



Introduction to EcoSan Toilets

There are many different toilet structures that could be described as ecological sanitation technologies. However, for the purpose of this section we will focus primarily on the urine diversion (UD) toilet which we have used extensively in Haiti. We have also used the humanure toilet developed by Joe Jenkins and the arborloo which has been widely promoted in Africa. A brief overview of each toilet type will be provided here, but the detailed operations and technical guidelines which follow will focus on the UD toilet as this is the design we have implemented most widely. Our designs are adapted from the work of others and in response to user feedback. The designs are constantly being adjusted to meet the needs and preferences of local communities. This introduction will briefly describe each type of toilet that SOIL has constructed and list some of the most relevant lessons learned.

Arborloo

The arborloo is a very low cost toilet ideal for rural areas where there is ample space and low risk of flooding. This toilet is a simple shallow pit (less than 1 meter) toilet with a light weight superstructure placed over a hole. The toilet itself can be either squatting or sitting and has a single hole with no separation of poop and urine. Each time the toilet is used, cover material (either soil or carbon rich organic material) is added to the pit to reduce odors and flies and speed the decomposition of the wastes. When the toilet is almost full the superstructure is moved to a new hole, the old pit is covered with a layer of soil and a tree is planted in the old pit. The decomposing wastes provide nourishment for the tree and the user never has to handle the wastes. This method is extremely low cost and a toilet can be built using only local materials.



Humanure Toilet

The humanure toilet that we have used in Haiti was designed by Joe Jenkins when he visited us in April 2010. This toilet is also very low cost (~\$75 US) and can be constructed using local materials. The toilet itself consists of wooden box with a 15 gallon receptacle below the toilet seat. The box opens to allow easy removal of the

The SOIL Guide to Ecological Sanitation®

First Edition, February 2011



receptacle when full and the toilet seat on top of the box provides comfort for users. These toilets do not separate poop and urine and are very good for children and handicapped users who may have difficulty with the UD toilets. This toilet is also an excellent option when the nutrients from the urine are desired in the compost, provided that transportation to an offsite composting facility is not necessary. Each time the user uses the toilet they apply a layer of cover material to reduce flies and odours and when the receptacle is full it is emptied into a compost bin and replaced with a clean receptacle.

Urine Diversion (UD) Toilet

The UD toilet is characterized by a special seat or squat plate which separates the urine and poop, ideally preventing any mixing of the two. Urine can be collected and used in agriculture or compost production or it can be drained into an underground soak away. Poop falls into the chamber below the toilet, which can either be a removable receptacle or a vault that is emptied only after long intervals of storage. UD technology has been used throughout the world but is particularly prevalent in Sweden, South Africa, Germany, India and Mexico. Urine diversion is based on the understanding that from a public health perspective it is most important to remove the poop from the environment, whereas urine does not pose a significant risk to humans. Urine diversion toilets facilitate the removal and treatment of poop, and also have increased user approval. The main benefits are:

- Reduction of odors and flies by reducing the moisture of the wastes
- Reduction in the amount of cover material needed
- Reduction in the volume of wastes needing to be removed from the toilet and treated
- Facilitation of pathogen die off through desiccation of the poop

SOIL has built three types of UD toilets to date, each of them relevant for different development and emergency contexts

- A. Double vault toilet: This design was based on models in South Africa where each toilet seat has two chambers underneath. The poop falls directly into the chamber below where it is covered with carbon material. When one chamber fills the toilet seat is moved to the other chamber and the first chamber is sealed. The poop is stored in the first chamber until the second is full (length of storage will be dependent on the size of the chamber and the number of users). When the second chamber fills up the first is emptied so that it can be reused. Under ideal conditions or with very long storage times, the poop may have decomposed by the

The SOIL Guide to Ecological Sanitation©

First Edition, February 2011



time it is emptied. However Haiti is a very humid climate and we have found that decomposition and sterilization do not take place in the chambers of our toilets. As such, we recommend rigorous pathogen testing or secondary composting before using the material in the chamber for agriculture.

- B. UD toilet with drum: When SOIL began an emergency EcoSan program in Port-au-Prince following the 2010 earthquake we changed to a drum system whereby a 15 gallon plastic drum is placed beneath the toilet to collect poop and carbon material. When the drum is full it is removed and replaced. The removed drum can then be sealed awaiting collection for transport to the compost site. This system requires less handling of wastes but maintenance must happen on a regular basis as opposed to semi annually, as with the double vault model. This system works particularly well when there is extensive usage of the toilet and when offsite composting is required.

- C. Portable UD toilet: Following the earthquake over 4000 portable toilet units were brought into the country. As organizations are now shifting their focus from emergency response to long-term development projects, many of these toilets are not currently being used. Portable toilets are extraordinarily expensive to service and maintain. SOIL engineers have modified these extra portable toilets to serve as UD toilets by installing the separating seat and placing a 15 gallon drum beneath the seat. Urine can be collected or diverted into an underground soak away. These toilets are excellent for communal toilets in camps (as they have very low space requirements and lock easily) or for use at community events and festivals.



Table 1: SOIL Toilet Types and Lessons Learned

Toilet type	Positive	Negative
Arborloo	Cheap	Requires a lot of space
	Trees are produced	Floods easily
	No handling of wastes	Not near water source
	Easy for young children	
Humanure toilet	Cheap	Heavy to transport
	Easily removable	Increased cover needed
	Space requirements low	Bucket close to seat
	Conserve urine	Fill quickly
	Easy for children	
Double Vault Toilet	Infrequent waste handling	Expensive
	Long lasting design	Difficult to empty
UD Toilet with drums	Easy to empty	Regular drum removal
	Less contact with wastes	
Portable UD unit	Easy to transport	Urine clogs easily
	Space requirements low	Bucket close to seat

Although the toilet design is certainly an important aspect of any project, the importance of community acceptance cannot be underplayed. We have found that projects are only sustainable when they are demand driven, meaning that the availability of hardware does not guarantee acceptance by the community. This guide encompasses both the technical and social aspects of EcoSan but it should be noted that social implementation strategies are likely to be more widely variant among communities than technical design, so it is important to work with local actors who know the needs and desires of their communities

The SOIL Guide to Ecological Sanitation©

First Edition, February 2011



and are able to help develop a social marketing strategy to create demand for EcoSan systems.

The section which follows includes a detailed overview of community education, toilet management and technical designs based on SOIL's experience in Haiti. Examples of several case studies are provided.

It should be noted that this guide is a work in progress and we plan to send frequent updates to our network. Please contact us if you have suggestions for expansion of the guide or if necessary details or explanations are lacking.



Managing Urine Diversion Toilets

While the development of an appropriate design and the actual construction of the toilets are necessary for a successful project, effective management of the toilets is an ongoing requirement that keeps the toilets functioning and clean. Whether the responsibility for the upkeep of toilets falls to members of a household, a community organization or a paid employee, routine maintenance by the operator is essential for the continued, hygienic function of the urine diversion (UD) toilets. Routine repairs should also be the responsibility of the operator while more extensive repairs to the structure are the responsibility of the individuals/group that installed the toilets. While SOIL has found there are many differences between maintenance programs for community-run public toilets and paid public toilets, there are a number of essential points to appropriately maintaining both types of toilets.

Operator Responsibilities:

- Routine cleaning of toilet pedestal to ensure good hygiene and proper use. Care should be taken to prevent chemicals from entering into the poop drum as this will ruin the composting process.
- Cleaning inside and outside of the toilet structure.
- Verifying that sufficient cover material is being applied by users.
- Making cover material available to each user.
- Timely removal and storage of filled drums to avoid any human-fecal contact from overfilled drums.
- Proper installation of drums with the help of the guide in the bottom chambers.
- Periodic verification of clear and functioning urine pipes to avoid blockages in the seat's drain.
- Provision of toilet paper and appropriate disposal of used toilet paper.
- Provision of water and soap for the hand washing system.
- Ensuring that the toilets are accessible to all members of the targeted population.
- Educating first-time users on the basic steps of using a urine-diversion toilet.

Management schemes will vary widely depending on a number of factors, including but not limited to: location, population, access to cover material, funds available to employ toilet operators, etc. Organizations or groups planning on installing UD toilets must commit to working with the targeted



communities to identify management schemes that are appropriate for both parties. Interested organizations also must be prepared to adapt to changing needs and concerns that can affect the management and functioning of the installed toilets. Over the past 5 years, SOIL has gained experience from projects in Cap-Haitien as well as in Port-au-Prince implementing both paid-public toilets and community-managed toilets.

