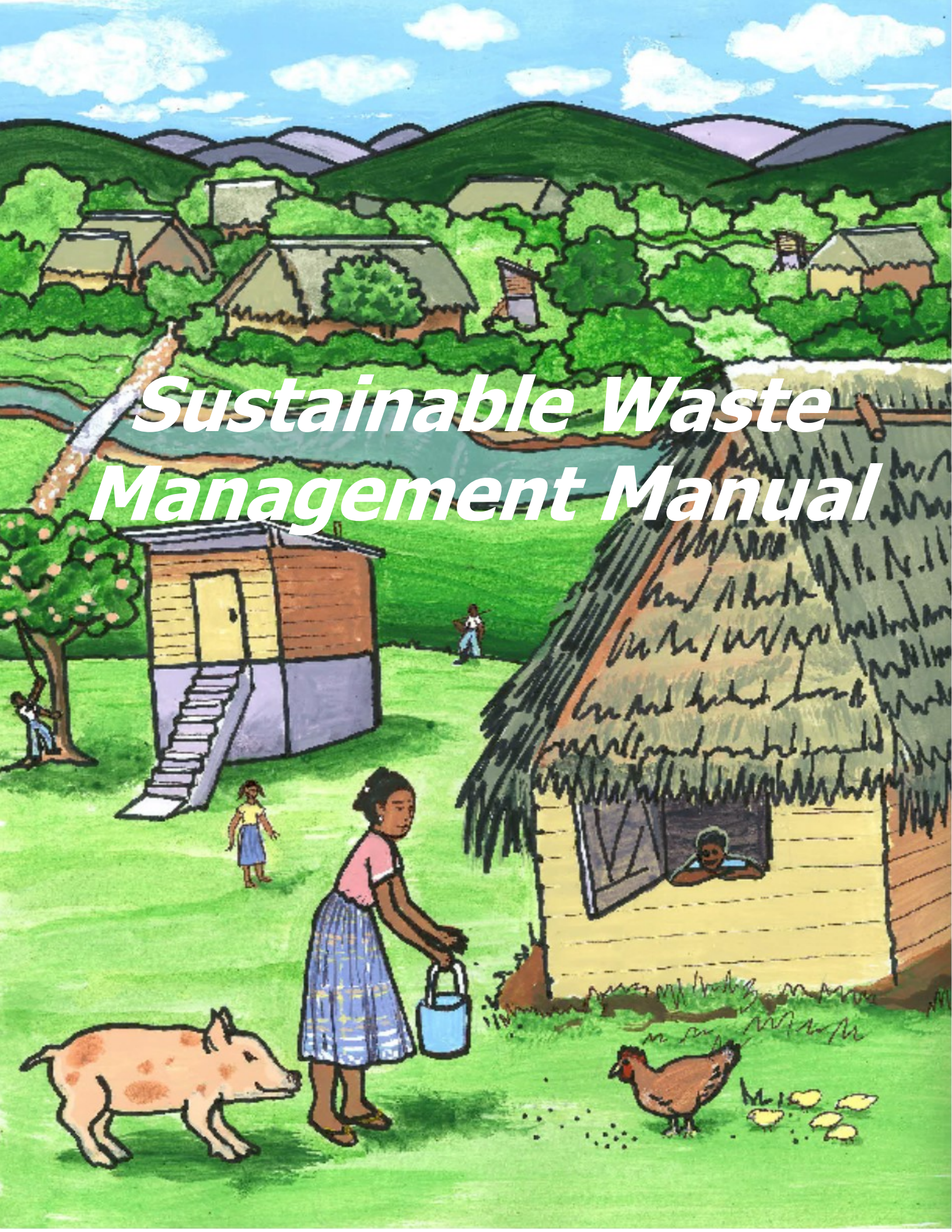




Sustainable Waste Management Manual

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2017

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Foreword

The San Benito Poite (SBP) Latrine Project was developed to address the health and hygiene needs of the community. San Benito Poite, like many of the southern villages in Belize, faces high rates of gastrointestinal diseases resulting in a high number of community members visiting clinics with diagnoses of gastroenteritis. These diseases are most commonly caused by the consumption of contaminated food and water. As a result, the fecal-oral cycle of disease begins, and is ultimately sustained through poor hygiene practices, including improper hand washing, defecating in the open, and not covering food. The goal of the SBP Latrine Project was to create a healthier environment by eliminating uncontained feces through the use of clean and sustainable latrines.

In this manual, you will find descriptions of both the problem and the solution, as well as a step by step guide on how to construct a double-vaulted composting latrine. This type of latrine is best suited for communities that are flood-prone and/or have a high water table, as well as those that are seeking more sustainable waste management practices.

This project was created through a collaboration of the community of San Benito Poite, Peace Corps Belize, and the Maya Mountain Research Farm (MMRF). Support for this project came from community members in the village of San Benito Poite, a Peace Corps Partnership Project grant funded through crowd-sources contributions, and MMRF. The Peace Corps Partnership Project grant is a tool that allows Peace Corps Volunteers worldwide to assist local communities to implement small, sustainable projects in their communities. The technical expertise was provided by MMRF, an education/research centered NGO operating in Belize that promotes permaculture and sustainable agriculture.

The Problem

How do we contaminate water?

When human waste ends up in the ground, it can contaminate ground water. This makes it possible to put the bacteria, viruses and eggs of people infected with different kinds of feces borne illnesses back into more people.



The Problem (cont.)

How do illnesses spread?

Traditionally, many people used to “go to the bush” to defecate. This waste would sometimes be eaten by pigs or dogs who could then carry the illnesses in their own feces or saliva and retransmit it to other people.



The Problem (cont.)

How do people get sick?

Flies can land on the feces of a sick person and then land on uncovered food. When someone eats the contaminated food it can make them sick. Feces borne illnesses include eggs, bacteria and viruses that cause diarrhea/loose stool, tape worms, round worms, cholera, giardia, hepatitis.



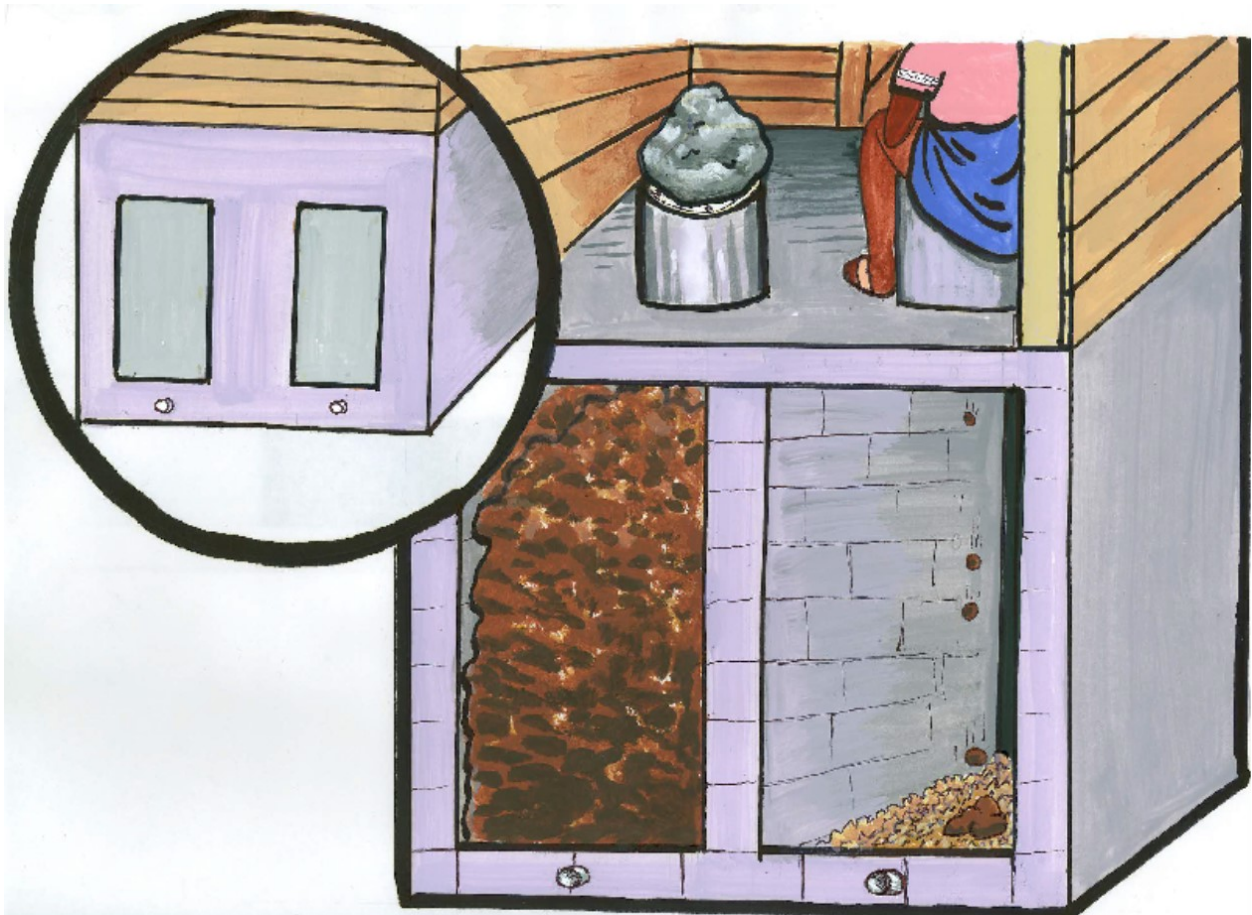
The Solution

What is a double-vault composting latrine?

Double vault latrines are two vaults that you fill with feces and a source of carbon, such as rice hulls or sawdust. When you have carbon and oxygen in air, you get thermophilic composting, which is where small organisms break down the feces at high temperatures.

When using the latrine, you use only one vault at a time. First you put in a layer of carbon, saw dust or rice hulls, about 6 inches deep. Then, every time you use the toilet, you throw down some more carbon to cover it. If the balance is good, there should be no smell.

When the first vault fills up, close it to let the feces complete the composting process, which takes about 2 years. During that time, you will use the second vault until it is full. When the second vault is full, close it. Empty the first vault, which is now filled with clean, bacteria-free compost. You will then use the first vault again and repeat the process.



Complete Parts List

The amounts listed below reflect 2017 prices in Belizean Dollars. The prices are included to give an estimated cost of each latrine. It is advised to price out the cost of a latrine with the current market value before purchasing materials.

