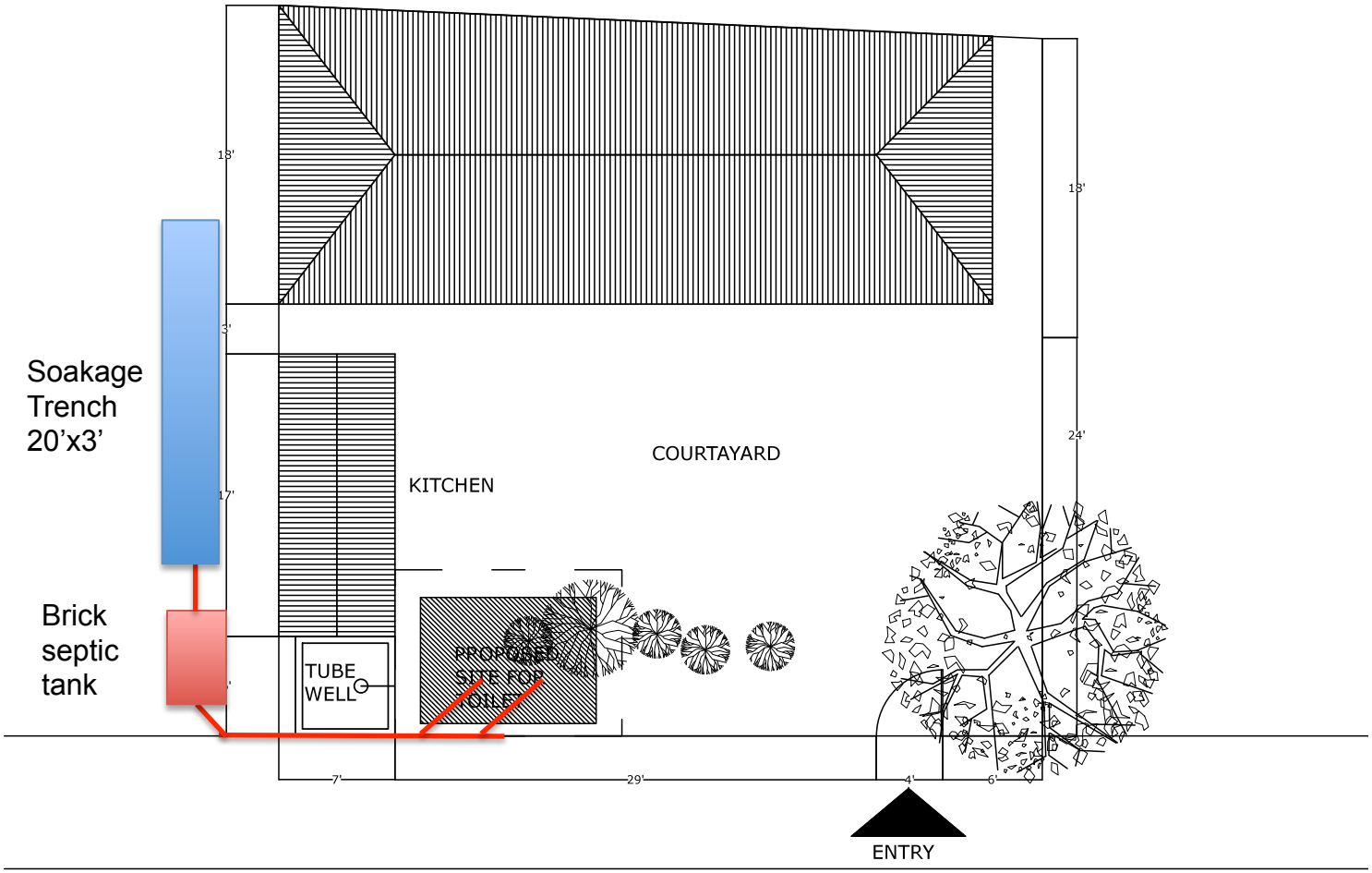
SITE 01


Site 2

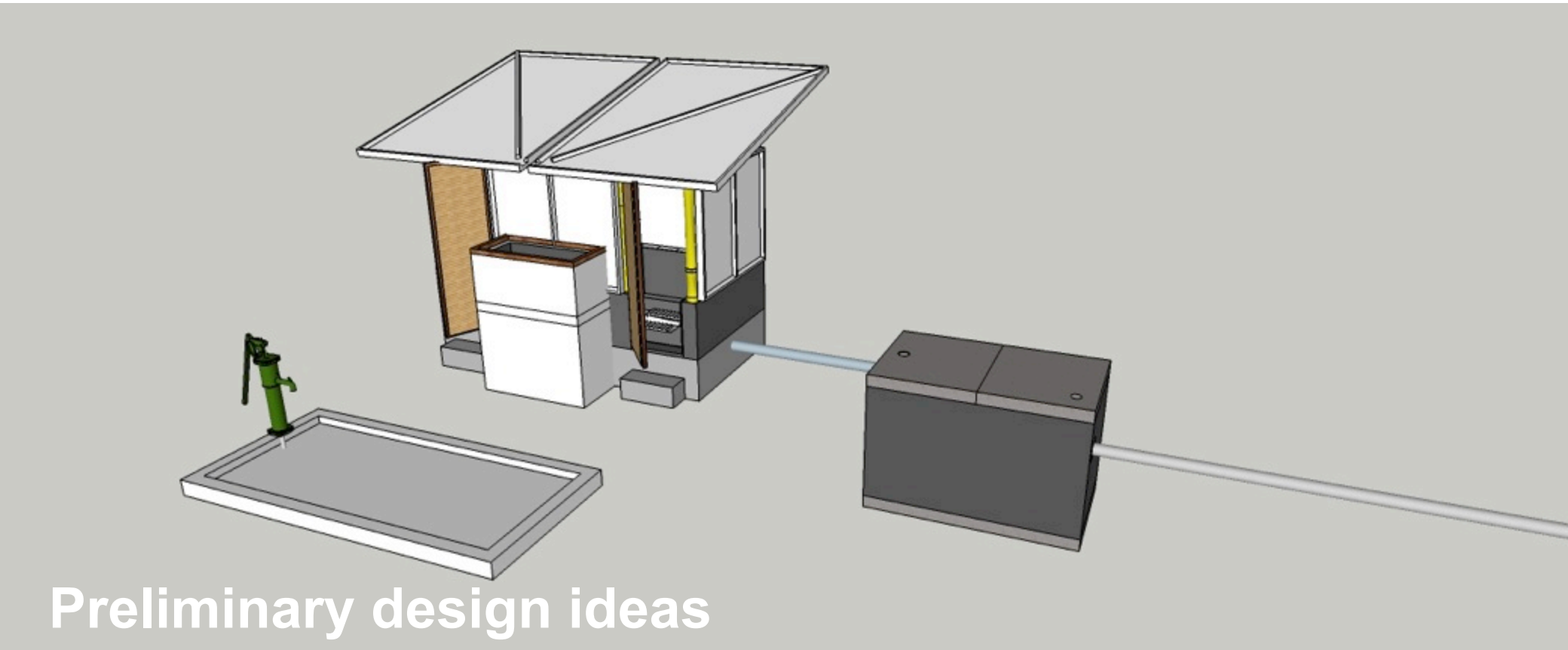

SITE 02


13'
13'
3'
24'
17'
KITCH
COURTAYARD
TUBE WELL
PROPOSED SITE FOR TOILET
6'
7'
29'
4'
6'
ENTRY