Case Study 1: Community-Managed Public Toilets

From 2006 to 2009, SOIL installed over fifty UD toilets in Haiti, with 36 of them concentrated in Cap-Haitien and the surrounding areas of the North Department. Some of these toilets were built at the request of city officials with assurances that individuals would be employed by local government to maintain the toilets. The large majority of these toilets, however, were built after community leaders and local organizations made specific, written requests to SOIL for ecological sanitation toilets to be built in their community.

All of these toilets were installed as double vault urine diversion toilets with composting occurring in the toilet chamber. SOIL's role in maintaining these toilets was limited to periodic check-ins and responding to significant repair requests. SOIL also maintained responsibility for the emptying of the vaults after the toilets became full (typically a 6-9 month period).

Lessons learned

1. Toilets that were installed as a result of formal requests by community groups/organizations were often better managed. This demand-driven model can and should be applied in other contexts to improve ownership of the facilities by the community.
2. Responsibility of finding carbon-rich cover material should not be placed on individual users. In order to ensure that there will be sufficient amounts of an appropriate cover material, implementing groups must identify a large source and make sure it is routinely transported to toilet sites either by the implementing organization or the community group responsible for the toilet.
3. Adequate decomposition of feces was not able to occur in the 6-9 month collection period due to a combination of a humid climate and insufficient cover material put in by users. A large compost site was opened in the fall of 2009 to facilitate the secondary composting phase for the contents of the vaults when emptied. Toilets located in rural areas had individual compost sites that were located immediately adjacent to the toilets.

The SOIL Guide to Ecological Sanitation®



First Edition, February 2011

4. Collaboration with local authorities produced few results, as promises to hire operators to manage the toilet were not kept. Installation of toilets in certain areas at the request of local authorities often proved to be politically motivated.
5. Toilets that were installed at schools and churches were generally better maintained as the responsibility was taken up by members already committed to the general upkeep of the respective institutions.
6. Public toilets that were not managed by paid operators were not well maintained and resulted in unhygienic facilities. This, in turn, led to low usage of the toilets, thus alternative practices persisted (open defecation, use of canals, plastic bags, etc.).

Moving forward

As a result of the lessons learned from the past four years in Cap-Haitien and the past year in Port-au-Prince, toilets in the urban area of Cap-Haitien have been modified: Onsite composting using vault toilets has been replaced by offsite composting using the removable 15 gallon drum system. The new system requires supporting infrastructure including: A drum collection and delivery service provided by the Cap-Haitien SOIL office, and a secondary composting site located in Limonade (a short distance from downtown Cap-Haitien). The photos below show how the vault toilet chamber has been modified with the drum system:



In addition, in response to the cholera outbreak SOIL has employed toilet operators in some of the urban, public toilets to ensure that these remain open, functioning and adequately clean. Periodic supervision of the toilets and the toilet operators has also been put in place to provide feedback and education to toilet operators when necessary to continue to improve the management of the toilets.



Case Study 2: Public Toilets in IDP Camps



Soon after the earthquake on January 12th, 2010, SOIL, with the financial assistance of Oxfam Great Britain (GB), introduced ecological sanitation to IDP camps, schools and churches within the Port-au-Prince metropolitan area. While many of the sites were identified by SOIL as in need of sanitation services, committees from other sites approached SOIL staff in the field or made requests at our office upon hearing of the project and testimonies from individuals at other

sites where SOIL was functioning. Urine diversion toilets, modified from the double vault system to the current single vault system that utilizes 15 gallon drums, were installed in 32 different sites.

By August of 2010, SOIL had installed 196 toilets across these 32 sites with the majority of them spread across the communes of Cite Soleil, Tabarre and Delmas. At the peak of displaced populations living in spontaneous camps, the number of beneficiaries for these toilets was an estimated 20,600 individuals. For the construction aspect of this project, over 130 masons and carpenters were trained and hired in ecological sanitation construction. All toilets were separated into men, women and child facilities and privacy for users was assured by the installation of locks in each toilet. Collection and delivery of drums for each site occurred once a week, with cover material provided at most sites in large quantities from time to time. At sites where space allowed, 125 gallon rainwater fed stations were constructed to provide water for hand-washing. Other sites had smaller buckets along with taps to ensure that all users could wash hands.

At each site, the committees played an essential role in the implementation and ongoing management of SOIL's program. Their responsibilities included:

- Introducing SOIL to the site (either by request at SOIL office or sought out by SOIL staff on first visit).
- Taking part in the initial ecological sanitation education seminar and making a decision as to whether this sanitation option was appropriate and desirable for the particular site.

The SOIL Guide to Ecological Sanitation©

First Edition, February 2011



- With SOIL engineers, identifying location, quantity, and type of toilets to be installed by SOIL.
- Identifying carpenters, masons, and other laborers for the construction phase of the project.
- Nominating a representative who remained in regular contact with SOIL, reporting toilets in need of repair, cleaning material needs, and any other social issues that may come up.
- Assisted employing and supervising toilet operators for all public toilets (200 HTG for each 8 hour shift). Some committees appointed 2 individuals responsible for maintaining the toilets while others employed systems that resembled Cash-For-Work programs where toilet operators changed every week or every 2 weeks.

All cleaning materials needed for the toilets were provided, including but not limited to: bleach, disinfectant, toilet paper, insect spray, brooms, gloves, masks and liquid soap. Depending on the system employed by each site, the identified representative(s) would come to the SOIL office to pick up payment for the toilet operators as well as the necessary cleaning supplies. At larger sites, depots were identified and cleaning materials were able to be stored for one month at a time.

In terms of monitoring, SOIL's site supervisors would visit each site at least twice each week, verifying the quality of maintenance provided by the toilet operator as well as identifying any repairs that needed to be completed. These regular visits by SOIL staff worked to further develop relationships with the committees as well as the populations and allowed for early identification of potential problems within each site. Although initially all repairs were done by SOIL staff, committee members in many of the sites were trained on how to deal with the periodic plumbing issues to ensure that repairs were made as quickly as possible and that the toilets remained open and functioning.

Lessons learned

1. We found it critical to our program to develop and maintain solid relationships with the camp committees in order to receive feedback on toilet design as well as management. Furthermore, it created a sense of empowerment among committee members where they felt directly involved in the project and thus were committed to maintaining and promoting the toilets.



2. Increasing participation of committees in other activities of SOIL (seminars on ecological sanitation, visits to compost site) can improve understanding of overall program and can indirectly improve management of toilets.
3. It is essential to pay operators to take care of public toilets. Other programs where toilets were the responsibility of the camp committee or other individuals on a voluntary basis were often not well maintained.
4. Operators employed for one or two weeks at a time were often not effectively trained by committees to properly manage the toilets. Long-term operators, however, were able to develop relationships with SOIL staff and committee and continuously improve on the management of the toilets.
5. The appearance of toilets can be linked to quality of management, as a good-looking toilet can instill a sense of pride and motivate operators to manage the toilets well and keep them clean.
6. Without controls on cleaning supplies excess amounts are used and in some camps may have been sold by the committees. Monitoring usage of cleaning supplies at each site and using model sites to estimate appropriate quantities for other sites can help to reduce these costs.
7. The most common problem with the toilet is the clogging of urine pipes, which can be traced back to plumbing as well as management issues (see toilet photos document). A potential solution to the management side of this could be putting the responsibility for adding cover material solely in the hands of the toilet operator.
8. Regular supervision improves toilet management and enables repairs and other issues to be dealt with rapidly.
9. Providing each toilet facility with a garbage can lead to an improved appearance in the area outside the toilet as well as reducing the potential for trash to be put into the toilets.
10. Monitoring of drums is necessary to prevent theft but also enabled SOIL to track sites that were either not using sufficient cover material or



A toilet operator moves a clean empty drum into a SOIL UD toilet.

The SOIL Guide to Ecological Sanitation©

First Edition, February 2011



were unable to prevent users from disposing of other materials in drums that could negatively affect the composting process.

11. Men continue to urinate outdoors. Urinals were installed at all sites, but did not solve the problem. Increased promotion is needed to increase usage of urinals by men.
12. Most people will wash their hands if provided with adequate facilities. Each site was upgraded to include rainwater catchment systems, larger reservoirs, and adequate liquid soap in order to ensure that hand washing would be available.

Moving forward

In general, the almost 200 toilets that have been installed in sites across Port-au-Prince continue to function properly and have been a tremendous success.

SOIL is currently transitioning away from systems which place large amounts of control in the hands of the camp committee (cleaning materials, the selection of toilet operators, facilitating payments, etc.) and systems with a high turnover of toilet operators.