Blocks (4 inch): 148 ($\$1.40 \times 148 = \207.20)
Cement: 15 bags ($\$19.95 \times 14 = \299.25)
Sand and gravel: 75 buckets or 2.5 yards ($\$45.00 \times 2.5 = \112.50)
Plain sand: 20 buckets or 1 yard ($\$45.00 \times 1 = \45.00)
Zinc roofing: 4 pieces (8 feet x 33 inches) ($\$29.20 \times 4 = \116.80)
Rebar (3/8 inch): 10 pieces ($\$15.75 \times 10 = \157.50)
Tying wire: 2.5 lbs ($\$2.00 \times 2.5 = \5)
Umbrella head nail: 3/4 lb ($\$4.50 \times .75 = \3.38)
Heel Strap (for cement): 4 ($\$6.75 \times 4 = \27.00)
Threaded rod (3/8 inch): 48 inches ($\$18.00 \times .20 = \3.60)
Washers (2/3 inch): 16 ($\$0.20 \times 16 = \3.20)
Nuts (2/3 inch): 16 ($\$0.15 \times 16 = \2.40)
3 inch PVC pipe: 1 ($\$78.00$)
3 inch PVC elbow: 2 ($\$8.50 \times 2 = \17.00)
2 inch PVC pipe: 4 feet ($\$33.00 \times .20 = \6.60)
Toilet seat: 2 ($\$29.00 \times 2 = \58.00)
Flat metal sheeting (26 gauge) : 1/2 sheet (4 feet x 4 feet) ($\$65.00 \times .5 = \32.50)
Nails (2.5 inch): 4 lbs ($\$3.50 \times 4 = \14.00)
Nails (1 inch): 1/4 lb ($\$3.50 \times .25 = \0.88)
Cement nails (4 inch): 1 lb ($\$3.75$)
Cement nails (2.5 inch): 1/4 lb ($\$3.75 \times .25 = \0.94)
Hinges: 1 ($\$6.50$)
Wire mesh: 3 feet wide (3 yards) ($\$8.25 \times 3 = \24.75)
Wall mount basin: 1 ($\$78.00$)
Basin bracket: 1 ($\$6.00$)
Screws: 5 ($\$1.00$)
Bathroom faucet: 1 ($\$16.00$)
Angle valve: 1 ($\$8.50$)
Supply line: 1 ($\$8.00$)
Po plug: 1 ($\$5.50$)
P trap: 1 ($\$6.25$)
PVC Glue: 1 ($\$5.00$)
Lumber for bracing (2 inch x 4 inch): 110 ft ($\$150.00$)
Lumber for posts (4 inch x 4 inch x 8 feet): 4 posts ($\$20.40 \times 4 = \81.60)
Lumber for siding (1 inch x 4 inch): 175 feet ($\$112.20$)

Total: \$1,703.80 BZD

List of Parts by Use

The parts from page 6 are organized below by their specific uses. Each grouping is a step in the construction process of the latrine. You will find the corresponding building instructions on pages 8-13.

Foundation (pg.8-9)

Cement – 3-3.5 bags
Sand and gravel – 24-28 buckets
Rebar – 4.5 lengths (180 feet)
Tying wire – 1 lb
2 inch PVC pipe for drainage

Block Walls (pg. 10)

Blocks – 148
Cement – 4-4.5 bags (laying blocks and plastering inside of walls)
Sand – 16-20 buckets

Toilet seat chutes (pg. 11)

Cement: 1 bag
Sand and gravel: 4-8 buckets
5 Gallon bucket: 2
Toilet Seat: 2

Floor and stairs (pg. 12-13)

Cement: 5-5.5 bags
Sand and gravel: 40-44 buckets
Rebar: 5-5.5 lengths (floor and stairs)
Tying wire: 1.5lb
Heel Strap: 4 (one in each corner)

Ventilation (pg. 12-15)

3 inch PVC pipe: 2
3 inch PVC elbow: 2

Access Door (pg. 15-17)

Metal sheeting

Scrap wood for frame

Cement nail (2.5 inch): 1/4 lb

Superstructure (pg. 15-17)

Posts: 4 - 4 inchx4 inchx6-7 feet

Threaded rod: 48 inches

Nuts: 16

Bolts: 16

Boards: 1 inch x 4 inch(175 feet)

Bracing/floor/roof: 2 inch x4 inch (110 feet)

Nails (2.5 inch): 4 lbs

Cement/Regular nails (4 inch): 1 lb

Zinc Roofing: 4 sheets

Umbrella head nails: 3/4 lb

Wire mesh

Nails (1 inch): 1/4 lb

Hinges for door: 1

Sink (pg. 15-17)

Wall mount basin: 1

Basin bracket: 1

Screws: 5

Bathroom faucet: 1

Angle valve: 1

Supply line: 1

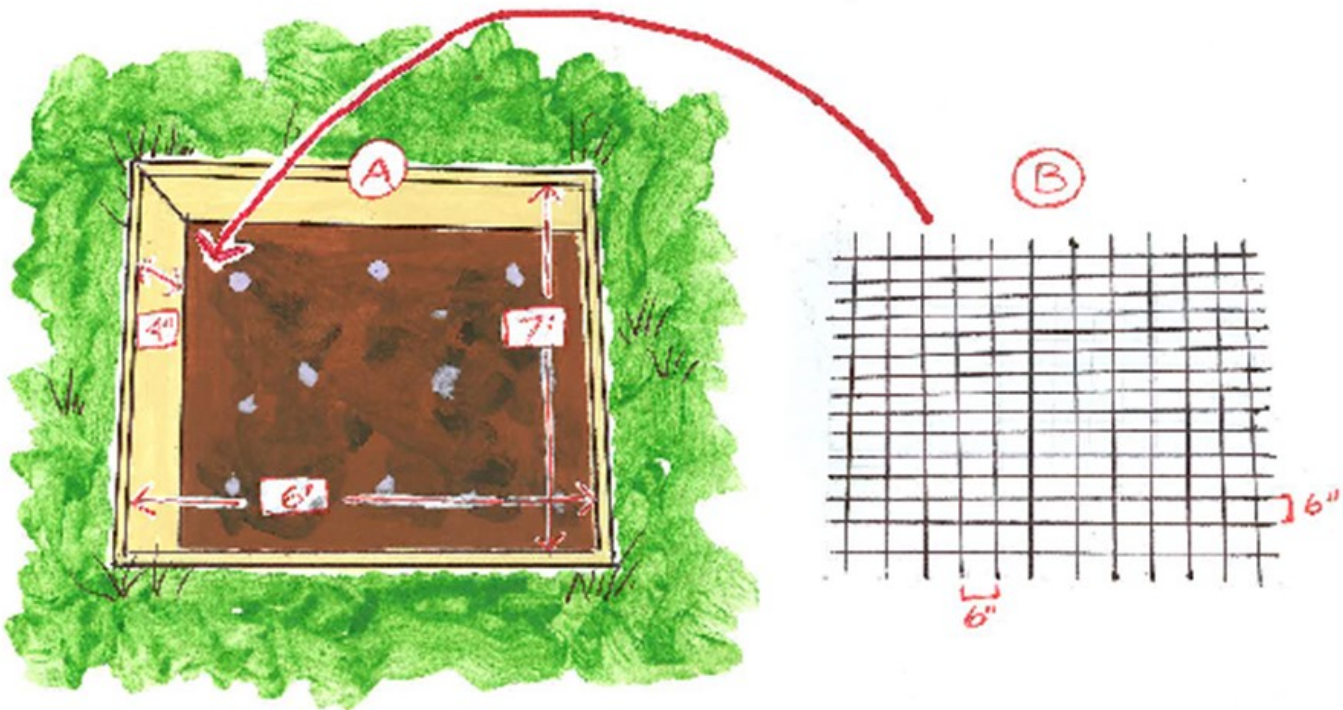
Po plug: 1

P trap: 1

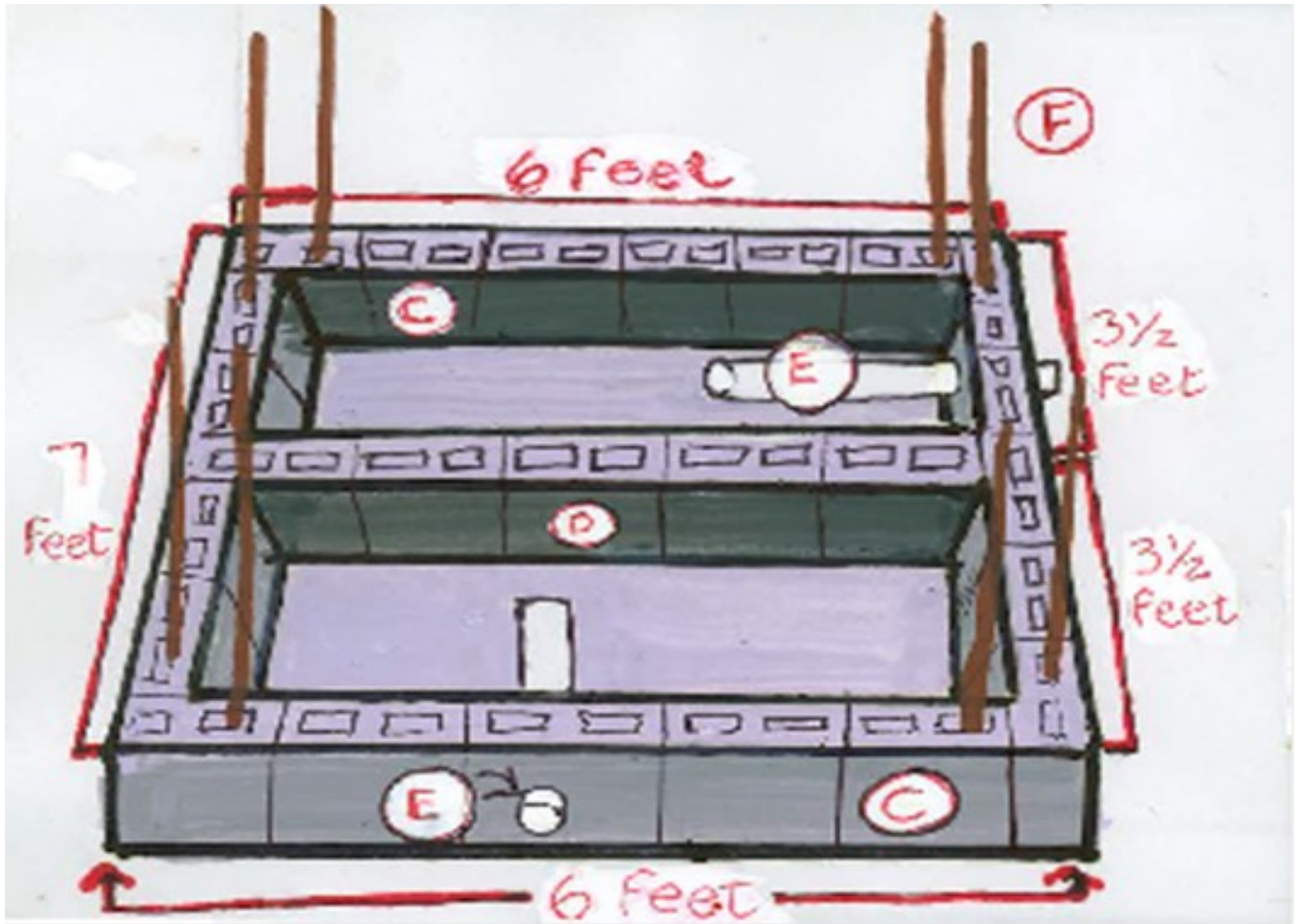
PVC glue: 1

The Foundation

Measure out a seven and a half foot by six and a half foot (7.5'x6.5') rectangle and level the ground. Using scrap wood, build a frame on the perimeter of the rectangle with boards that are four inches (4") high^A. Make sure that the inside measurement of the frame is seven feet by six feet (7'x6').