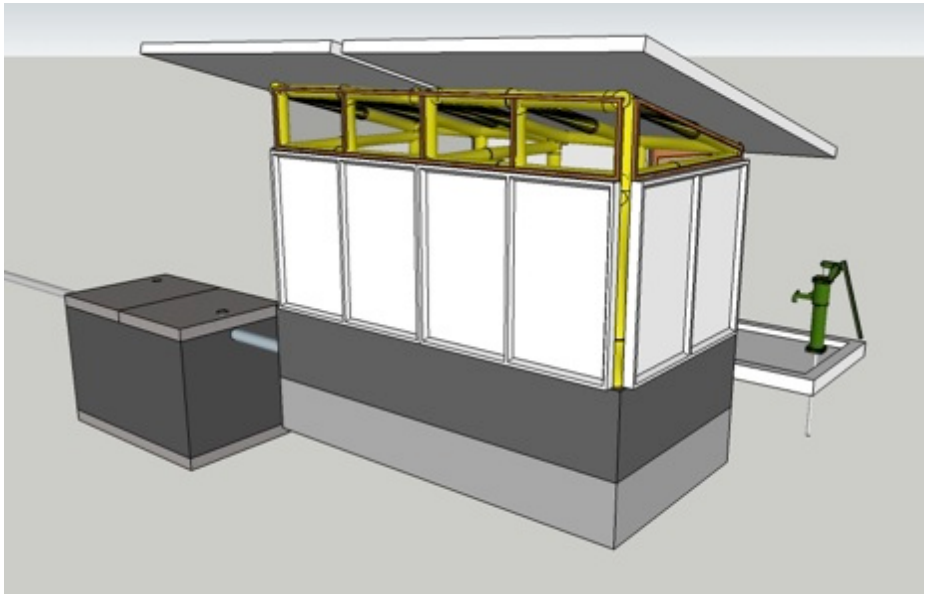
SITE 02

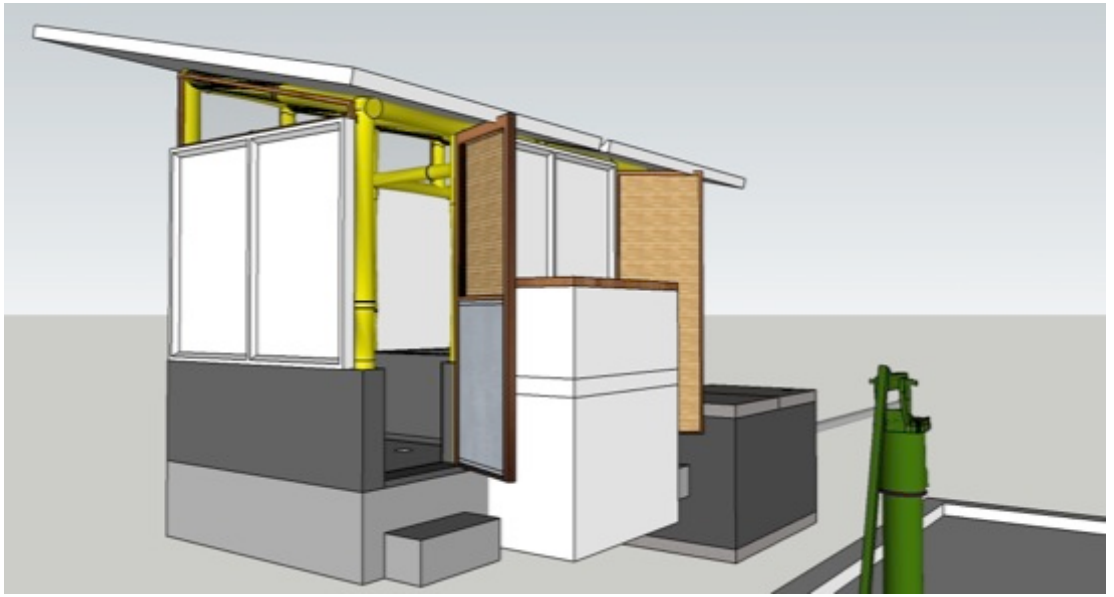

Soakage
Trench
20’x3’
Brick
septic
tank
KITCHEN
COURTAYARD
TUBE
WELL
PROPOSED
SITE FOR
TOILET
ENTRY
18'
13'
24'
17'
7'
29'
4'
6'