SOIL is putting more responsibility in the hands of toilet operators, training individuals on ecological sanitation and how to perform simple plumbing and structural repairs.

The next edition of The SOIL Guide to EcoSan will include a case study on communal toilets. This toilet management approach will be implemented in small camps where there is adequate space to provide several families with a toilet of their own. Each family will have a key to the communal toilet and all families will be responsible for managing it, thereby obviating the need for paid toilet managers.



Community Outreach and Education

Initial Training with Community Representatives

The initial education and training of potential users is perhaps the most important step of realizing a successful ecological sanitation (EcoSan) project. While SOIL has experienced extremely high user acceptance with projects in Haiti, failure to properly approach and educate users from the start would seriously hinder an EcoSan project's chances. Improper use of urine diversion (UD) toilets could result in low user acceptance not only due to the inevitable smells and fly-breeding but also because of the extremely unhygienic conditions for toilet managers and those that are emptying/cleaning the toilet drums that arise from misuse of toilets.

Assuming that the local population has already been contacted or has made a specific request for the installation of an EcoSan toilet, the first step is a formal meeting with these individuals or groups.



This initial meeting with the committee or community offers an opportunity for hygiene promotion and general education around the benefits of proper sanitation as well as a forum to introduce ecological sanitation as a viable solution to sanitation needs. Prior to constructing any toilets, the community should not only understand the differences between EcoSan toilets and other existing sanitation options, but also understand the benefits and responsibilities that come along with operating and managing a EcoSan toilet. Below is an example of a meeting outline that SOIL has utilized in approaching communities new to EcoSan.

Initial meeting w/Dotwa IDP camp committee, Port-au-Prince, June 2010

Community Meeting Outline

1. Introduction of committee/community members, as well as partners present.
2. Explanation by community members of current sanitation situation.

The SOIL Guide to Ecological Sanitation®

First Edition, February 2011



3. Explanation of what ecological sanitation is by a SOIL representative
4. Introduction of benefits of EcoSan in regards to a population's health, the environment and for those working in the agricultural sector. Also, the benefits of EcoSan in comparison to other traditional sanitation options should be stressed here.
5. Present the different types of EcoSan toilets and how different interventions depend on a variety of factors (water table, resources available, space, land owner issues).
6. Present SOIL's compost site set-up, how pathogens are killed, the testing for pathogens as well as nutrients, and what will be done with the final compost.
7. Proper use of UD toilets, which includes a participatory activity that engages the audience and allows them to act out in front of others how to properly use the UD toilet (materials required: separating seat, toilet paper, bagas, willing participants). For participatory activity, see "11 Steps to Using a Urine Diversion Toilet" in sections T4 and T5.
8. Responsibilities of toilet operator in keeping the toilet(s) functioning properly (see general management section).
9. Discuss possible management solutions with the committee that take into account capacity of partners and resources available.
10. Explanation of collection/distribution system that ensures constant access to cover material as well as a long-term (1-2 weeks) stock of drums.
11. General Q&A.
12. Committee decides if they would like to move forward with EcoSan or whether they would rather have SOIL identify another organization that can help with more traditional options. If there is general agreement, it is possible to identify the location for the toilets immediately.

Once the community or committee has decided that they would like to implement an EcoSan program, the construction phase begins. To further integrate the community into the project, the construction of the toilets should include carpenters, masons and laborers from the same community as much as possible. Once the toilets are finished, these individuals should have a general understanding of the technical aspects of the toilets and can

The SOIL Guide to Ecological Sanitation®

First Edition, February 2011



be called upon for repairs when needed.

Educating the General Population

Prior to opening the toilet for use by the larger population, implementing organizations should discuss with the committee or community organization about the most appropriate method of educating households regarding ecological sanitation and how to properly use the toilets. Where time and funds allow, the method that ensures almost 100% of families gain a sufficient understanding of the toilets is one where hygiene promoters can do door-to-door education campaigns within the area where the toilets are located. This two-way communication method is unique in that it allows each user the opportunity to ask questions and voice doubts and it provides the implementing organization with valuable data on the perceptions of users prior to the toilets being opened. Focus should be put on having each household know the “11 Steps to Using a Urine Diversion Toilet” (see sections T4 and T5).

In situations where door-to-door education campaigns are not possible, community events can be organized with the community to draw large audiences and allow one education seminar to reach a large number of people. As one cannot expect all members of a community to be present at one inauguration, the goal is to educate those present and have the message diffuse to others via relationships within and between families, friends and neighbors.

Inaugurations

Approaches to inaugurations are different from the initial education seminar done for the community leaders. While the initial meeting’s objective is for individuals to gain a comprehensive understanding of ecological sanitation, proper use of the toilets, and the

responsibilities for the committee, the inaugurations should focus on proper use of the toilets. While the animator/emcee should take the opportunity of to communicate the basics of ecological sanitation, the presentation should build towards the participatory activity: “11 Steps to



Well-known Haitian musician BelO performing at an inauguration in Port-au-Prince, 2010

The SOIL Guide to Ecological Sanitation®

First Edition, February 2011



Using a Urine Diversion Toilet”

To increase attendance and interest in the event, implementing organizations should look to the community leaders to mobilize large numbers of people. Any opportunity to collaborate with local musicians or comedians will increase interest in the event and give more weight to messages you are trying to get across.

Effective Strategies for Inauguration Events

- Effectively scheduling when majority of population is likely to be available (often Friday or Saturday evenings)
- Making use of visuals and photos (existing toilets, compost site, experimental gardens)
- Attendance and endorsement by well-known local personalities to increase interest
- Animator/emcee should be an experienced community mobilizer and should be able to engage a large audience around a topic that is not commonly focused on, i.e. toilets
- Education portion should build up to the participatory activity, which concludes the educational portion of the event



Eleven Steps to Using a Urine Diversion Toilets

To ensure that the urine diversion (UD) toilets are being used properly by target populations, SOIL has devised a simple, participatory activity that aids communities and individuals in learning the correct way of using these toilets; it also really makes people laugh!

This activity involves the animator/emcee going slowly through the 11 steps, voicing each step to the rest of the audience, the rationale behind each action, while also acting out the step with the available visual aids (toilet seat, bagas, buckets, toilet paper). When the 11 steps have been completed and any questions have been answered, members from the audience are selected to come forward and try to complete the steps without help from others. It is important to note that participants should verbalize what they are doing while going through the 11 steps.

This participatory activity can be turned into a game, where the audience can be split by neighborhood, sex or some other variable and each individual can support the individual that is representing them. Winners are determined, of course, by completing all the steps without error or help from others. It will be up to the animator to gauge the situation and determine whether participants need encouragement or stricter refereeing. This activity is meant to be educational but also entertaining for all those involved.

For an example of how SOIL incorporates these steps into a participatory activity during toilet inaugurations, follow this link for a video of SOIL's Baudeler Maglore going through the steps with a community in Grand Riviere du Nord, Haiti: <http://www.youtube.com/watch?v=OJWEaqXAAsU>.

SOIL's 11 STEPS TO USING A URINE DIVERSION TOILET

STEP 1:
Open the toilet seat

Dekouvri twalet la

STEP 2:
Remove your
Pants
*Desann
pantalon'w*

STEP 3:
Sit down
Chita



STEP 4:
Poop!
Kaka! Twalet!

STEP 5:
Stand up
Kanpe

STEP 6:
Take the toilet paper, wipe, and throw it in the garbage
Pran papye a, siye deye'w, e jete nan poubel la

SOIL's 11 STEPS TO USING A URINE DIVERSION TOILET



STEP 7:
Pull up your pants
Monte pantalon'w



STEP 8:
Take the bagas and empty it into the back hole
Pran bagas la, vide'l nan twou kote twalet la tonbe a



STEP 9:
Close the lid
Fème kouvèti a



STEP 10:
Wash your hands
Lave men'w

STEP 11:
And you're off!
Gaz kole!





Monitoring and Evaluation

Once the construction phase and the education/inauguration events are complete, the toilet is ready for use! By now, the implementing organization has worked with the community to put in place a management scheme that works for both parties. Despite the great deal of work completed to arrive at this stage, the work for these two groups is not complete; public toilets always require regular monitoring and evaluation, or 'supervision'.