Create a seven foot by six foot (7'x6') grid of rebar by tying together rebar every six inches (6") both vertically and horizontally^B. Place the grid in the leveled rectangle and place small rocks below to make sure the rebar is not touching the ground.



When mixing cement for the foundation, mix eight buckets of sand and gravel per each bag of cement. Pour a seven foot by six foot by four inch (7'x6'x4") thick foundation.

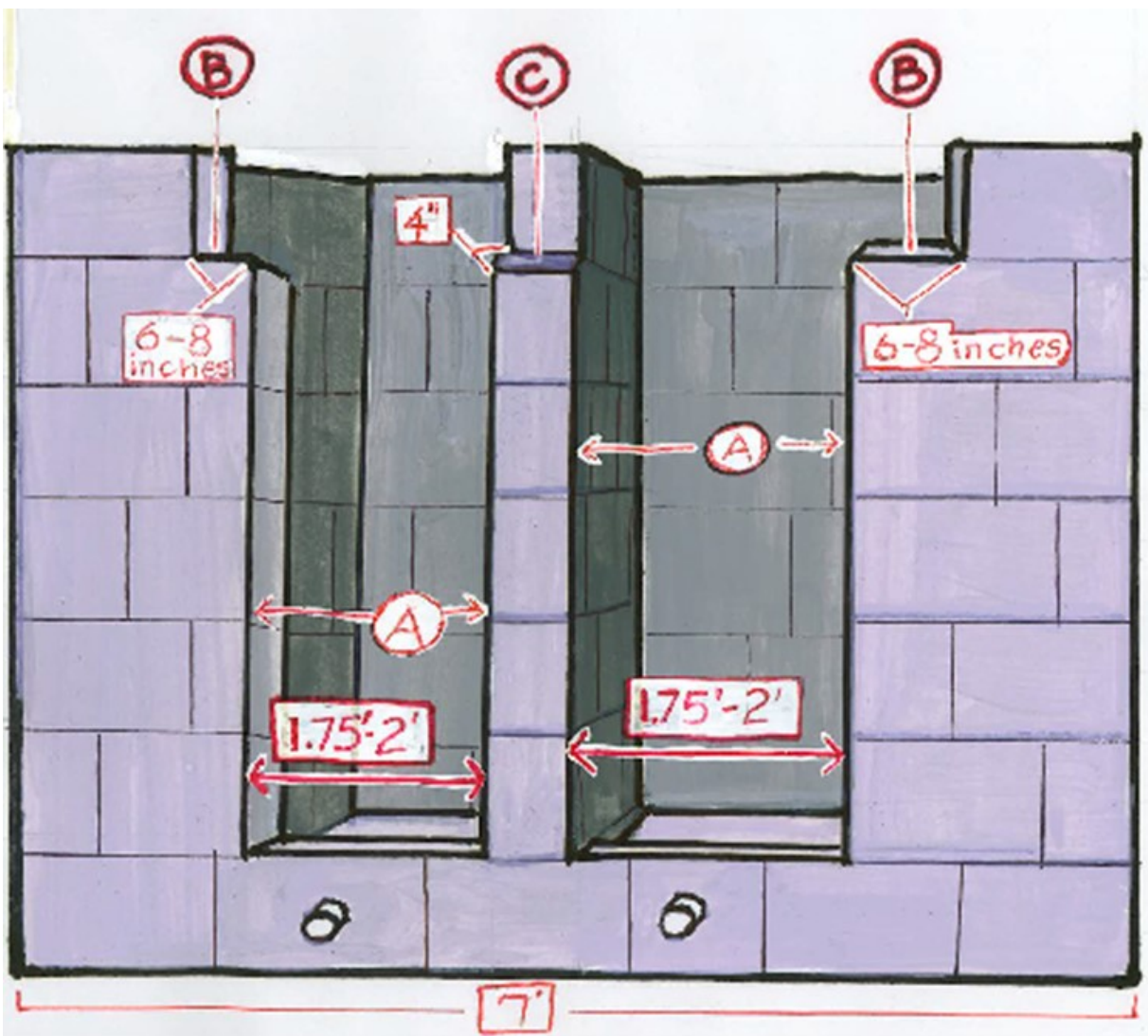
When the cement is semi-dry, lay one full row of blocks to create a firm hold in the foundation. One full row includes the outside perimeter^C and the dividing wall^D that runs parallel with the six foot (6') sides of the perimeter.

Chip a two inch (2") hole in two of the blocks on the perimeter, one in each section. Lay the two inch (2") PVC pipes in the floor of the foundation and through the chipped blocks so that the end of the pipe runs flush with the edge of the foundation^E. After laying the pipes, fill in the chipped hole around the pipe with cement ensuring that it is fully closed. In each corner^F, stand straight two three foot (3') pieces of rebar in the corner blocks^F.

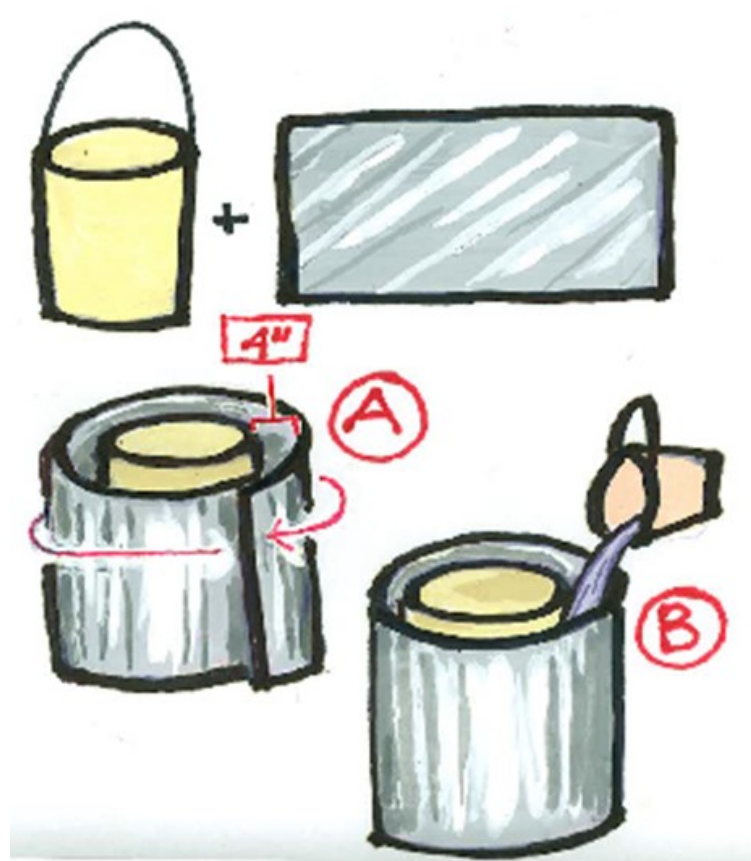
The Block Walls

When mixing cement to lay the blocks, mix four buckets of sand per each bag of cement. Lay rows 2-7 of the blocks making sure that the blocks are staggered when laid. Do not lay full rows of blocks. There will be a space left open at the back of each vault where the access doors will go^A. The space will be about a foot and three quarter inches to two feet (1.75'-2') wide depending on how the blocks are laid.

For the top row of blocks (row 7), place the correct size block that leaves six to eight inches (6"-8") of space from the block to the edge of the door frames on the back of the latrine^B. For the dividing wall, leave a four inch (4") space from the end of the dividing wall at the back of the latrine to the last block placed on the dividing wall^C. The space left open will be framed and filled with cement when pouring the floor on the following day. Plaster inside walls of the vaults. When plastering, mix four buckets of sand per each bag of cement used.



The Toilet Seat Chutes



To create the toilet chutes, wrap and tie the flat metal sheeting around an old five gallon bucket leaving a four inch (4") space between the metal and the bucket^A. Mix four to eight (4-8) buckets of sand and gravel with one bag of cement. Pour half of the mixed cement into the space created by the metal sheet making sure not to pour higher than the top of the bucket^B. Let the mold harden, and when dry, remove the metal sheeting and the bottom of the bucket so that you have an open toilet chute. Repeat the process with the rest of the mixed cement to create the second toilet seat chute.

The Floor, Stairs, and Ventilation

Use scrap wood to create a frame around the structure and inside of the vaults to pour the floor^A. Make sure to frame the space left open at the top row of blocks so that it is also filled with cement. That will create the top of the door frame for the access doors. The perimeter frame needs to be four inches (4") above the top of the blocks.

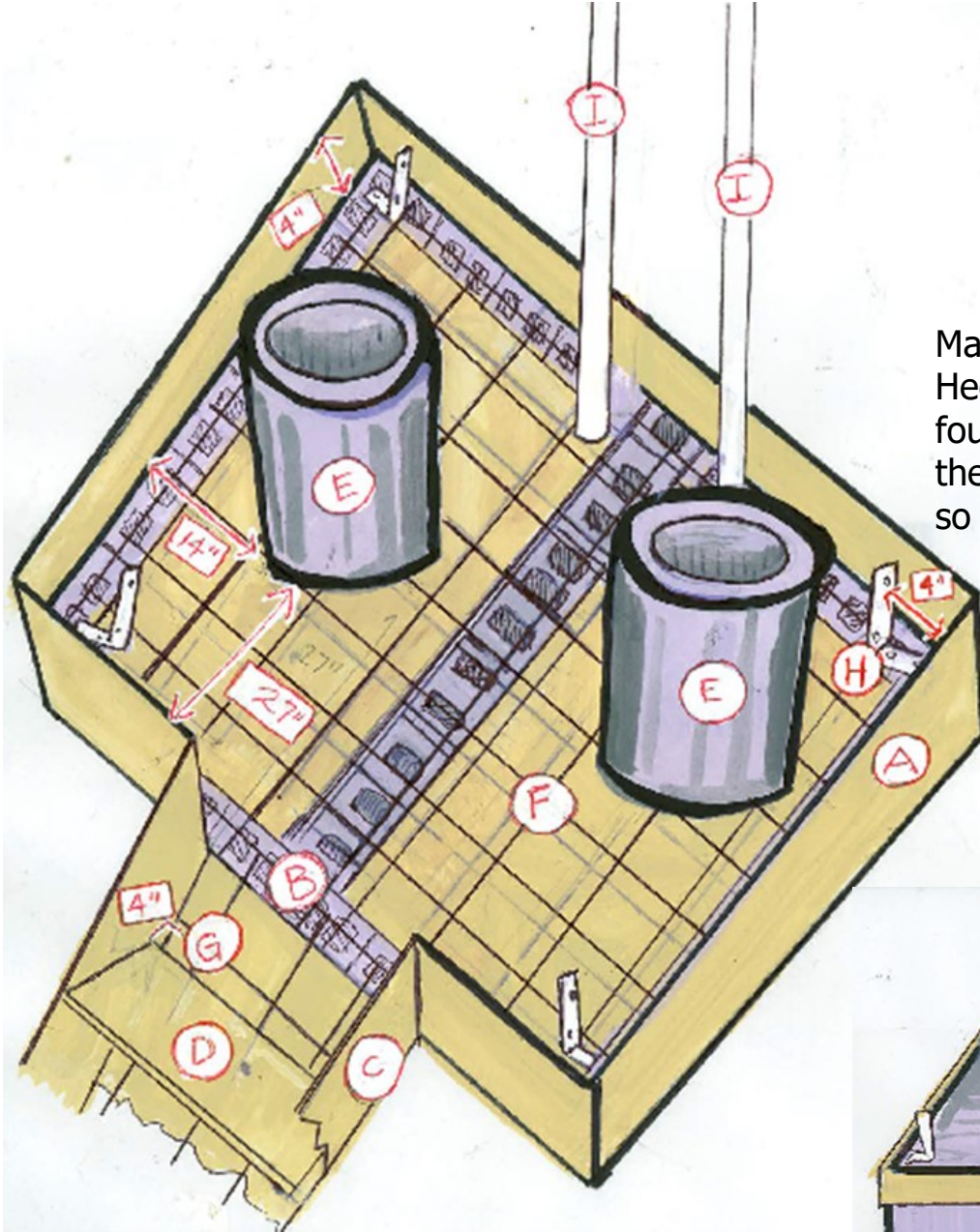
When putting the frame at the front of the structure, leave a two and a half foot (2.5') space where the stairs will go^B. Use more scrap wood to build the frame for the stairs. Use seven to eight foot (7'-8') boards to form the outside and bottom of the frame^C. Use seven boards that are eight inches (8") tall and space them about ten inches (10") apart to form the steps^D. When nailing the boards to form the steps, make sure to leave a four inch (4") space between the boards and bottom of the frame so the steps will have a four inch (4") thick foundation.