SITE 02

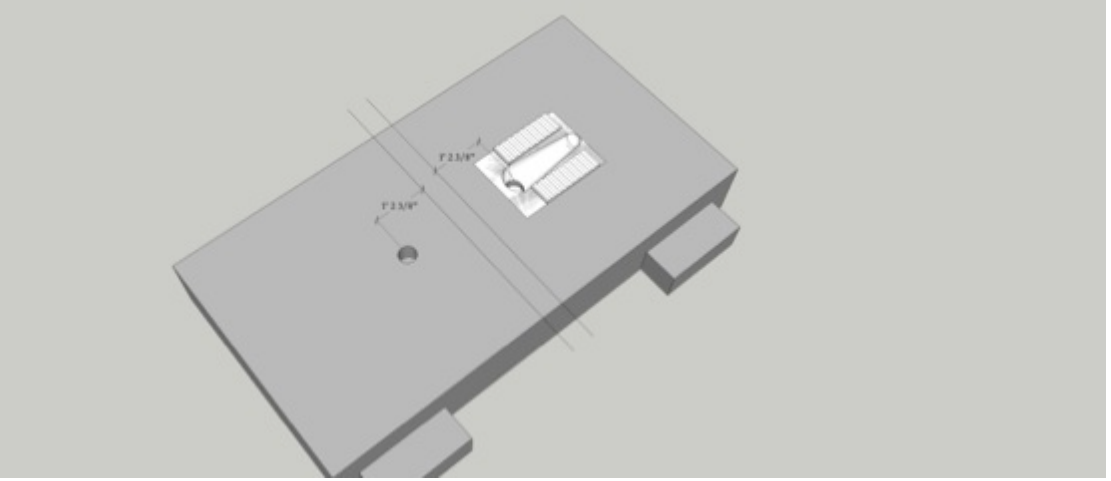


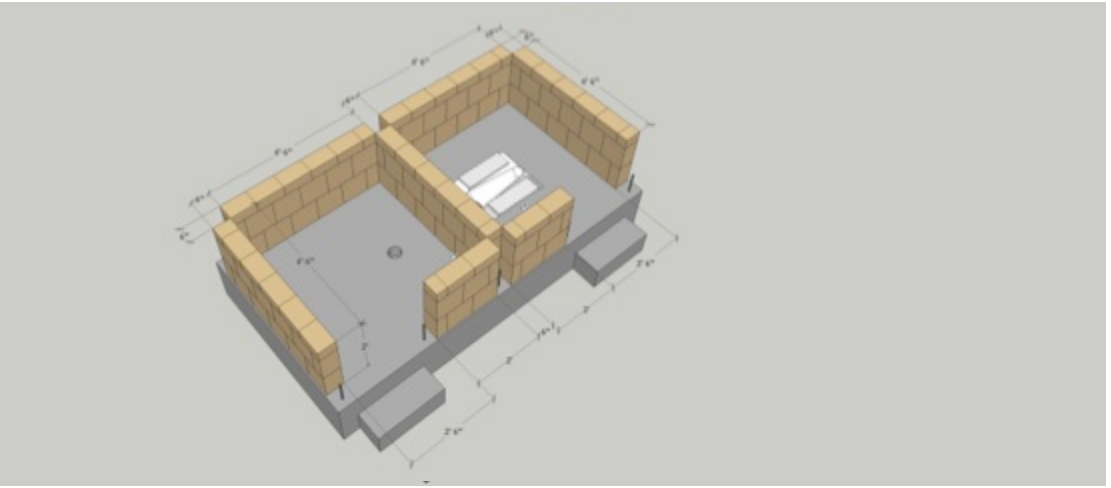
Preliminary design ideas

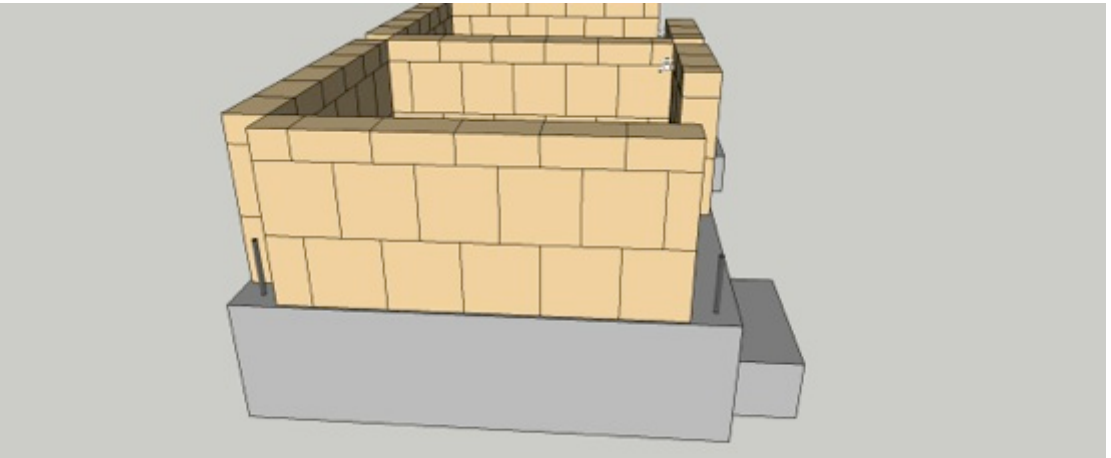




Preliminary design for the trial wash and toilet area with waste disposal systems







The construction method and materials

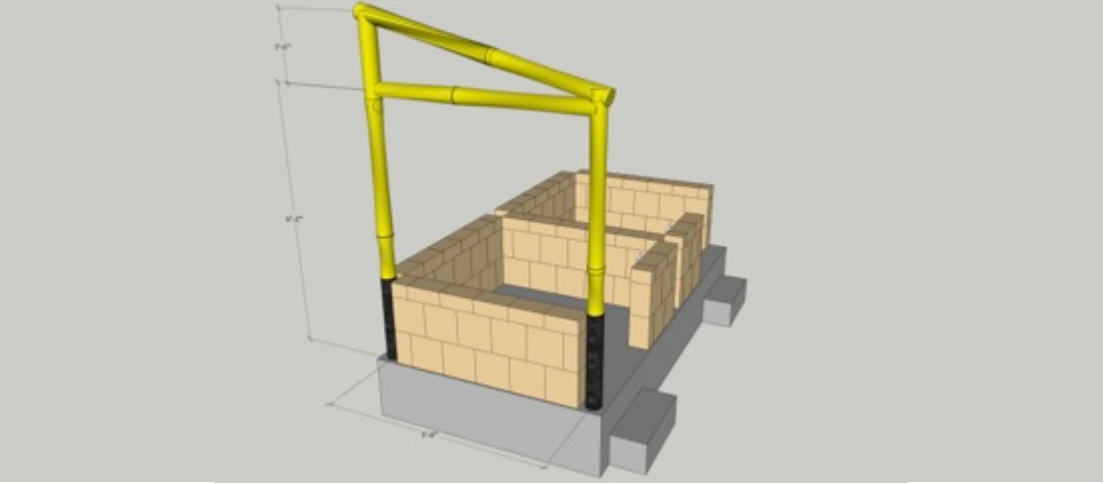