Supervision comprises:

- Identification of hardware problems and scheduling repairs
- Encouraging and supporting toilet operators
- Receiving feedback from *operators*, especially concerning potential hardware and software improvements
- Receiving feedback from *users*, especially concerning potential hardware and software improvements

In the event of toilets being managed by long-term operators, routine monitoring is necessary to ensure that the operator is taking their responsibilities seriously and the toilet remains clean and functioning. In urban settings like in Port-au-Prince, SOIL found that visiting each site and speaking with the toilet operators a minimum of two times each week had a strong impact on the cleanliness and usability of the toilets. Supervisors are required to work through a checklist of previously identified requirements for each toilet site to function properly. An example of this checklist can be found in section T7, Toilet Monitoring Checklist.

Each week, supervisors submit a report for each toilet site. The report provides:

- A historical record of toilet use, toilet problems and toilet maintenance
- A discussion document to facilitate full-team (including engineers, animators, managers, supervisors, and community liaison officers) discussions
- A tool used for discussion during the interface with each site's representative during the weekly payroll and cleaning materials delivery

The SOIL Guide to Ecological Sanitation®

First Edition, February 2011



While the community should be supervising toilet operators and checking up on repairs on their own, monitoring reports are a method of holding the community/committee accountable and showing the organization's commitment to a successful project.



Technical Specifications for Urine Diversion Toilets¹

Introductory Notes

1. This section does not address hand washing. A toilet without a designated hand washing point is unacceptable and a space should ALWAYS be reserved adjacent to the toilet, for hand washing.

Section Objectives

1. To provide the reader with a technical specification, to be used in conjunction with the drawings and photos in this guide, to construct a SOIL Urine Diversion (UD) toilet with drums as opposed to vaults.
2. To provide the reader with some background to the development of the SOIL UD toilet, by including as footnotes, information on previous designs and lessons learned.
3. To provide the reader with a part of the SOIL Guide to Ecosan, which, if thoroughly studied, provides a complete package of information and instructions on how to implement a successful EcoSan project.

Performance Objectives (POs)

The Performance Objectives (POs) guide the design, construction and operation of the SOIL UD toilet. If one of the POs does not achieve its PO criteria then the toilet will not perform properly. If more than one of the POs fails to meet its criteria by a large margin, then the toilet may fail completely and will need to be closed to users. The POs and their criteria are shown in the table below:

PO	PO	PO Criteria
1	Acceptability	Toilet acceptable to 90% of users ² .
2	Operation	Toilet designed and constructed so as to be accepted by 100% of operators

¹ This technical section of the document focuses solely in the urine diversion (UD) toilet design that SOIL has used in IDP camps in Port-au-Prince. These specifications can be used as general principles to adapt the design to local needs, including substituting materials. In future editions of this guide we plan to include complete technical guidelines for other SOIL toilet models. If you have specific questions about other models please contact us at info@oursoil.org.

² It is rare that any public toilet will be acceptable to 100% of users. A 90% target is a realistic and practical target.



3	Excreta capture	100% of excreta should be captured in the poop drum.
4	Urine drainage	100% of urine should be drained away from the SOIL UD toilet seat, without blockage of the drainpipe or spilling of urine.
5	Odour	0 odour in the cubicle and in the chamber
6	Vectors	0 vectors in the cubicle and in the chamber

Technical Specification

Ref	Specification	Reference Documents.
4.1	POSITION & ORIENTATION	
	A SOIL UD toilet has good ventilation, but will nevertheless get hot under a Caribbean sun. Positioning the toilet in shade to stay cool during the day is a good idea.	PHOTO T16a
	Sufficient space (at least 60cm but ideally 100cm) should be left at the front and sides of the toilet structure to allow for user access to the front, and operator access to the front and sides. If possible, the same space should be allowed at the back of the toilet for any eventual maintenance.	PHOTO T16b, T16c
	The toilet should be sited in such a location as to allow privacy for the user, but not so much so that the toilet is obscure to the point of insecurity, from its community of users.	PHOTO T16a
4.2	DESIGN LIFE	
	All materials specified for use with the SOIL UD toilet have a design life of more than 2 years.	
	The design life of the SOIL UD toilet (wooden structure) is, of course, entirely dependent upon the number of users, their respect for the good function of the toilet, and the performance of the toilet operators. At the time of publishing this edition, it is estimated that	



Ref	Specification	Reference Documents.
	the design life of the SOIL UD toilet is between 1 and 2 years ³ .	
	Periodic maintenance is necessary for the toilet to last until the end of its design life.	
4.3	TOILET SEAT	
	The SOIL UD toilet seat comprises: <ul style="list-style-type: none"> • A wooden box pedestal • A fiberglass SOIL UD toilet seat. 	PHOTO T13, T15 Dwg.T5
	The wooden pedestal has a double coat of paint on the inside and outside. The pedestal is made using 4 pieces of ¾” plywood, connected together with 2.5” wood nails and wood screws.	Dwg.T5
	The SOIL UD toilet seat was made in Port-au-Prince. Its components and characteristics are: <ul style="list-style-type: none"> • A cover that closes tightly. • A very comfortable sitting area. • A proven design which easily and comfortably separates urine and poop. • An easy material to clean. • A material that is easy to repair by a fiberglass specialist. 	PHOTO T15
	The weak point in the SOIL UD toilet seat is the metal hinge that connects the seat to the cover. There are 2 points of consideration for the metal hinge: <ul style="list-style-type: none"> • The metal hinge will oxidize and perish very quickly in the toilet environment. IT IS ESSENTIAL that the hinges on the toilet seat have protective painting. • The screws must be the correct head size and screw length in order to hold the hinge. 	
	The SOIL UD toilet seat is screwed into the pedestal using wood screws. The spaces left in the corners of	PHOTO T13

³ The first SOIL UD toilet in Port-au-Prince was commissioned in March 2010. It is still achieving all of its POs. None of the SOIL UD toilets were noticeably damaged after Tropical Storm Matthew of October 2010.

The SOIL Guide to Ecological Sanitation©

First Edition, February 2011



Ref	Specification	Reference Documents.
	<p>ground and the wooden structure.</p> <ul style="list-style-type: none"> To provide a load-bearing raft upon which the wooden structural elements can sit. 	
	The soak away is located so that the urine drainpipe does not interfere with the positioning and removal of the poop drum.	PHOTO T3 Dwg T1
	The dimensions of the soak away have been proven adequate to provide a good area for the urine to soak away. However, an engineering assessment of underlying ground conditions and permeability should be made before siting the SOIL UD toilet.	PHOTO T4 Dwg T1
	The concrete slab is constructed using the following concrete materials: 1 - sack of cement. 1 - 55 gallon drum of sandy gravel. Water.	
4.6	STRUCTURE GENERAL	
	Plastic sheeting is used as cladding material. Different grades of plastic sheeting are available and a higher grade of plastic sheeting will provide a more durable and better-looking toilet.	PHOTO T7
	Plastic sheeting is attached to the wooden structure using 1" nails. If executed carefully, a very good tight finish to the cladding is possible.	
	If a good tight finish is achieved on the structure, the plastic sheeting will not detach, unless it is detached deliberately. E.g. by children.	PHOTO BAD T7
	Even the strongest plastic sheeting is not heat-resistant and will be damaged if exposed to heat. I.e. do not position the toilet next to a cooking site.	PHOTO BAD T9
	The SOIL UD toilet is often fitted with a rainwater collection gutter on the roof, which feeds a central hand washing point. The roof structure is strong and will support this.	
	Materials used for the wooden structure are shown in	PHOTO T10



Ref	Specification	Reference Documents.
	the Bill of Quantities. The central plywood wall that separates the cubicles MUST be well fit.	
4.7	CHAMBER	
	The chamber's main function is to provide just enough clearance to get the 15 gallon poop drum in to position under the poophole when the drum is empty, and out safely and easily when it is full. Accordingly, the chamber is not tall and the toilet structure is very solid.	PHOTO T1, T2
	The ergonomics of drum positioning and drum removal is an important factor in achieving POs 2,3 and 5. The drum guide and the plywood drum platform are ESSENTIAL elements in this and should be constructed and positioned carefully. Early toilet designs involved raising the poop drum on removable pieces of 2*4. This proved cumbersome and did not always allow for accurate alignment beneath the poophole.	PHOTO T1 Dwg_T5 PHOTO BAD T8
	The wooden elements in contact with the concrete floor are susceptible to moisture damage: from rain & damp and also from stray urine. These elements should be treated with a double coat of paint before being nailed to the concrete floor.	Dwg_T1
	Double-leaf chamber doors with internal door-stops and external locks provide chamber access.	PHOTO T11, T12
	Diagonal bracing struts (1" * 4") are provided on the main elements of the chamber frame.	Dwg T1
	Ventilation to the chamber is not needed if the toilet is used properly. There should be no odour and no flies.	
4.8	CUBICLE	
	The cubicle has dimensions large enough to be accessible to most disabled users, but there is no wheelchair access.	Dwg T2
	There are 2 shelving units in the cubicle, the shelf visible upon opening the door is for flowers. Flowers	PHOTO T17