Place the hardened toilet chutes on the floor frame^E. The toilet chute should be placed about 14 inches (14") from the side edge of the blocks and about 27 inches (27") from the front edge of the blocks.

Lay and tie the rebar pieces on top of the frame like the rebar for the foundation. Create a grid-like structure placing the rebar every six inches (6") in both directions^F. You will have to cut the rebar to fit in the spaces where it meets the toilet chutes. To lay the rebar for the stairs, cut three seven foot (7') pieces of rebar and lay them in the frame and tie them to the rebar grid of the floor. Cut seven two foot (2") pieces of rebar and tie them horizontally to the rebar on the stairs for each step^G. Place a few small rocks below the rebar to make sure the rebar is raised a few inches and is not touching the wooden frame on the floor or the stairs. Stand any extra eight inch to ten inch (8"-10") pieces of rebar in the perimeter blocks that will help secure the frame on day four.

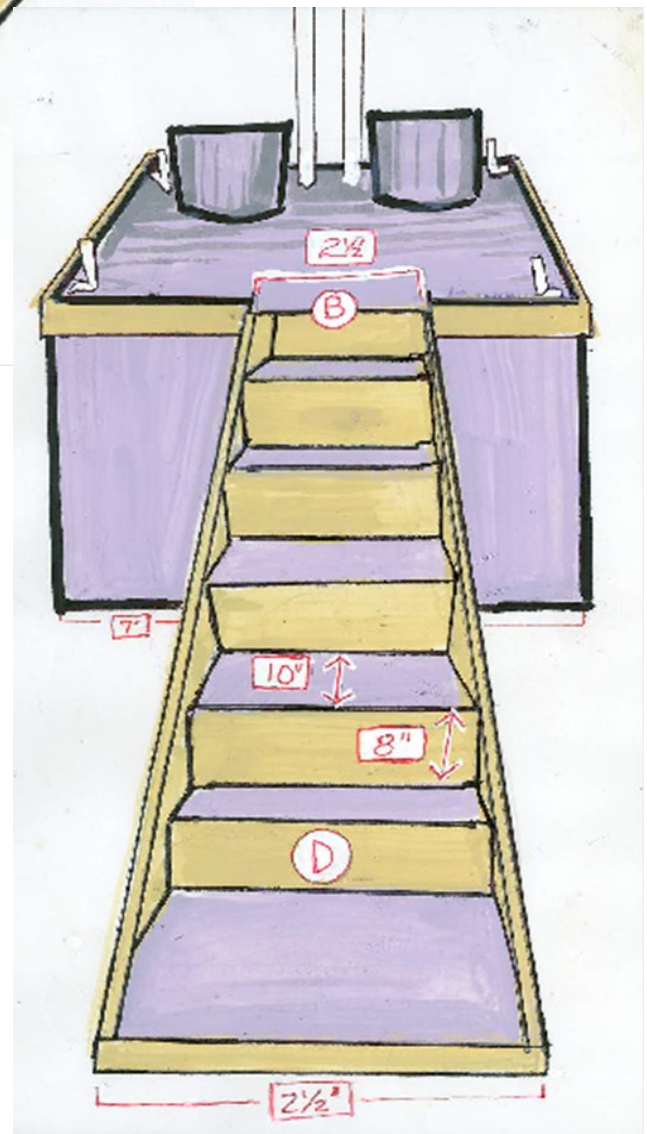
Place one Heel strap in each of the four corners^H.

Place the two ventilation pipes in the floor, one in each section^I. Someone will likely have to hold the pipes while the cement is being poured around them.



Make sure that the Heel straps are placed four inches (4") from the edge of the frame so the posts will fit.

When mixing the cement for the floor and stairs, mix eight (8) buckets of sand and gravel for each bag of cement used. Pour the floor and stairs.



The Superstructure, Access Doors, and Sink

Begin by attaching the four inch by four inch (4"x4") posts to the Heel straps that were placed in the floor on day three. The two front posts should be seven feet (7') tall and the two back posts should be six and a half feet (6.5'). Cut the threaded rod to 5 inch (5") pieces, bore holes in the posts to line-up with the Heel straps, and secure the posts with the threaded rod, nuts, and bolts^A.

Cut two two inch by four inch by seven feet (2"x4"x7') pieces of wood and nail them on top of the posts to connect each back post to the front posts. Next cut three two inch by four inch by eight and a half feet (2"x4"x8.5') pieces of wood. Nail one piece at the back of the structure to connect the two back posts, one in the middle, and one at the front of the structure to connect the two front posts.

Cut appropriate length two inch by four inch (2"x4") boards to create the frame on the floor. Place the boards on the perimeter of the floor between each of the posts^B making sure to leave a two foot (2') space at the top of the stairs for the door. Drill holes in the boards on the floor and bend the rebar to secure them.

Cut three two inch by four inch (2"x4") pieces of wood to appropriate lengths for the bracing on the back and two sides of the structure^C. Cut two two inch by four inch (2"x4") posts to appropriate lengths to create the door frame.

Cut the ventilation pipes so they will fit just under the roof^D. Use the elbow and the extra pipe to face the pipes out of the back of the latrine.

Next, use the umbrella head nails to attach the zinc roof^E. Make sure that the zinc pieces overlap each other about six to eight inches (6-8").

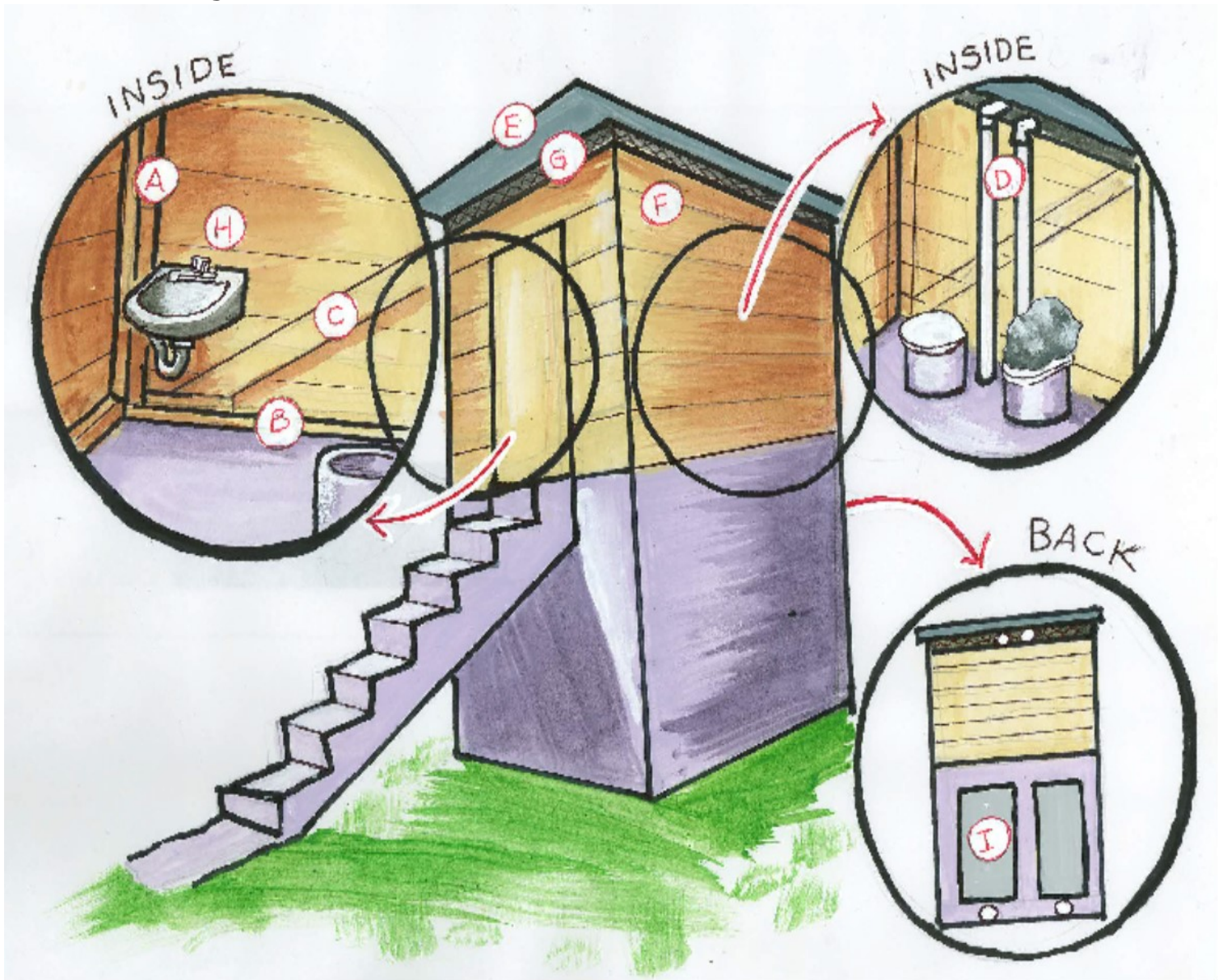
Nail the one inch by four inch (1"x4") boards to close the structure^F. Leave an eight inch (8") space between the top of the boards and the roof. Measure and cut the wire mesh to fit in the space and nail it to the boards with one inch (1") nails^G.

Create the door to the structure.

Attach the sink to the inside of the structure^H.

Create the access doors at the back of the latrine by using scrap two inch by four inch (2"x4") wood to create a door frame inside the blocks. Create the metal door by nailing the flat sheet metal to a small wooden frame^I.

Drill holes in the wall to connect the water source to the sink and to direct the runoff pipes outside and to the ground.