The plinth

- 450 above ground level
- One step
- Pan and wash area plumbing installed

The blocks

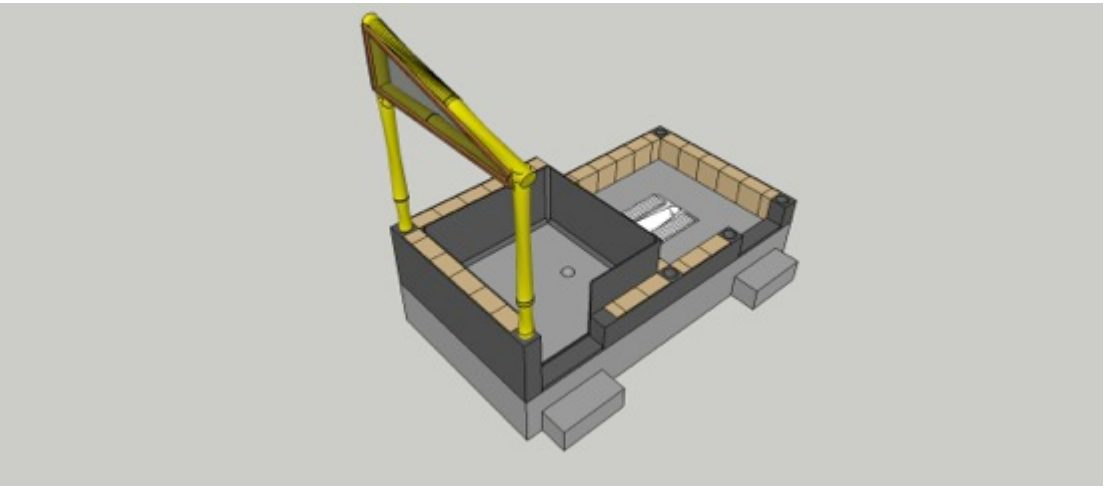
- Cement stabilised earth blocks (as per SAFE)
- Tie material incorporated to link to bamboo column frames

- Reinforcing bars are set into the concrete plinth for attaching the bamboo columns