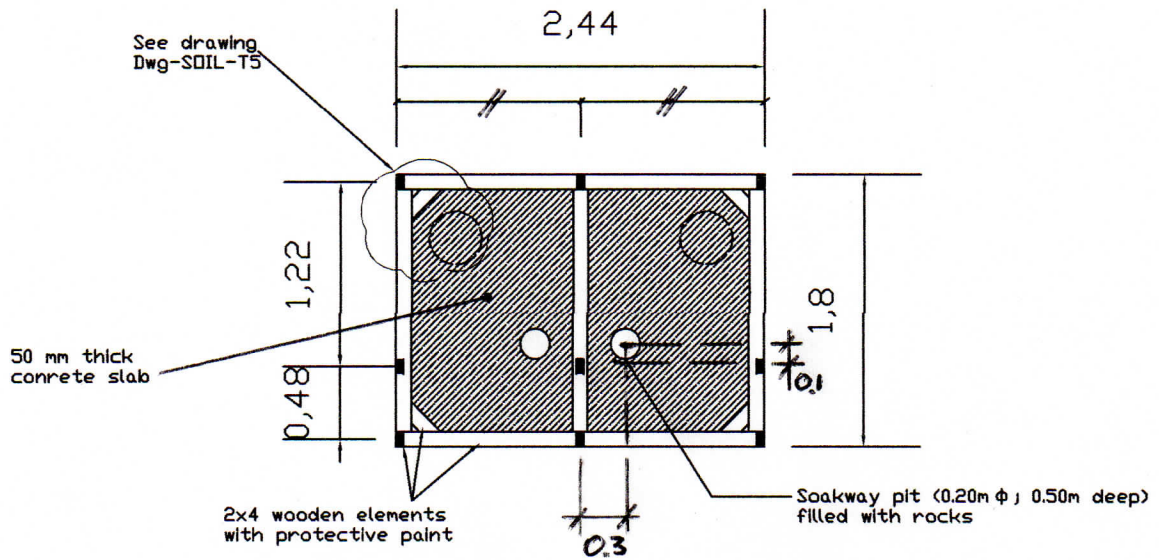


Ref	Specification	Reference Documents.
	are a key part in achieving PO 1. The shelf visible only upon closing the door inside the cubicle is for toilet paper, which if located on the other shelf, would be visible, and could be stolen.	
	The wooden slats visible from the inside of the cubicle should be arranged so that the central slat is at a height suitable for the toilet seat cover to rest against it when the toilet seat is up.	PHOTO T9
	Education and software are the most important factors in achieving all POs. As such, an information poster 'On EcoSan' should be affixed in each cubicle, facing the toilet seat.	
	The poophole is cut in the plywood floor using the 15-gallon drum lid as a guide. The drum guide (see 4.7) if fixed AFTER the poophole is cut.	PHOTO T5, T6 Dwg T5
4.9	BALCONY, STAIRS AND ACCESS	
	The handrail on the stairs, constructed in accordance with the technical drawings, is essential for disabled access to the balcony and the toilet cubicles.	
	The central element to the stairs is essential in preventing deflection, and eventual failure of the stairs unit.	PHOTO T8 Dwg T2
	The balcony also provides access to fill up the cistern of an adjacent hand washing point if one is constructed next to the toilet.	
	The balcony and stairs are the only wooden element not protected by the roof. These elements require treating with a double coat of wood paint to protect them from dust and wind and rain.	
	A 60cm wide gravel pathway should be provided at the front and sides of the toilet structure to allow for operator access to the chamber doors.	Dwg T2

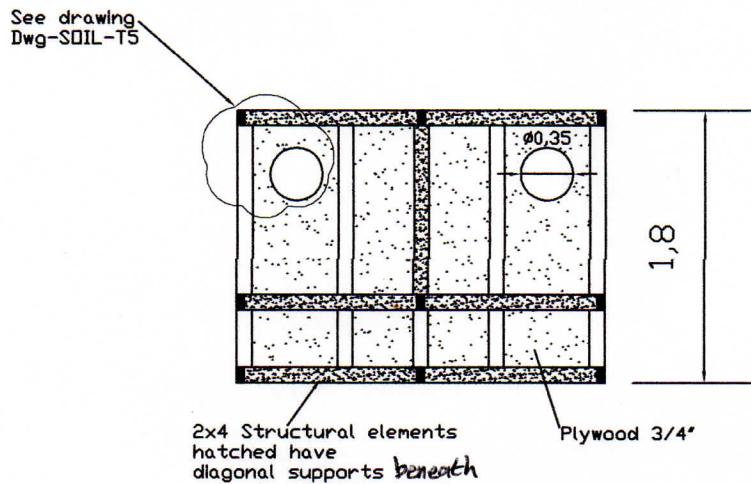


List of Drawings: SOIL Toilets

Drawing no.	Toilet Type	Drawing Title	Drawing Creation Date	Rev.
T.01	SOIL UD Toilet: Wood	Plan views on toilet chamber	October 2010	-
T.02	SOIL UD Toilet: Wood	Plan view on toilet cubicle	October 2010	-
T.03	SOIL UD Toilet: Wood	Front & Side Elevations	October 2010	-
T.04	SOIL UD Toilet: Wood	Front & Side Sections	October 2010	-
T.05	SOIL UD Toilet: Wood	Details	21 st Feb. 2011	-



Concrete base level



Plywood floor level

NOTES:
1, ALL DIMENSIONS IN METRES



TIT PWOJE (TITRATE PROJECT)
KONSTRIKSYON TWALET SECH AN BWA
(CONSTRUCTION OF DRY TOILET, WOODEN CONSTRUCTION)

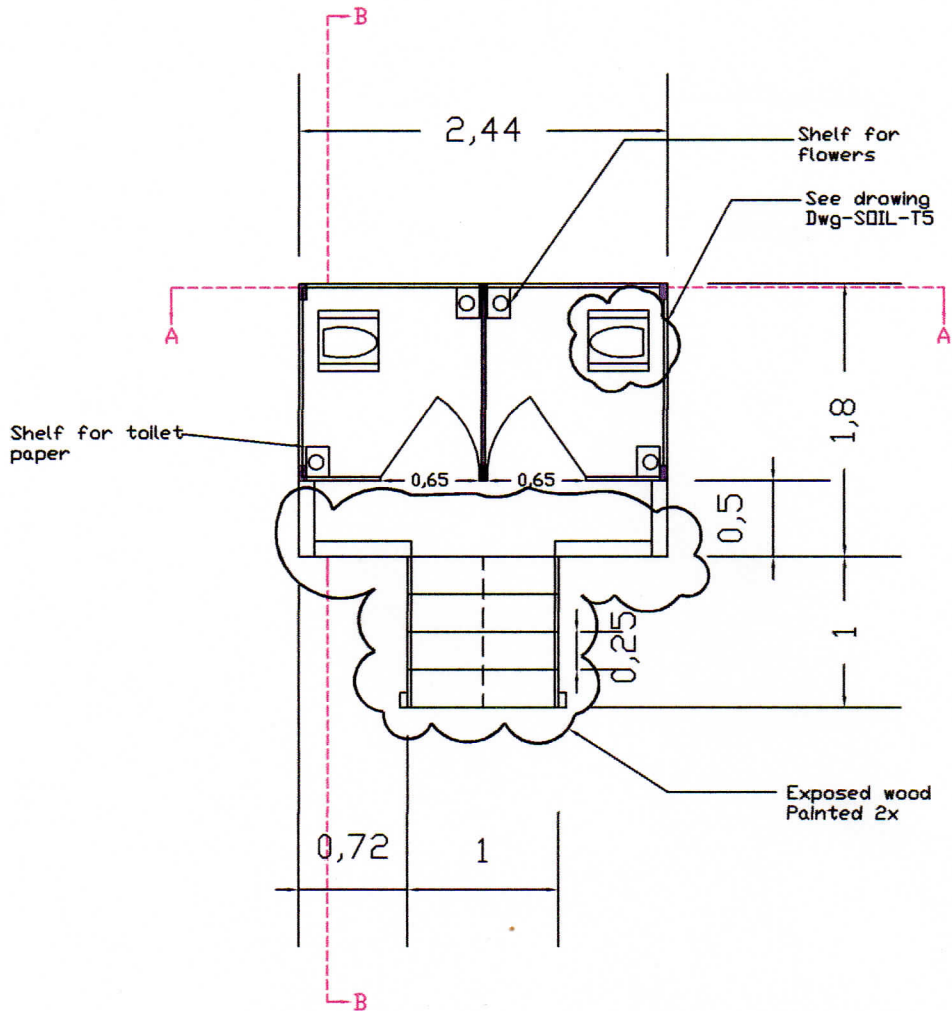
TIT DESEN AN (TITLE OF THE DRAWING)
PLAN (BAZ AK ESTRIKTI TWALET)
(PLAN VIEWS)