Nail or screw the door to the wooden frame on the back of the latrine.

Xyib'ankil

Li latrine project re li k'aleb'aal San Benito Poite (SBP) ki yoob'amank re xtemq'ankileb' li kristian re kauilal. Li k'aleb'aal Poite, kama nab'al li k'aleb'aal se B'elice, naril nab'al li yajel re se' sa' ut nab'al li kristianeb' neke xik se' b'anleb' rikin li yajel gastroenteritis. Li yajel ain joon ta chap joq'e ta k'ux li wa ink'a us yib'amb'il, ink'a chaab'il naj ch'aj rub' li xyib'ank re', li kristian neke q'otak chirix kab'l ut joq'e ink'a chaab'I ta mule' li wa. Eb' ain neke b'anunkre', ut na qamokre', li yajel. Li xyalalil li SBP ha'an re xyib'ankil junak chaab'il najej b'ar junil li kristian chaab'il neke xtzekrib'.

Sa' li hu ain, ta tau li problem ut li xyib'ankil, jokan ta tau ajwi chankru xyib'ankil junak li q'otleb'aal kwwib' xjulel. Li q'otleb'aal ain jwal chaab'il re kama najej mas na b'ut'iha ir'ut.

Li project ki yoob'amank rikin li temq' li k'aleb'aal San Benito Poite, li Peace Corps, ut li Maya Mountain Research Farm (MMRF). Li temq' re li k'anjel ain ki chal rikin eb' li k'aleb'aal, li temq' tumin rikin li Peace Corps ut ajwi li MMRF. Li temq' tumin xb'an li Peace Corps ha'an jun temq' reheb' laj k'anjel re Peace Corps re te'ex tyoob' junak project sa' xk'aleb'aaleb'. Li chaab'il naleb' ha'an xtaumank rikin li MMRF.

Li ch'ajkilal:

Chankru naqa tz'ajni li ha?

Jog'e naj na julak lix tz'ajnil li kristian sa' ch'och, joon naj j'ot li ha' wank rub'el ch'och. Chikama' in q'un re t'ok li bacteria, viruses ut li molb' wank rikin junak kristian wank xyajel rikin junak ani chik.



Li ch'ajkilal (xkomon)

Chankru naj puktasirib' li yajel?

Chalen chaq, nab'al li kristian neke xik "se' pim" chix tz'ekb'aleb 'rib'. Li tz'ajñ ain wank kuntank neke xk'ux li kuy malaj tz'i; ut nekex qam li yajel sa' xq'ot eb' malaj xchuub'eb' ut nekex b'on jalan chik kristian.



Li ch'ajkilal xkomon

Chankru neke yajo li Kristian?

Eb' laj b'ujl neke xakli chiru lix q'ot junak li yaj, ut neke xik chik chiru tzekehem, xkeb'al chix yajel jalan. Joq'e naj junak ani naj k'ux li wa wank tz'aj sa' joon na yajo. Li yajel na chal se' q'ot na chal kama xmolb' kok' xul, bacteria ut virus ha'an neke kehok re q'otakil, xyawail lukum, sank, xa'awk, giardia, ut q'anyajel.



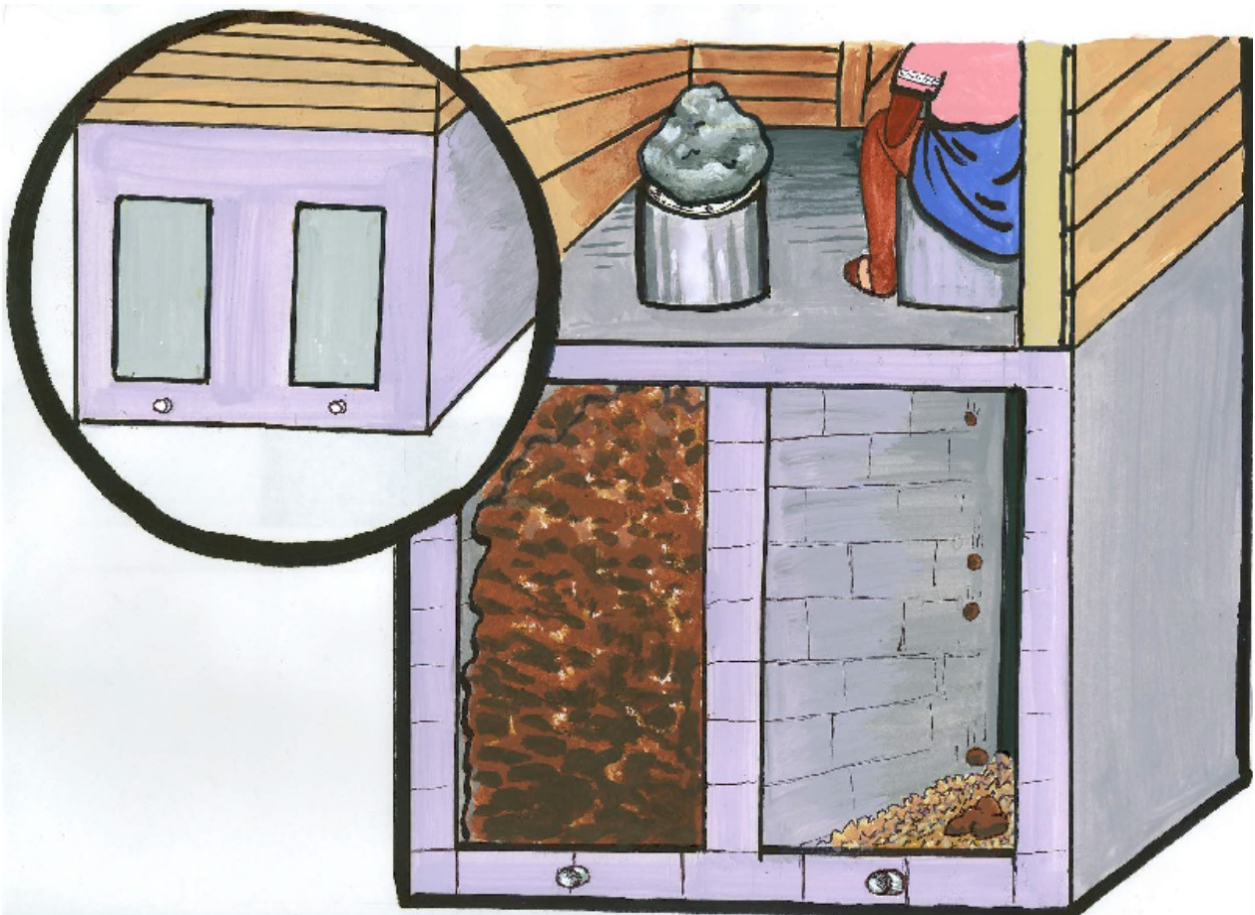
Chankru xyib'ankil

K'aru li q'otleb'aal kwiib' xjulel?

Li q'otleb'aal kwiib' xjulel, lix kaab'ichal ain ta nujtasi chi q'ot ut kama' rix aroz malaj saw dust. Xb'anak joq'e wank li carbon ut li iq' xsa' tyamp li q'ot, neke tyoola kok' xul re'ex k'ajinkil li q'ot.

Joq'e naj ta wosari junak li q'otleb'aal, jun ajwi ta wosari xb'een w'an. Xb'eenil ta hir b'ayak li carbon, saw dust malaj rix aroz, wakib' inch ihru ta qe. Ut joq'e chik ta wosari li q'otleb'aal, ta mule'/ta hir xkomon li carbon malaj rix aroz xb'ehen. Wi us naj ta b'anu, maka'ak' lix b'ook li q'ot.

Joq'e naj tnujak li xb'eenil jul, tz'ap ihre' ut ta wib'e chi e'lk li q'ot sa', ain naj q'am kama kwiib' haab'. Ut anajwa joon naka wosari li xkaab'il jul toj retal tnujak. Joq'e naj tnujak wichik ain ta tz'ap ajwi. Ut anajwa joon naka wosari li xb'eenil li jul, chirix li kwiib' haab' maka' chik q'ot xsa'. Kama 'an chi kama'an ta b'anu.



Li k'a'aq re ru na raj re xyiib'ankil junak

Eb' li xtz'ak awankeb' taq'a ha'an eb' re li haab' ain- 2017. Eb' li xtz'ak wankeb' re xtz'ilb'al irix harub' xyiib'ankil junak li q'otleb'aal. Na tyemank naj tento ta tz'il irix harub' ta tz'ek chix xyiib'ankil junak.

Blocks (4 inch): 148 ($\$1.40 \times 148 = \207.20)
Cement: 15 bags ($\$19.95 \times 14 = \299.25)
Sand and gravel: 75 kub'eet or 2.5 yards ($\$45 \times 2.5 = \112.5)
Samahii': 20 kub'eet or 1 yard ($\$45 \times 1 = \45)
Simb': 4 r'epel (8 foot x 33 inches) ($\$29.20 \times 4 = \116.8)
Steel: 10 rapal ($\$15.75 \times 10 = \157.50)
Alampr: 2.5 liwr ($\$2 \times 2.5 = \5)
Kalawx re simb': 3/4 liwr ($\$4.50 \times .75 = \3.38)
Heel Strap: 4 ($\$6.75 \times 4 = \27)
Threaded rod: 48 inches ($\$18.00 \times .20 = \3.60)
Washers: 16 ($\$.20 \times 16 = \3.20)
Nuts: 16 ($\$.15 \times 16 = \2.4)
3 inch PVC pipe: 1 ($\$78.00$)
3 inch PVC elbow: 2 ($\$8.50 \times 2 = \17.00)
2 inch PVC pipe: 4 feet ($\$33 \times .20 = \6.60)
Toilet seat: 2 ($\$29.00 \times 2 = \58)
Flat metal sheeting (26 gauge): 1/2 sheet (4 feet x 8 feet) ($\$65.00 \times .5 = \32.50)
Kalawx (2.5 inch): 4 liwr ($\$3.50 \times 4 = \14.00)
Kalawx (1 inch): 1/4 liwr ($\$3.50 \times .25 = \0.88)
Cement nails (4 inch): 1 liwr ($\$3.75$)
Cement nails (2.5 inch): 1/4 liwr ($\$3.75 \times .25 = \0.94)
Hinges: 1 ($\$6.50$)
Wire mesh: 3ft wide (3 yards) ($\$8.25 \times 3 = \24.75)
Wall mount basin: 1 ($\$78.00$)
Basin bracket: 1 ($\$6.00$)
Screws: 5 ($\$1.00$)
Bathroom faucet: 1 ($\$16.00$)
Angle valve: 1 ($\$8.50$)
Supply line: 1 ($\$8.00$)
Po plug: 1 ($\$5.50$)
P trap: 1 ($\$6.25$)
PVC Glue: 1 ($\$5.00$)
Lumber for bracing (2 inch x 4 inch): 110 feet ($\$150.00$)
Lumber for posts (4 inch x 4 inch x 8 feet): 4 posts ($\$20.40 \times 4 = \81.60)
Lumber for siding (1 inch x 4 inch): 175 feet ($\$112.20$)

Total: \$1,703.80 BZD

Li hu re k'a'ak re ru na ajmank

Eb' li k'a'ak re ru na ajmank sa' li pajina 6 tusb'ileb' chi taq'a rikin chankru ta wusariheb'. Li junjunk chi ch'uut ha'an naj kut chank ru ta yiib' li q'otleb'aal. Ha'an ain ta tau se' pajina 8-13.