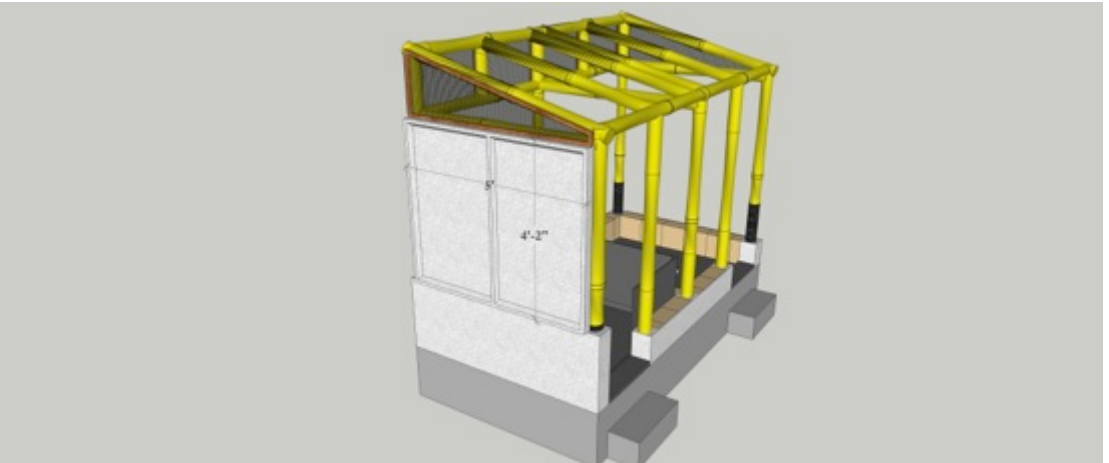
The bamboo frames with grouted joints

- Treated bamboo (as per SAFE)
- Pinned to plinth with ¾” (18mm) reinforcing bar and joint grouted
- Any bamboo encased in render will be painted with bituminous paint for increased protection from moisture



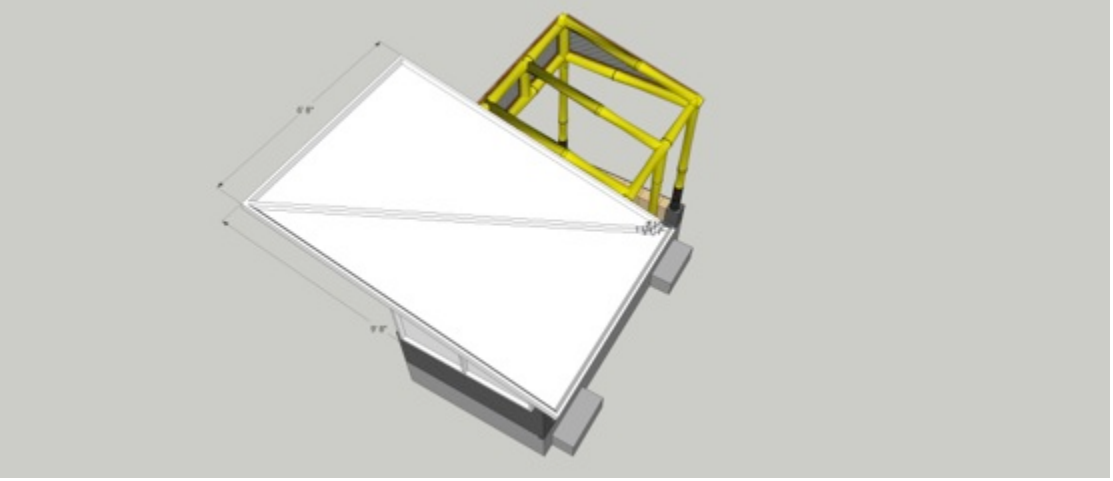
The render

- Hard set render to 2’ (600mm)
- (NOTE this would be done after all block work, framing and roofing were completed to avoid damage)



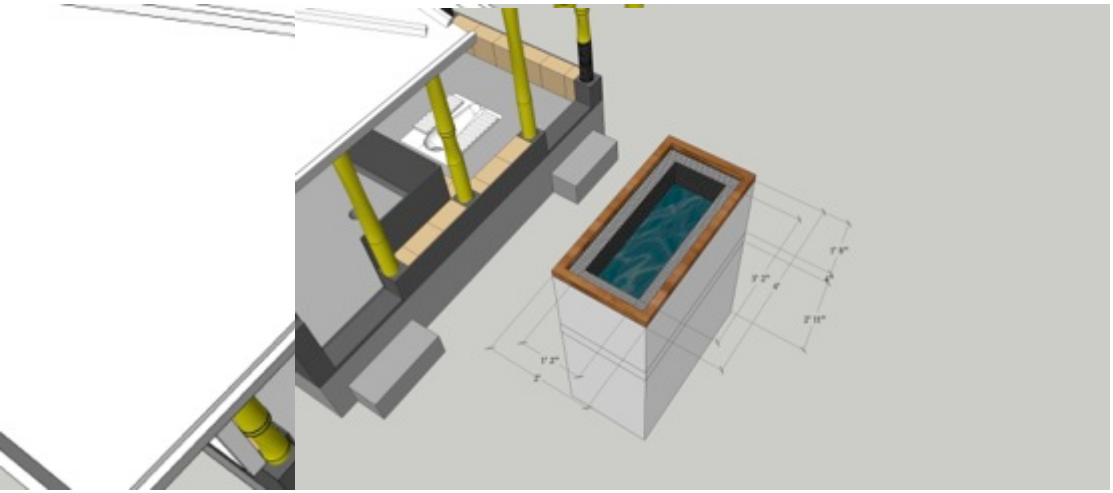
The wall panels above 2’ (600mm)

- Cement plastered woven bamboo matting (as per SAFE) with 1.5” (35 mm) general thickness and 3” (75mm) thickness at rib points.