DATE: OCTOBRE 2010

No PLAN: T1

ECH: 1/50

SOIL ENGINEERING SERVICES



Plan view

NOTES
1, ALL DIMENSIONS IN METRES



TIT PWOJE (TITRATE PROJECT)
KONSTRIKSYON TWALET SECH AN BWA
(CONSTRUCTION OF DRY TOILET, WOODEN CONSTRUCTION)

TIT DESEN AN (TITLE OF THE DRAWING)
PLAN DISTRIBISYON
(PLAN VIEW)

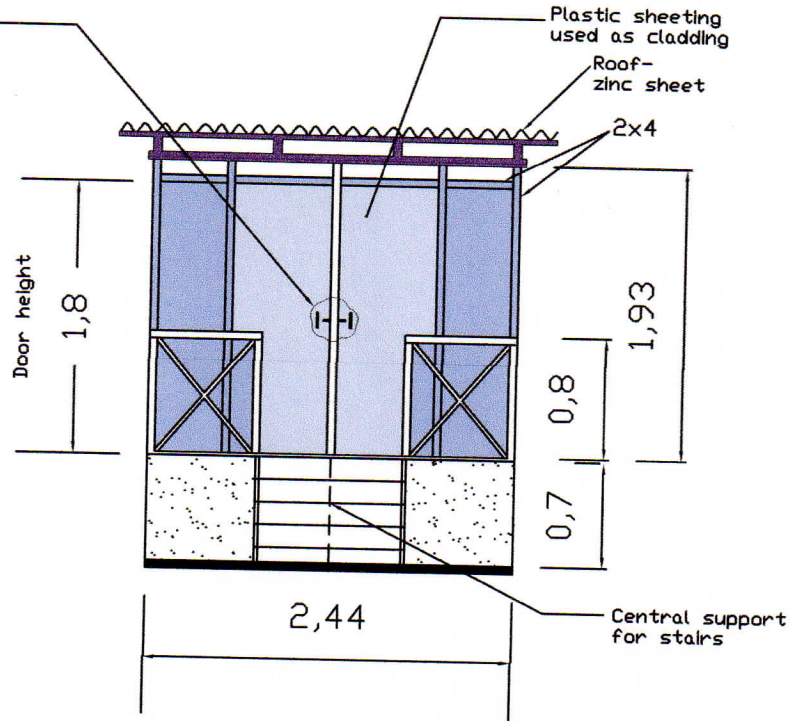
DATE: OCTOBER 2010

No PLAN: T2

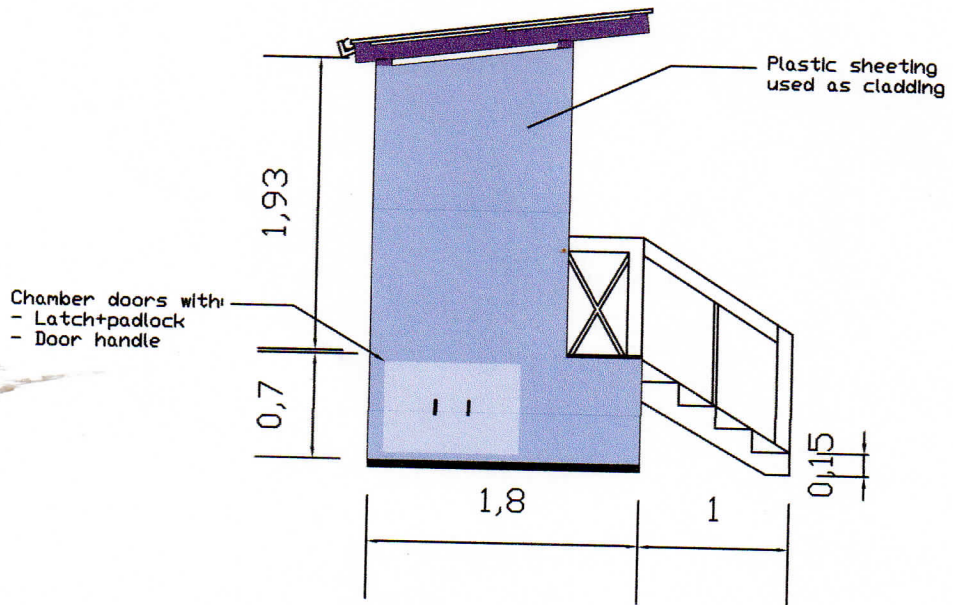
ECH: 1/50

SOIL ENGINEERING SERVICES

Each door finished with
 - Padlock+latch on outside
 - Stiding loch on inside
 - Door handle on outside



Front elevation

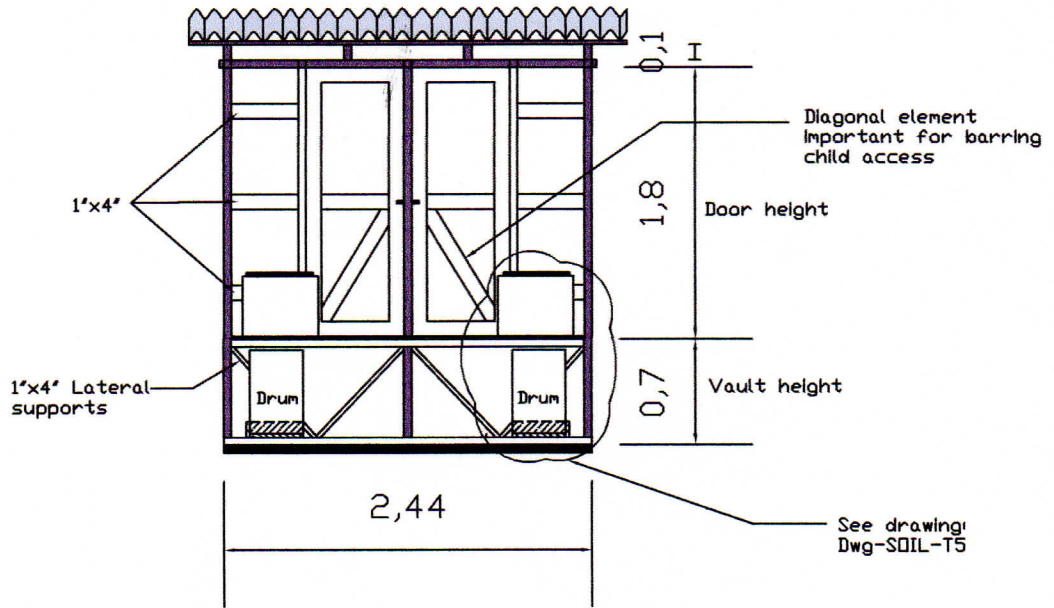


Side elevation

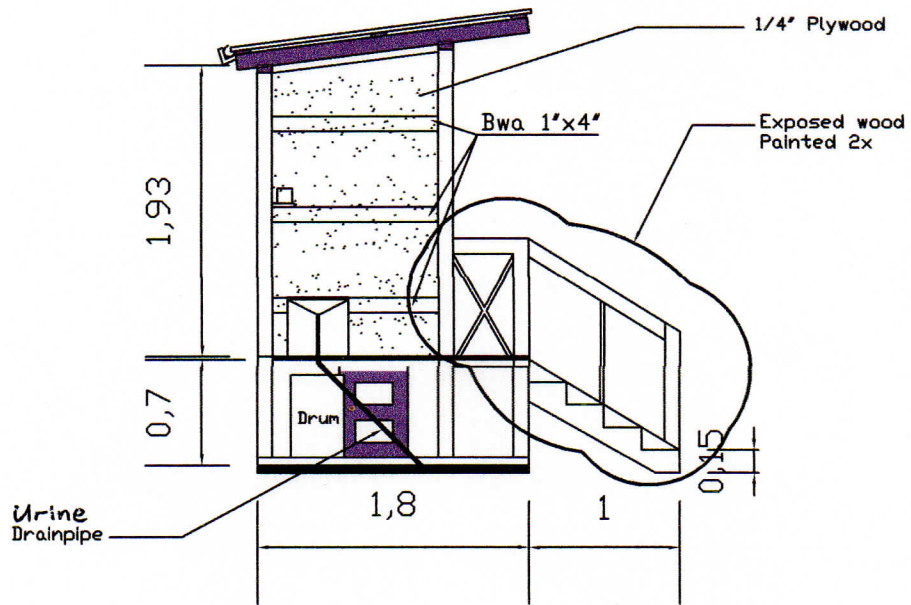
NOTES:
 1, ALL DIMENSIONS IN METRES



TIT PWOJE (TITRATE PROJECT) KONSTRUKSYON TWALET SECH AN BWA (CONSTRUCTION OF DRY TOILET, WOODEN CONSTRUCTION)	DATE: OCTOBRE 2010
	No PLAN: T3
	ECH: 1/50
	SOIL ENGINEERING SERVICES



Section AA



Section BB

NOTES
1, ALL DIMENSIONS IN METRES.