Li Foundation (pg. 24-25)

Cement – 3-3.5 bags

Sand and gravel – 24-28 buckets

Steel – 4.5 lengths (180 feet)

Alampr – 1 liwr

Li Tzak (pg. 26)

Blocks – 148

Cement – 4-4.5 bags (laying blocks and plastering inside of walls)

Sand – 16-20 kub'eet

Li chunleb'aal re q'otak (pg. 27)

Cement: 1 bag

Sand and gravel: 4-8 buckets

Toilet Seat: 2

Nimq'i kub'eet: 2

Li Floor ut kaleer (pg. 28-29)

Cement: 5-5.5 bags

Sand and gravel: 40-44 buckets

Steel: 5-5.5 lengths (floor and stairs)

Alampr: 1.5 liwr

Heel Strap: 4 (one in each corner)

Rokeb'iq (pg. 28-31)

3 inch PVC pipe: 2

3 inch PVC elbow: 2

Re kab'l (pg. 30-31)

Metal sheeting

Scrap wood for frame

Cement Nail (2.5 inch): 1/4 liwr

Xjunxakil li q'otleb'aal (pg. 30-31)

Posts: 4 4 inch x 4 inch x 6-7 feet

Threaded rod: 48 inches

Nuts: 16

Bolts: 16

Boards: 1 inch x 4 inch (175 feet)

Bracing/floor/roof: 2 inch x 4 inch (110 feet)

Kalawx (2.5 inch): 4 liwr

Cement/Regular nails (4 inch): 1 liwr

Simb': 4 sheets

Kalawx re simb': 3/4 liwr

Wire mesh:

Nails (1"): 1/4 liwr

Hinges for door: 1

Ch'ajb'a ub (pg. 30-31)

Wall mount basin: 1

Basin bracket: 1

Screws: 5

Bathroom faucet: 1

Angle valve: 1

Supply line: 1

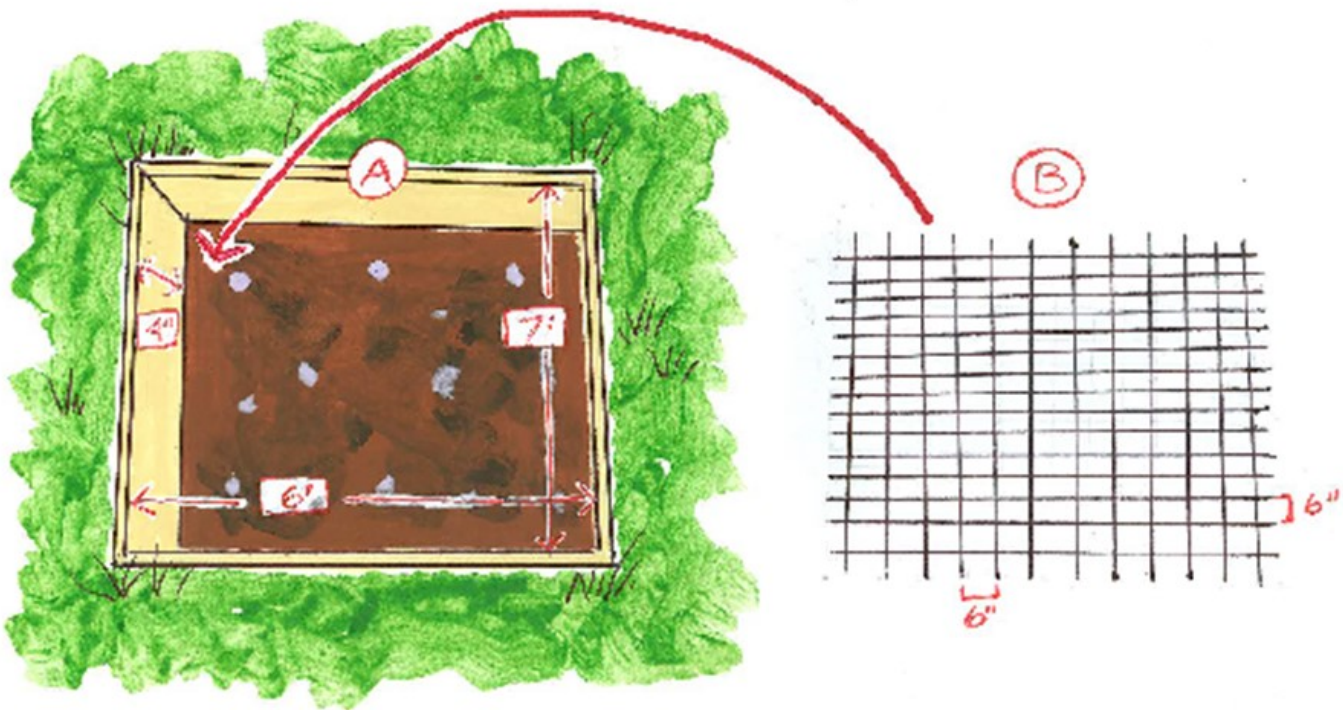
Po plug: 1

P trap: 1

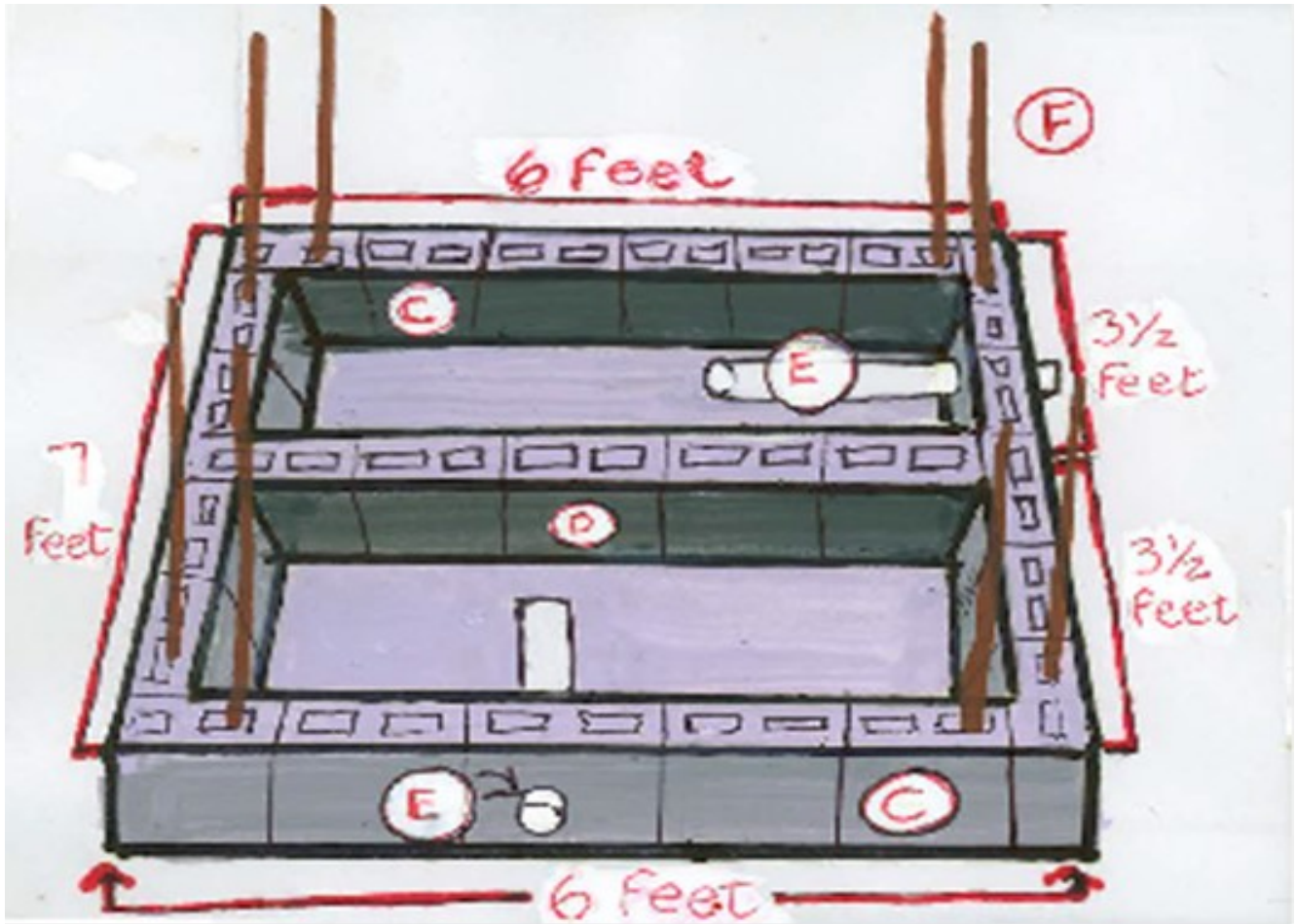
PVC glue: 1

Li Foundation

B'is xnaj b'ar ta tyiib' li q'otleb'aal, kama junak wuqub' pieh imeer ut wakib' pieh imeer (7.5'x6.5'). Tyiib' junak frame chirix li najej rikin junak li tab'l (4 inches) xteram^A. Ut taje retalil naj wuqub' by kwakib' pieh (7'x6') xsa'.



B'ak li steel chirib'il chi kok' ka'xukut re okre re rub'el^B. Tanab' li steel xa b'ak sa li chaxon xa tyiib' ut ta qe kok' pek chi rub'el re ink'a tch'e' a ch'och.



Jog'e naj tyo a mixihom li cement re foundation, mixi waxaqib' kub'et sand and gravel re' junjunk chix saah'kil cement. Qe junak foundation wuqub' pies rok, waqib' pieh rit ut kahib inch ru/xpimal (7'x6'x4").