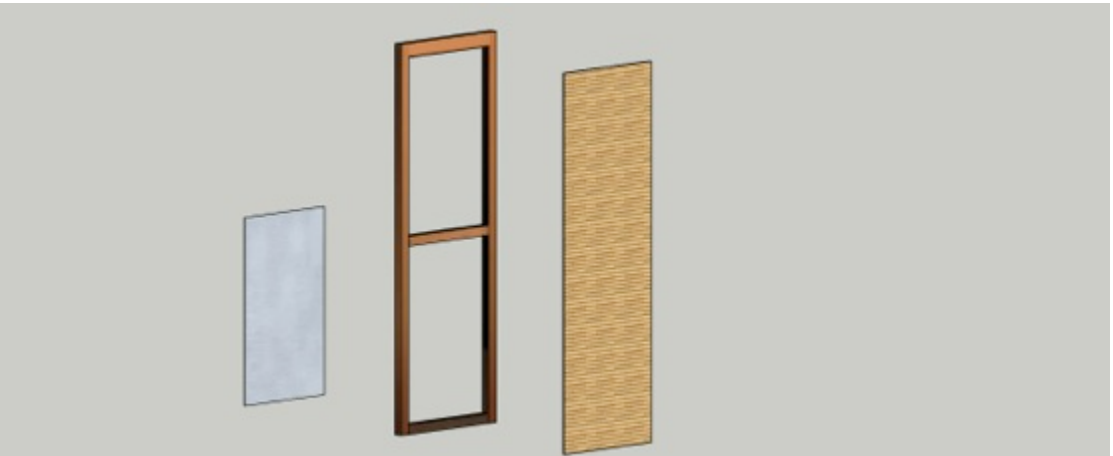
The roof panels

- Cement plastered woven bamboo matting (as per SAFE) with 1.5” (35 mm) general thickness and 3” (75mm) thickness at rib points.
- Note ribs reinforced with ¼” steel rod
- Ribs end at one bottom corner to allow drainage to cistern/tank.



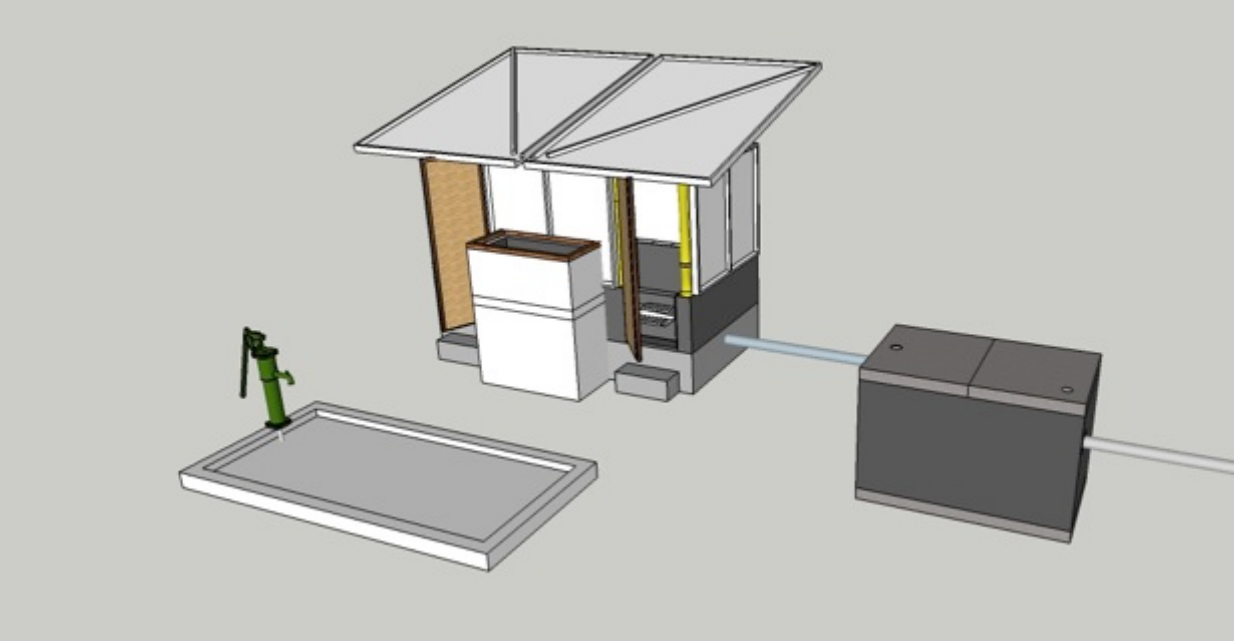
The water cistern / tank

- The base is to be made of fired bricks and concrete slab
- Rendered on the water side
- Timber frame and mesh to top to prevent mosquitos and flies
- 2 x taps fitted to serve wash and toilet areas ONLY.