TIT PWOJE (TITRATE PROJECT)
KONSTRIKSYON TWALET SECH AN BWA
(CONSTRUCTION OF DRY TOILET, WOODEN CONSTRUCTION)

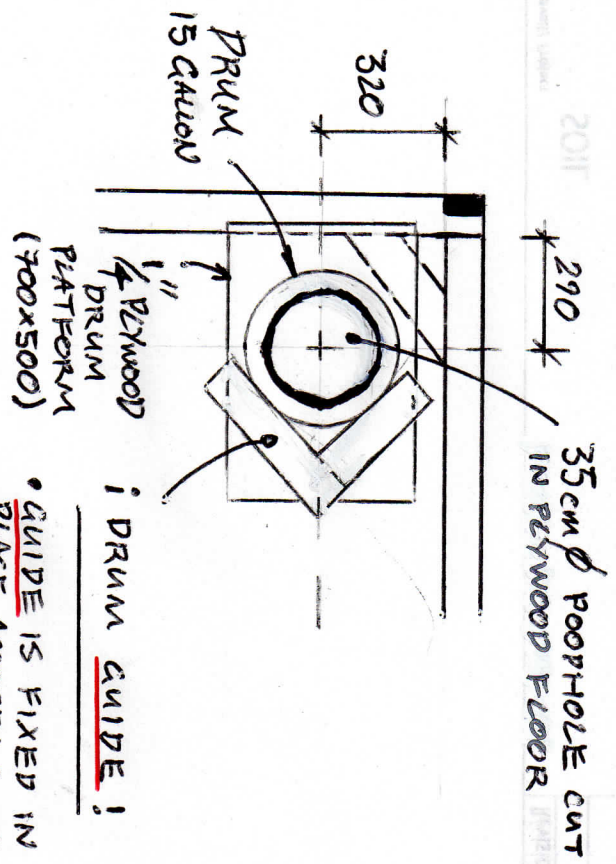
TIT DESEN AN (TITLE OF THE DRAWING)
KOUP VETIKAL
(VERTICAL SECTIONS)

DATE: OCTOBRE 2010

No PLAN: T4

ECH: 1/50

SOIL ENGINEERING SERVICES

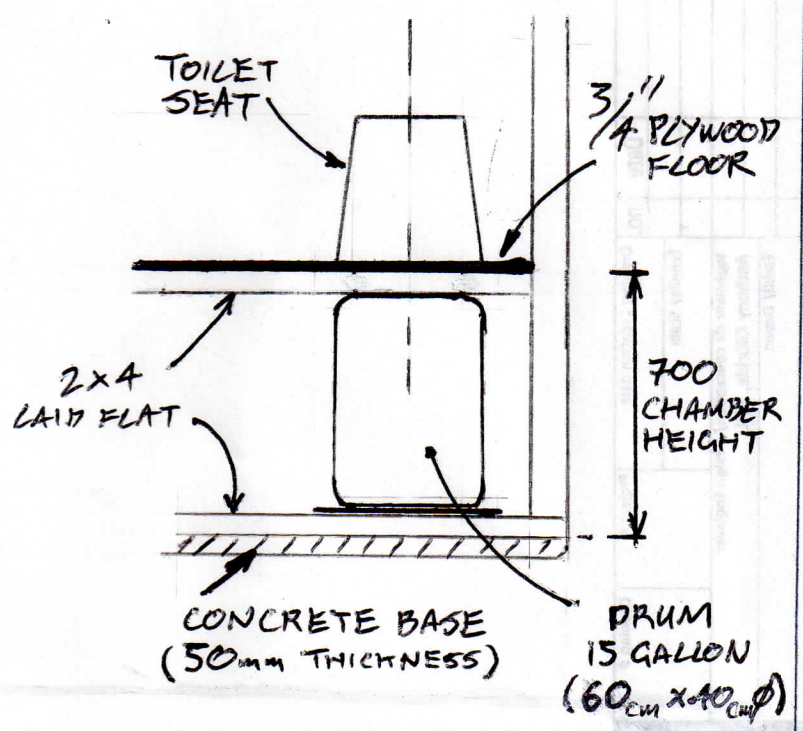


PLAN VIEW OF DRUM GUIDE IN CHAMBER.

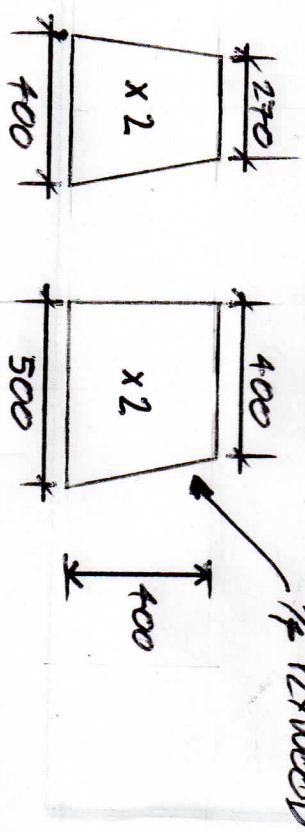
- DRUM IS POSITIONED ACCORDING TO POPHOLE.
- GUIDE IS FIXED IN PLACE ACCORDING TO POSITION OF DRUM.
- 1 DRUM GUIDE!
- GUIDE USES 2 PIECES 1" x 4", 400mm LONG.

NOTES
 1, ALL DIMENSIONS IN MM UNLESS OTHERWISE STATED,

SIDE VIEW INSIDE CHAMBER



PIECES FOR WOODEN TOILET PEDESTAL.



SOIL AND TOILET : WOOD

DETAILS

Revisions/ Revisions		Date	no.	Drawing Creation date	Project #	Drawing #
				21st Feb. 2011		T.05
Echelle/ Scale				1:20		
Ingénieur de conception/ Design Engineer				Anthony Kilbride, SOIL		
Etabl/ Drawn				Anthony Kilbride		





Toilet Bill of Quantities

Bill Of Quantities for "SOIL UD Toilet WOOD" construction							
Notes:							
1, Unit costs are based on 2010 Port-au-Prince prices.							
Materyo	Materials	Quantity	Unit	Unit Cost	Total (HTG)	Total (\$H)	Total (\$US)
Bois 2x4x16	Wood, 2*4, 16'	17	Unit	625	10625	2125	265.6
Bois 1x4x14	Wood, 1*4, 14'	20	Unit	300	6000	1200	150.0
Plywood ¾ in	Plywood ¾ in	5	Unit	1700	8500	1700	212.5
Planches 1x8x12	Wood, 1*8, 12'	3	Unit	550	1650	330	41.3
Tôles 6 ft	Zinc sheeting, 6ft	6	Unit	275	1650	330	41.3
Clous tôle	Nails, zinc sheet	1	Llbs	60	60	12	1.5
Clous 4", llbs	Nails, 4"	4	Llbs	40	160	32	4.0
Clous 3 in	Nails, 3"	10	Llbs	40	400	80	10.0
Clous 2 1/2 in	Nails, 2.5"	10	Llbs	40	400	80	10.0
Clous 1 in	Nails, 1"	2	Llbs	40	80	16	2.0
Sac de ciment	Ciment	1	Unit	300	300	60	7.5
Cadenas	Padlocks	4	Unit	100	400	80	10.0
Paire couplet 3x3	Door hinges, 3"	6	Unit	35	210	42	5.3
Charnière à cadenas	Latch for padlocks	4	Unit	30	120	24	3.0
Manches pour portes	Door handles	2	Unit	125	250	50	6.3
Taquet 4 in	Internal door lock	2	Unit	75	150	30	3.8
Crochet	Hook & Chain	4	Unit	50	200	40	5.0
Siege SOIL UD	SOIL UD Toilet Seat	2	Unit	2800	5600	1120	140.0
Bâche	Plastic Sheeting	2	Unit	1500	3000	600	75.0
Peinture (gal.)	Paint	2	Gallon	650	1300	260	32.5
Drum	15 Gallon Drum	2	Unit	500	1000	200	25.0
Tuyaux 3/4"	3/4" PVC drainpipe	1	Unit	165	165	33	4.1
Courbe 45, 3/4"	3/4" 45deg. Bend	1	Unit	20	20	4	0.5
Adapteur femal, 3/4"	3/4" female adaptor	1	Unit	30	30	6	0.8
Colle PVC (1/4 boite)	PVC Glue	1	1/4 Oz. bottle	100	100	20	2.5
				Total	42370	8474	1059.3