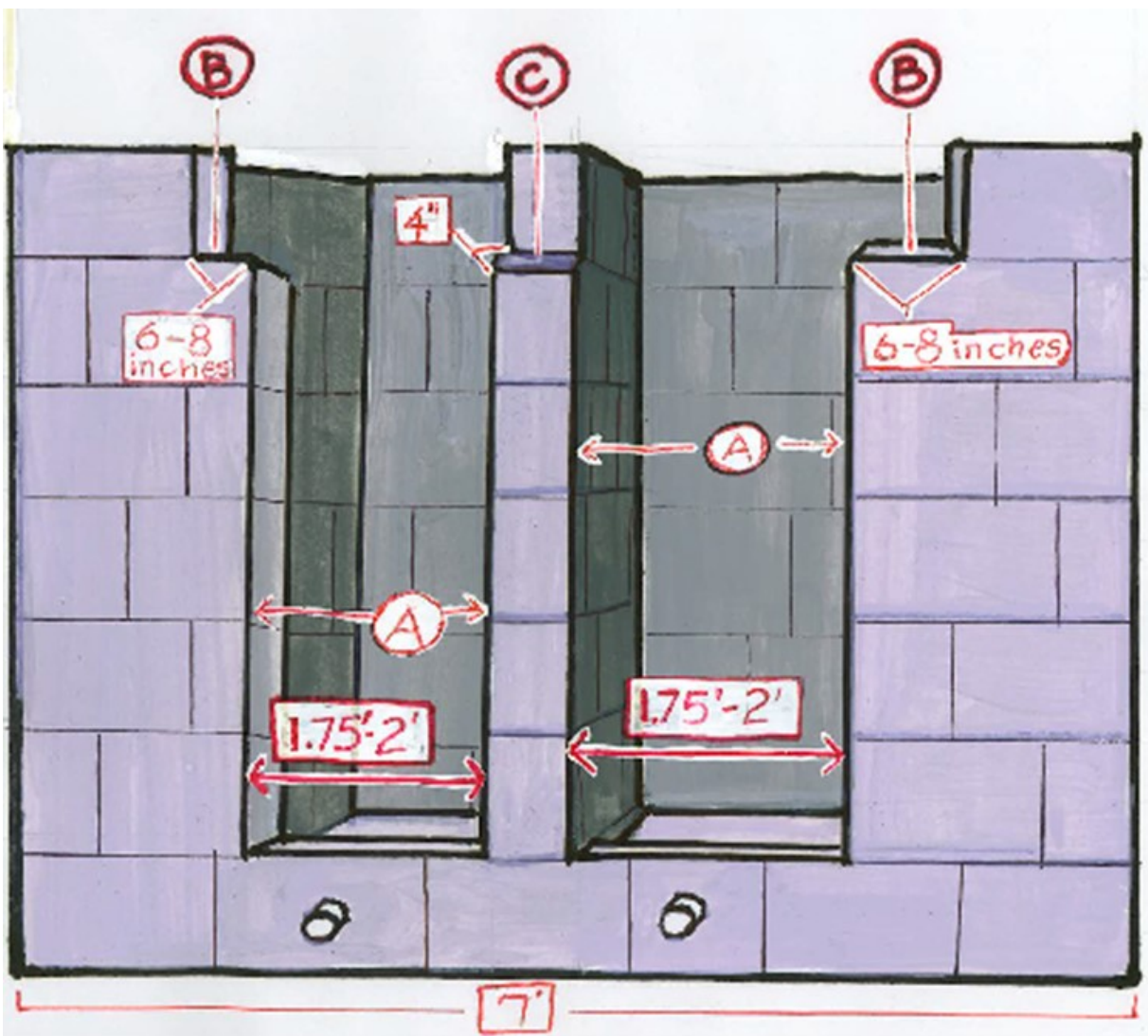
Jog'e naj toj ha' b'ayak li cement ta qe jun tzol chi blocks chirix^{C/D} re kaw tchaprib' li foundation.

Sa xkatsa' eb' li block sa' kapak'al, pa' junjunk li jul (2 inch) re b'ar ta woksi li 2 inch pipe. Ta mule' ain chiru cement re naj ink'a k'ut^E. Chirix ain ta woksi kwiib' chi steel, oxib' pieh iroq chire'heb' li blocks junjunk chire' li kaxon^F.

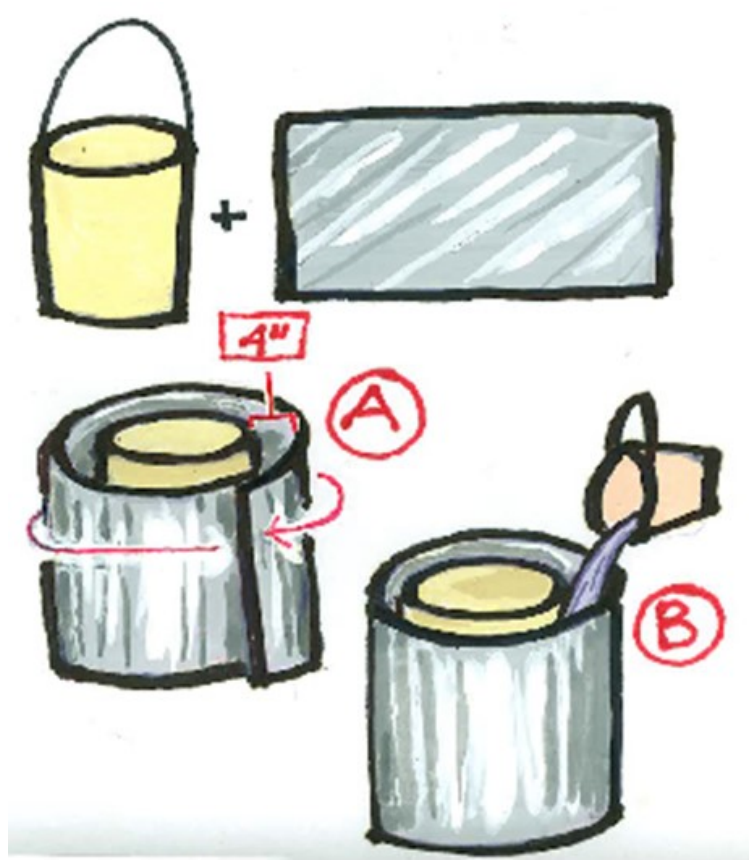
Li Tzak

Jog'e naj tyo a mixihom li cement re xkeb'al li blocks, mixi kahib' kub'eet chi samahi' re jun saahk chi cement. Keh 2-7 rox chi blocks ut tawil naj chiik tyokeb' chi xik. Naj tage' chik li xkomon li row, ta kanab' xnjat b'ar okre li rekab'l^A. Wank' b'ayak te'to b'ar okre li rekab'l chirix junjunk li jul kama 1 foot ut $\frac{3}{4}$ inch (1.75'-2') ut yaal naj ye chankru xa keh li blocks.

Re xwuqil li row (row 7), chaab'il naj ta keh li blocks re naj tkanab' six to eight inches (6"-8") yamyo xyamp li blocks rochb'een b'ar nakre' li rekab'l chirix li toilet^B. Re li xjachb'al li kwiib' chi jul, ta kanab' junak four inch (4") se' xyamp rikin li row chi blocks^C. Li yamyo ain okre chi nujtasimank chi cement jog'e na okre chi kemank li floor chi julajil. Plasteri li xsa' a xa yiib' ut re plasterib'k kahib' kub'eet chi samahi ta wosari re jun saahk chi cement.



Li chunleb'aal re q'otak



Re'ex yib'ankil li chunleb'al, b'ak li flat metal sheeting chirix junak li nimk'i kub'eet ut ta kanab' four inch ak (4") se' xyampeb'^A. Mixih kahib' malaj woxaqib' (4-8) kub'eet chi sand and gravel rikin jun saahk chi cement. Hoy jun hachalak li cement sa' li k'ak'o se' xyamp li metal sheet ut tawil re ink'a numeq xb'ehen li tob'^B. B'anu wi chik ain rikin xjun hachalil chik li cement re xyib'ankil li xkaab'il li chunleb'aal.

Li Floor, Kaleer, ut Rokeb'iq

Tyiib' junak li kaxon chirix li xa yiib' ewer re'ex kehb'al li floor^A. Tento ta tzap li k'ak'o ki kanah xb'ehen li tzaq re naj nujtasimank chi cement ajwi. H'an ain okre chi yiib'ankre xb'ehen b'ar okre li re kab'l. Li frame ain tento naj four inch (4") tak'enak xb'ehen li blocks.

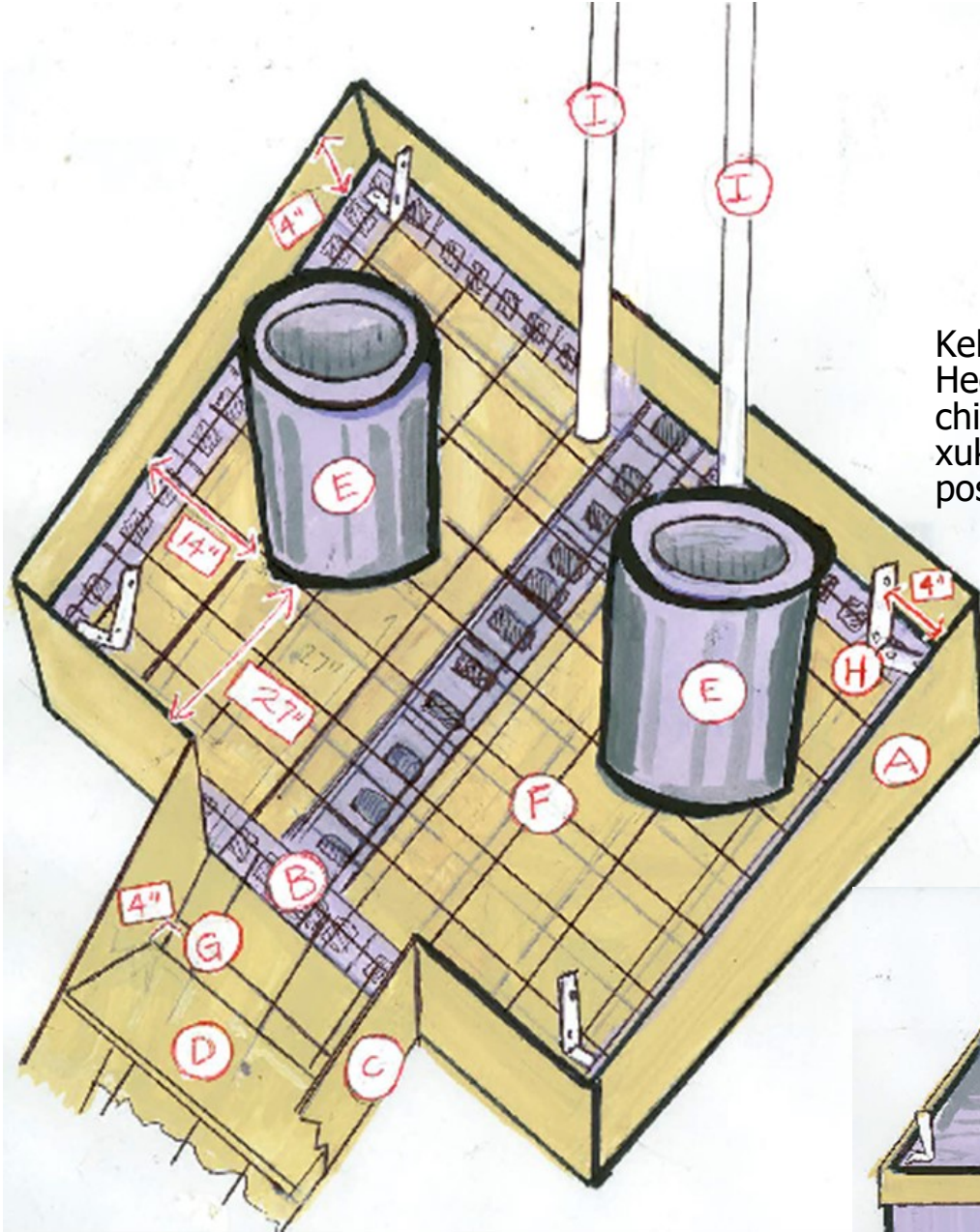
Joq'e naj tyo ayiib'om li frame, ta kanab' junak kwiib' pieh ut meer' (2.5') b'ar chikre' li steps^B. Ta usari q'eel tab'l re xyiib'ankil frame re' steps. Re' rub'el, usari tab'l wuqub' malaj woxaqib' pieh(7'-8') roq^C. Usari wuqub' chi tab'l ha'an woxaqib' inch (8") iru ut yiib' chi lajeb' inch (10") xyamp re xyiib'ankil li steps^D. Joq'e naj tyo a b'ojom li steps, ta kanab' kahib' k'utub' (4 inch) rub'el li steps chiru ch'och re naj kahib' k'utub'ak li foundation re li steps.