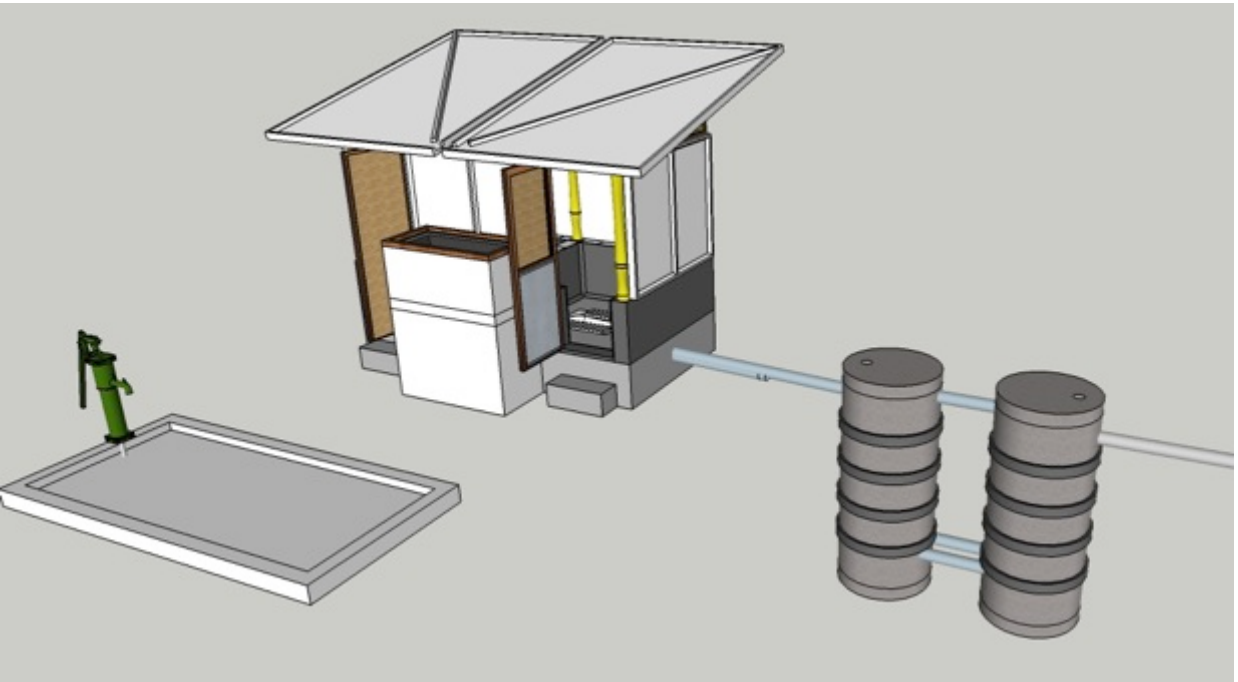
The doors

- Timber framed and lined externally with bamboo
- Lower 2’ (600mm) of the door, inside, to be metal sheet clad to enable cleaning



OPTION 1

- Rectangular septic tank
- Concrete upper wall panels

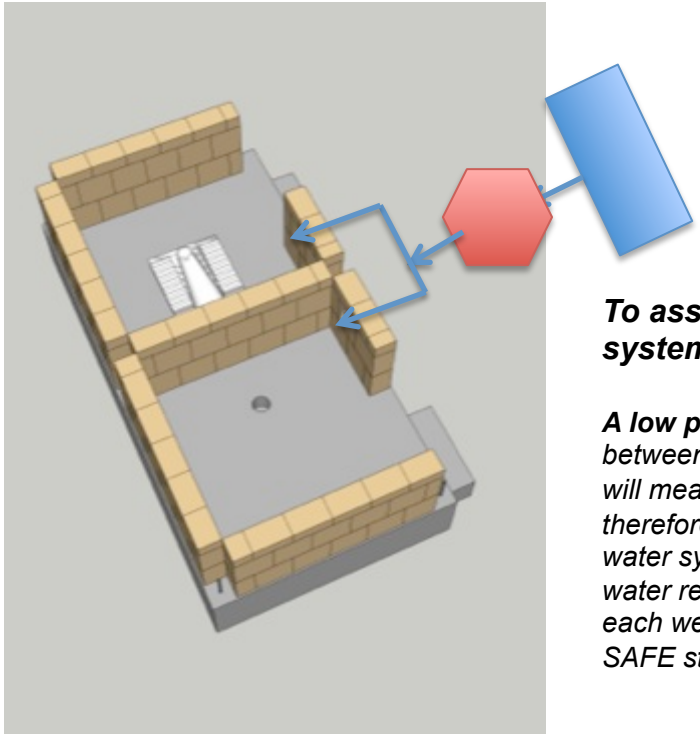


OPTION 2

- Concrete rings for septic tank
- Bamboo lined upper walls
- Consider different door layout depending on site layout.

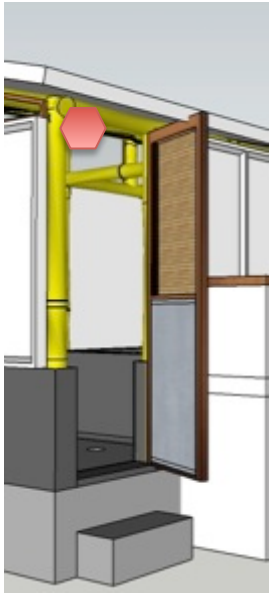
Elements Trial Type A	Cost (Bangladeshi Taka)
Plinth (all reinforcing, brick, concrete)	
Septic Tank (rings)	
Water tank / reservoir (brick concrete)	
Cement stabilised brickwork	
Bamboo frames	
All hard rendering and cement rendering	
Roof panels (bamboo reinforced concrete)	
Wall panels (bamboo reinforced concrete)	
Doors (including metal panel inside)	
Taps and pipes for water supply	
Toilet pan, wash area drain and all pipes to septic tank	
Fly mesh and frames and towel rail / coat hooks and soap holders	
Tube well (pump modification, base improvement and pipe to tank/reservoir)	
Total	(AUD)

Elements Trial Type B	Cost (Bangladeshi Taka)
Plinth (all reinforcing, brick, concrete)	
Septic Tank (brick)	
Water tank / reservoir (brick concrete)	
Cement stabilised brickwork	
Bamboo frames	
All hard rendering and cement rendering	
Roof panels (bamboo reinforced concrete)	
Wall panels (bamboo woven and insect proof)	
Doors (including metal panel inside)	
Taps and pipes for water supply	
Toilet pan, wash area drain and all pipes to septic tank	
Fly mesh and frames and towel rail / coat hooks and soap holders	
Tube well (pump modification, base improvement and pipe to tank/reservoir)	
Total	(AUD)



To assess water use, waste system load and overall use

A low pressure water flow meter *between the reservoir and the 2 x taps will measure the total water use and therefore assess the load on the waste water system and also overall use. The water readings will have to recorded each week by a family member or SAFE staff member.*



To assess overall use

A state data logger fitted to each of the doors will assess the number of times the doors are opened and closed and the time of day this occurs.