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T1:
Chamber beneath toilet



PHOTO T2:
Drum in position beneath
poophole

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T3:
Digging urine soakaway pit after
concrete base construction



PHOTO T4:
Urine Soakaway pit

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T5:
Poophole cut in plywood floor



PHOTO T6:
View of poophole inside
wooden box seat

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T7:
Plastic Sheeting cladding
on wooden structure



PHOTO T8:
Stairs with central support

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T9:
Internal Walls



PHOTO T10:
Wooden Structure

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T11:
Sideview of toilet showing chamber doors



PHOTO T12:
Close-up on chamber doors

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T13a:
SOIL UD toilet seat,
view on outside



PHOTO T13b:
SOIL UD toilet seat,
view from poophole



PHOTO T13c:
SOIL UD toilet seat,
view on outside

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T14a:
PVC filter with security cord attached



PHOTO T14b:
PVC pipe fittings for SOIL UD toilet seat

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T15: SOIL UD Toilet seat from fibreglass

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO T16a:
SOIL UD toilet positioned
in shade. Positioned for
privacy, but too obscure?



PHOTO T16b:
GOOD positioning of SOIL
UD toilet with just enough
space for chamber access



PHOTO T16c:
BAD positioning of
SOIL UD toilet with
not enough space for
chamber access

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011

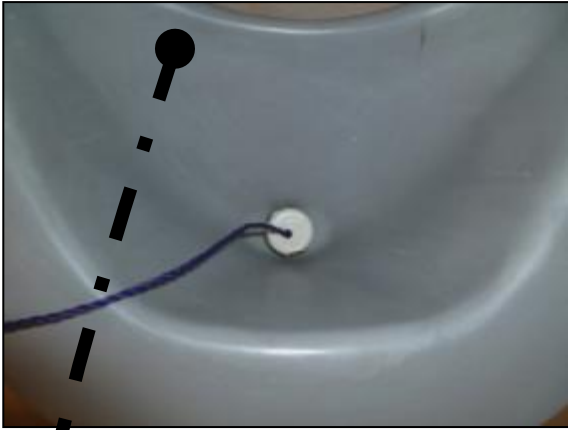
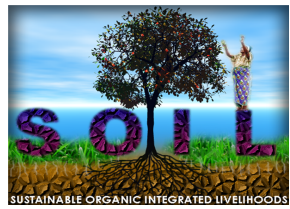


PHOTO T17
Unclogging urine bowl in UD seat



T6_Toilet Photos

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO BAD T1:
SOIL UD toilet, blocked
drainpipe.



PHOTO BAD T2:
SOIL UD toilet, blocked
drainpipe detached from
SOIL UD seat.



PHOTO BAD T3:
SOIL UD toilet,
detached drainpipe
with urine spilling onto
chamber floor.

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO BAD T4a:
Early SOIL UD
toilet seat with
holes for urine
drainage, NO filter.



PHOTO BAD T4b:
Early SOIL UD toilet
seat, drainage holes
forceably enlarged to
unblock drainpipe.



PHOTO BAD T4c:
SOIL UD toilet,
detached
drainpipe with
urine spilling onto
chamber floor.

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



PHOTO BAD T5:
Early plumbing with 90 degree bends causing drainpipe blockages.



PHOTO BAD T6:
Poorly installed drainpipe not entering into soakaway pit.

The SOIL Guide to Ecological Sanitation

1st Edition, February 2011



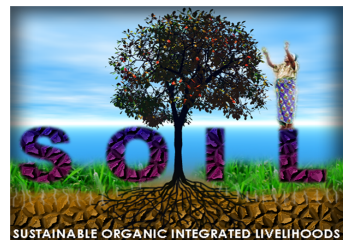
PHOTO BAD T7:
Plastic sheeting
deliberately detached by
children, for access.



PHOTO BAD T8:
Early drum guide
using removeable
pieces of 2*4 to
raise poop drum.



PHOTO BAD T9:
Heat damage to
plastic sheeting on
side of SOIL UD toilet.



Toilet Construction Checklist

Construction Checklist: SOIL UD toilet					
Name of Supervisor					
Date					
Name & Location of toilet					
COMPONENT	SPECIFIK (en creole)	Specification (en Anglais)	<input type="checkbox"/>	<input type="checkbox"/>	Comments
Fondasyon	2 sac cimen	2 sacs of ciment used per slab			
(Foundation)	Melanj beton kòrèk (Gravye : Sab : siman - 4: 2: 1)	Concrete mix correct (Gravier: Sable: Cimen – 4:2:1)			
	Epesè beton kòrèk	Concrete thicknes correct (at least 50mm)			
	Fòs pèdi pou pipi (20cmØ * 50cm pwofodè)	Urine soakaway pit constructed (20cmØ *50cm depth)			
	Travay sou platfòm beton nan 24è	Concrete cured for 24hours before loading with structure			
Estrikti	Wotè ramp eskalye kòrèk	Guiderails at the correct height			
(Access and Structure)	Wotè mach eskalye kòrèk	Steps with the right height			
	Lajè mach eskalye kòrèk	Steps at the right width			
	Supo lateral byen fet enba estrikti	Lateral supports in place beneath structure			
	Balis yo byen fet	Balistrade strong and at correct height			
	Pwela byen mete	Plastic sheeting strong and tight			
Cham twalet	Pòt kabin twalèt louvri anedan	Toilet door opening: opens inward			
(Toilet cubicle)	Bwat twalèt kache deyè pòt	Toilet door opening: opens toward toilet seat			
	Mezi bwat yo kòrèk	Toilet seat box: dimensions correct			
	Etajè pou papye yo fet	Shelf for toilet paper in place			
	Wotè twati twalèt la kòrèk	Height of toilet roof correct			
	Etajè pou flè yo la	Shelf for flowers in place			
	Manch pòt yo ak chanyè deyò yo monte	Door handle and external lock correct			
	Chanyè anedan yo monte	Interior lock correct			
Cham Anba	Pòt byen monte	Doors well fixed with smooth opening			
(Toilet Chamber)	Pòt louvri deyò sèlman	Door stop on doors			
	Gen espas pou pòt louvri deyò	Adequate space outside doors for opening			
	!! Wotè ray ak aret yo kòrèk !!	!! Guiderails for drum correctly placed !!			
Penti	Logo yo fet (SOIL, Oxfam, Fann, Gason)	All signs present (Fann, Gason, SOIL, Oxfam)			
(Painting)	Penti sou bwa yo byen fet (epesè penti, bwa ki pa kouvri ak pwela)	Exposed wood painted (2 coats of paint needed)			
Plonbri	Bwat yo byen fikse, nan bon sans	Wooden toilet pedestal attached to floor, with correct orientation			
(Plumbing for UD seat)	Siej yo byen fikse	SOIL UD Toilet Seat well fastened to pedestal			
	Tiyo pipi 3/4" itilize	Urine pipe used: 3/4" diameter			
	Tiyo Pipi byen konekte anwo	Urine pipe connected on top			
	Tiyo Pipi byen konekte anba	Urine pipe connected on bottom			
	Tiyo Pipi descend nan tou foss pèdi minimum 10cm	Urine pipe descends into soakaway pit by at least 10cm			
Artik operasyon	Doum pou bagas a la	1 * Large Drum (50 Gallon) for bagas			
(Operational items)	Ti bokit bagas anedan	2 * little buckets for bagas (1 per cubicle)			
	Ti Bokit pou papye ijènik anedan	2 * little buckets for toilet paper (1 per cubicle)			
	Cham enba femèn ak Kadna, 2 kle ak comite, 1 kle ak SOIL	Chamber below closed with padlocks, 3 key sets			