Keh li chunleb'al xb'ehen li frame, se' xyi li frame ta keh, 14 inch xnajtal chiru li xq'atsa ut 27 inch chiru xuk li blocks^E.

Tyiib' ut b'al li steel kama xa tyiib' re li foundation ut ta tyokob' xb'ehen li frame^F. Tento ta yok' li steel b'ar na nume li chunleb'al. Ut li steel re li stairs, ta yok' oxib' chi steel wuqub' pie roq ut ta tyokob' eb' chi chiik sa li frame re step. Tyok chik wuqub' r'apal chi steel kwwib' pieh(2 feet) roq ut ta b'ak chiru li oxib' xa tyokob' malak re junjunk chi steps^G. Keh pek rub'el li steel re naj ink'a tch'e' li frame. Kutub' junak r'apal chik steel woxaqib' malaj lajeb' pieh (8"-10") roq chirix li frame re floor re' naj tchap chi us re Xkahil kutank.

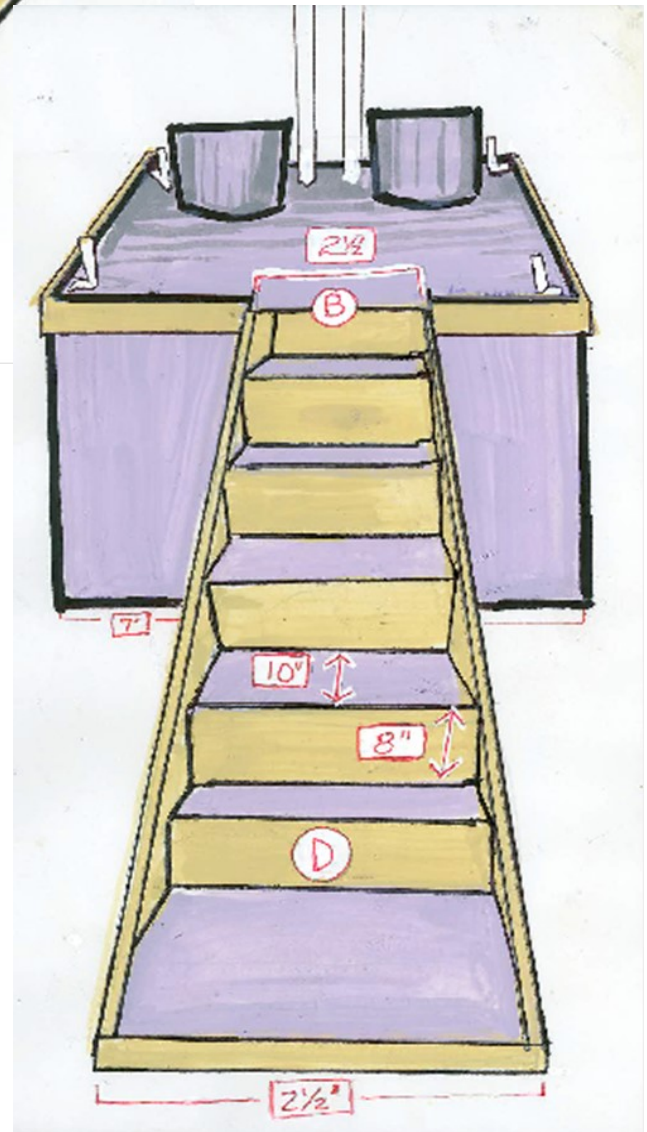
Keh junak li Heel strap sa' kahib' chi xuk^H.

Keh kwiib' ak ventilation pipes sa' li floor, junjunk xk'atk li chunleb'aal^I. Mare' tento te'ex chap joq'e naj te' hoy cement xb'ehen eb'.



Keh retalil naj eb' li
Heel straps kahib' inch
chik ma naj ctau lix
xuk re tz'akal toq li
post/ok'ech'.

Joq'e naj tyo a mixihom li cement re li floor
ut li steps, usari wuxaqib' (8) kub'eet sand
and gravel re' jun saahk chi cement. Hoy ain
sa' li frame re floor ut steps.



Li xjunxakil li q'otleb'aal, li re kab'l ut li ch'ajb'a ub

Keh li four by four (4"x4") oqech chiru li Heel strap xkehman chiru li floor eweraq. Li xb'eenil kwiib' chi ok'ech' wuqub' pieh (7 feet) ak iroq ut eb' li kwiib' chi ixb'ej, waqib' pieh imeer' ak (6.5 feet). Tyok li threaded rod chi hoob' inch (5") iroq, pah junak li jul sa' oqech ut ta b'ak chiru li threaded rod^A.

Tyok kwiib'ak li che' kwiib' inch by four inch by seven feet (2"x4"x7') ut ta kalauxi eb' xb'ehen xkahichal li oqech. Chirix ain, tyok oxib'ak li tab'l two inch by four inch by eight and a half feet (2"x4"x8.5') ih roq ut ru. B'oj junak re'ex xchapb'al a kwiib' chi oqech chi ixb'ej, jun se' xyi ut jun chi u'b'ej reheb' oqech wank chi u'b'ej.

Tyok eb' tab'l two inch by four inch (2"x4") roq re xyiib'ankil a frame chiru floor. Keheb' li tab'l ain se' xyampeb' li oqech^B ut ta kanab' b'ar tnumek' li re kab'l. Paheb' li jul re tnumek' li steel xa keh sahil roxil kutank. B'as li steel re'ex chapb'al li tab'l chiru li tzak.

Tyok oxib'ak two inch by four inch (2"x4") oqech re re kab'l^C.

Tyoleb' li ventilation pipes re tzakal tnumek' rub'el li simb'^D. Tyiib' li pipe b'ar e'lk li xb'ook li q'otleb'aal.

Kalauxi eb' li simb'^E.

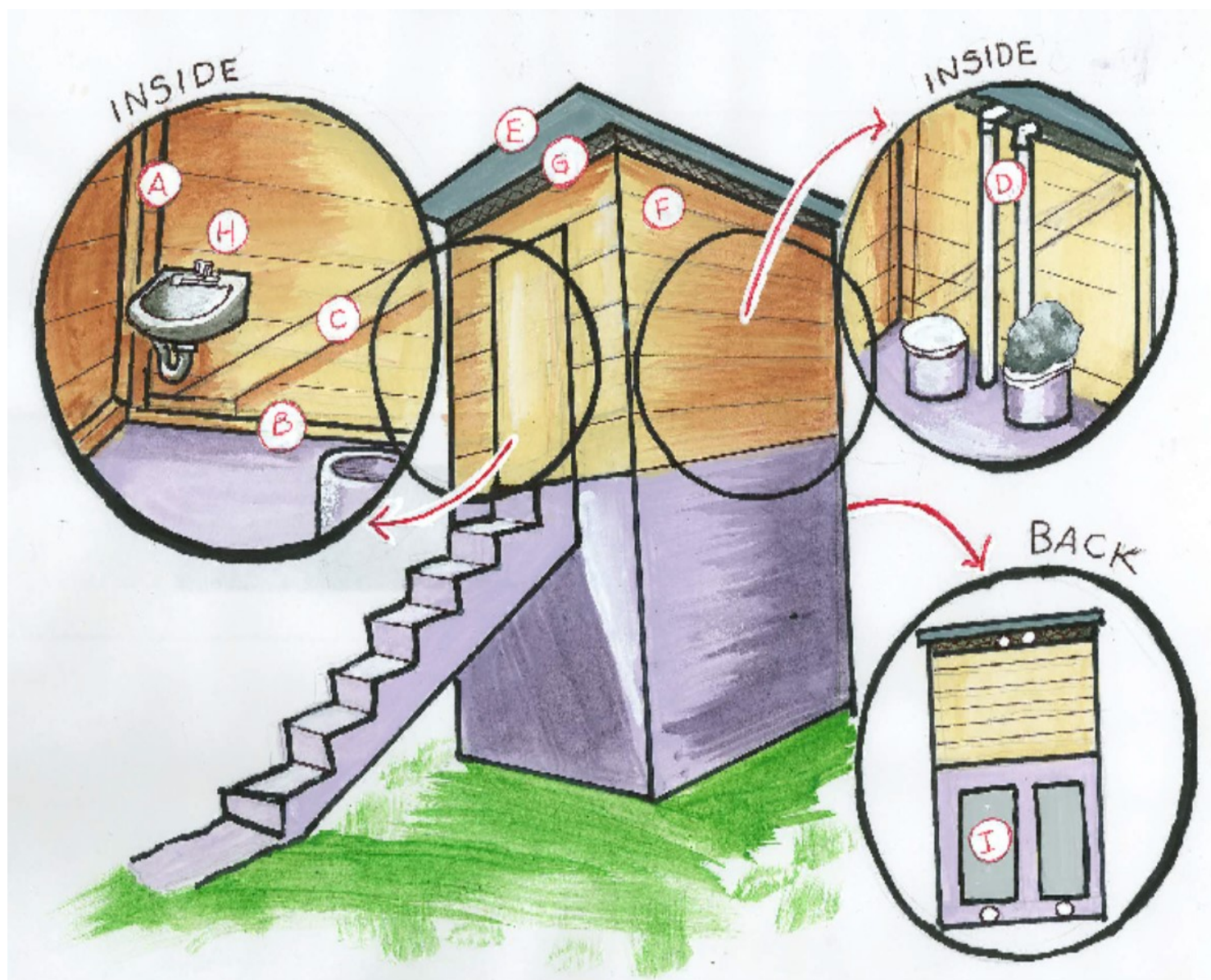
Kalauxi junak one inch by four inch (1"x4") tabl'e re xtzab'al^F. Kanab' junak yamyo kama woxaqib' inch (8") se' xyamp li xb'ehen li tab'l ut li xb'ehen li q'otleb'aal. B'is ut tyok li wire mesh re naj ttok sa li yamyo ain ut kalauxi chiru li tab'l^G.

Tyiib' li re kab'l anajwa.

Latz li sink sa' q'otleb'aal^H.

Yiib' li re kab'l chix juruch' li q'otleb'aal rusarinkil q'eel tab'l kwiib' inch chi kahib' inch (2"x4") re' xyiib'ankil junak frame. Tyiib' junak chiich' aj re kab'l, kalauxi' li sheet metal chiru li frame xa yiib'^I.

Pah jul re te'lk li pipe
chirix li q'otleb'aal.



B'oj malaj kalauxi
li re kab'l ain chix
jurux li q'otleb'aal.



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