The HOBO U9 State Data Logger *monitors state changes using an internal magnetic reed switch for monitoring contact closures or current flow of remote devices or presence of positive DC voltages up to 15V.*
Internal magnetic reed switch
External sensor cable included

The next steps

- Complete the documents for the 2 trial wash areas and toilets (HH, Kabir, Emu)
- Prepare final cost estimates (SAFE)
- Agreements with the two families selected (SAFE)
- Approval to commence construction (HH)

Construction

- To begin when the dry season conditions allow excavation (end of September approx.)
- Assisted by Worldskills, WCP, IAPMO support
- Construction completed mid to end of October
- Fitting of monitoring systems to assess performance *(see left)*

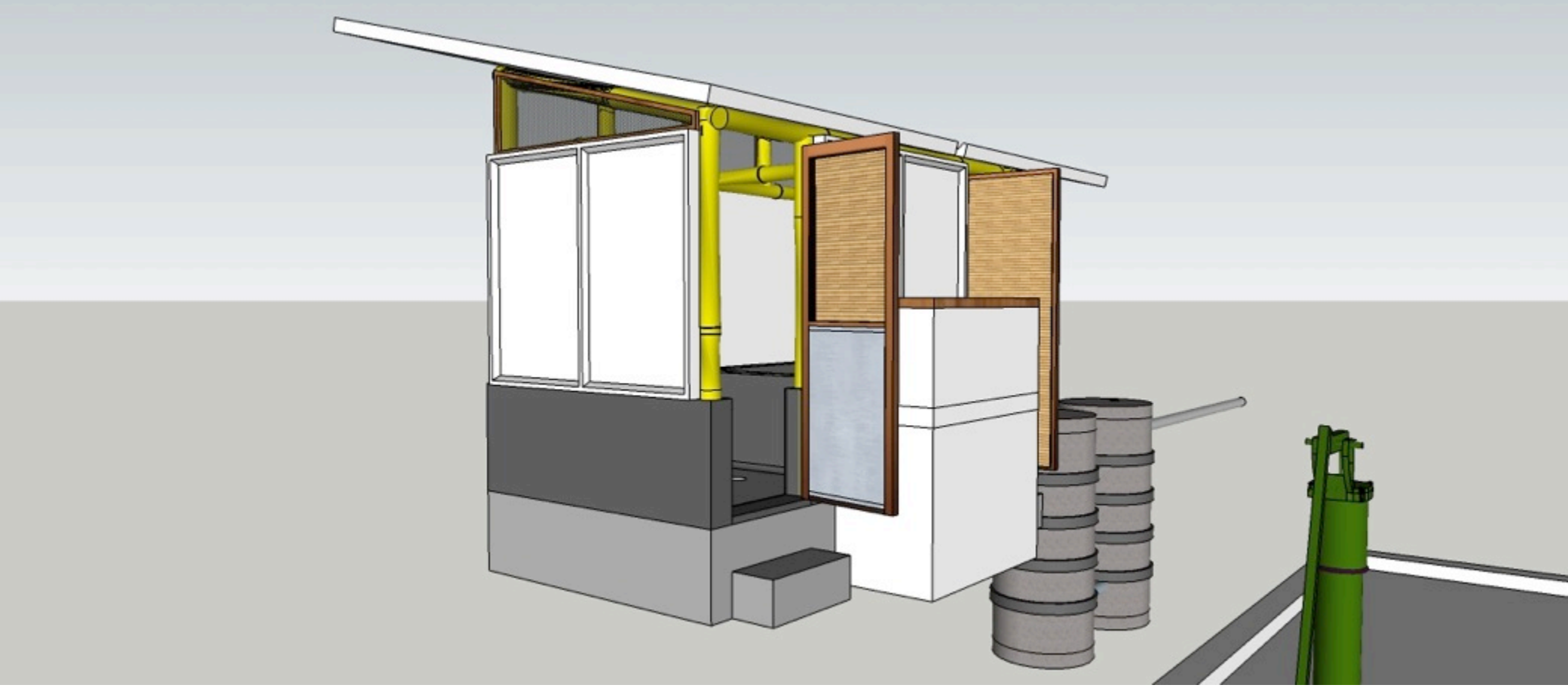
Assessment

- Late January 2014 preliminary assessment (use, scale, dry season waste system performance, family satisfaction)

- Mid to late July 2014 final assessment (use, wet season waste system performance, material performance, family satisfaction)

Revised design and program roll out

- July to September 2014 design revisions
- Seek additional program support based on working trial designs
- September /October 2014 program roll out



Healthabitat acknowledges –
The SAFE management team, staff and family
The local architects who gave their time to the workshop - Kabir, Emu, Saad, Abonee and Shuvra
Joseph Moores, SAFE volunteer, for structural engineering advice
The local villagers who participated
BRAC University and Krom Architecture
Quamrul for recording the event
The Singing Team
Donors in Australia who assisted Healthabitat to make the workshop possible