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Authors:  
Angus McBride, Caroline Muturi, David Githiri and Julian Parker  

Cover photo: Angus McBride/Oxfam  
Graphic Design: Alessandro Mannocchi/Rome
Double vault Urine Diversion Dry Toilets (UDDT) can be used as an alternative to pit latrines in refugee camps. They utilise two chambers for faeces, one of which is in use whilst the other is full and drying so that it can be safely disposed of after an appropriate period of time. A key advantage in camps is that they can be used indefinitely and therefore may be more economical than pit latrines, particularly in areas with rocky or unstable soils, or a high water table. From a user’s perspective, it is the lack of flies and smell from the toilet which make UDDTs relatively pleasant to use.

These Standard Operating Procedures (SOPs) were developed by Oxfam under UNHCR’s “Waste to Value” Project, which was funded by the Bill & Melinda Gates Foundation. They are largely based on UDDTs developed under the Waste to Value Project in Jewi refugee camp in the Gambella Region of Ethiopia, as well as those developed previously by Oxfam and the Norwegian Refugee Council in Melkadida Refugee Camp in the Somali Region of Ethiopia.

Urine Diversion Dry Toilets (UDDT) are a well-established technology in which the toilet interface has separate holes for urine and faeces. There are two chambers for the faeces – one of which is in use whilst the other is full with faeces drying inside. The urine is disposed of separately, either by capture in a storage container and periodic disposal or by infiltration into the ground around the toilet. Once the faeces has sat drying in the vault for twelve months, the pathogen load will be significantly reduced such that the vault can be safely emptied with the use of proper personal protective equipment, and potentially used as a soil conditioner on non-food crops or fruit trees. Latrines are difficult to empty when full, and the safety of the process is difficult to control, requiring consistent close supervision. Pits can also be prone to collapsing when emptied. Hence they are typically decommissioned when full in refugee camps. Double vault UDDT latrines can be emptied with a spade and are therefore easier and safer to empty than pit latrines.

Refugee camps frequently last for decades, and providing suitable sanitation is essential to protect public health. Pit latrines are the most common sanitation solution because they are cheap and easy to build, but are problematic to build in areas with high water tables, and rocky or unstable soil, or to replace periodically in congested camps. UDDTs are particularly advantageous in these situations as they can be built above ground and repeatedly emptied.

The design philosophy of the UDDT has been to balance cost, ease of construction, and user acceptability. The aim is to have a design that can be easily rolled out to thousands of households in a camp setting either by a UNHCR Implementing Partner or a contractor. The design does not require specialists to build and uses local or readily available materials and construction methods. The costs are comparable to that of a household latrine, and the UDDT may be cheaper over a 10 year lifecycle. The design has been tested at scale in Refugee Camps in the Somali and Gambella Regions of Ethiopia, although so far no vault emptying has taken place and the procedures for this are untested.

<table>
<thead>
<tr>
<th>Estimated Lifespan</th>
<th>Long term strategy</th>
<th>Best for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Pit Latrine</td>
<td>Two – three years</td>
<td>Rebuild &amp; Replace</td>
</tr>
<tr>
<td>UDDT</td>
<td>Indefinite</td>
<td>Empty vaults, use as fertiliser</td>
</tr>
</tbody>
</table>

1 Although mechanical equipment can make the process faster, more efficient and safer for emptiers, most examples of mechanical desludging equipment to date have been prone to breakdowns and have been unsustainable without outside technical support. The exception is the vacuum tanker, but these would struggle to access all areas of the typical refugee camp and normally require latrine pits to be lined.
UDDT Features

Steps
Vault
Faeces Holes
Footrests
Vault Door
Urine Pipe

Urine Soakaway
Vault Doors - locked closed using a bolt and nut

Easy to open cover for vault in use

Urine hole for urine and anal wash water

This vault is either empty, if the toilet is new, or full of faeces and drying

This hole is for faeces

Heavy cement cover for closed vault

Urine Pipe goes into Soakaway

Superstructure to suit local conditions

Steps

Handwashing Station

Ash is added after use
Technical Specification

Squatting Pan
A variety of different designs can be used for collecting and separating the urine and faeces. The design used here is a simple squatting pan design that is likely to be suitable for many parts of the world and is relatively easy to form using cement. Other options include seated versions and pans with separate holes for urine and anal wash water (see Figure 1).

Figure 1. The arrangement of the faeces and urine holes can be adapted to local practices.

Vault Size
There is a wide range in the quantity of faeces that one person produces, from 44 to 146 kg per year (Rieck et al, 2012). However, faeces are 80% water and after some months this moisture content will have reduced significantly. The density of UDDT contents has been measured as between 1,350 and 1,450 kg/m$^3$ (Strande et al, 2014). The design in this document has a vault size 80 x 80 x 80 centimetres, which is approximately 500 litres (0.5 m$^3$), which may be adequate for a five person household for twelve months. An example sizing is below, based on The Technology Review of Urine-Diverting Dry Toilets (Rieck et al, 2012):

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Adults x 0.4 kg/day</td>
<td>0.80 kg/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Children x 0.15 kg/day</td>
<td>0.45 kg/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>faecal weight</td>
<td>456 kg/year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>moisture loss -25%</td>
<td>-114 kg/year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cover material (0.1kg/p/day)</td>
<td>180 kg/year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>entire household</td>
<td>524 kg/year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>margin of safety (20%)</td>
<td>131 kg/year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>total design weight</td>
<td>655 kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>required vault volume (1,450 kg/m$^3$)</td>
<td>452 litres</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Vault Doors**

The doors on the vaults must be secure and seal well to keep the contents safely contained, prevent the ingress of rainwater and keep the inside of the vault dark and less visible to the user. For this reason painted steel doors are used – they are robust, secure, and can be easily fabricated. Alternative, low-cost designs are unlikely to be adequate.

A solar UDDT uses inclined vault doors to absorb more solar radiation, resulting in higher temperatures and faster drying of the vault contents. However, Winderberg & Otterphol (2016) found that solar UDDTs are not necessarily effective and recommended the construction of non-solar UDDTs. Rieck et al (2012) also recommend non-solar UDDTs, additionally citing the more complicated construction and increased likelihood of rainfall intrusion with solar versions. This design is for a non-solar UDDT with vertical vault doors.

**Cover Material**

After each use of the toilet a cup – approximately 200 ml, or enough to completely cover the fresh faeces – of cover material is poured in the vault over the faeces both for aesthetic purposes and to eliminate smell and flies. This cover material can be ash, dry soil, or sawdust.

**Urine Disposal**

The urine is disposed of into a soakaway as collection and reuse requires intensive management. The size of the soakaway should be adjusted to local conditions, and an infiltration test may be required to optimise this. Using stones rather than aggregate means that there is more space for potential detritus before it backs up into the urine pipe. The soakaway pit does not need a cover, but the urine pipe should extend below the surface.

The pipe to the soakaway should not be less than 2” (50mm), to ensure that blockages are kept to a minimum, and should slope downwards along its whole length (albeit with varying slope angles) to prevent pooling of urine. At the entrance to the pipe either mesh or a floor drain should be used to prevent detritus entering (Figure 2).

**Faeces Treatment**

After six to twelve months inside the faeces vault, the contents should be inoffensive (virtually odourless and with no visible live insects etc) and have significantly reduced pathogen load. This happens through a combination of dehydration, increased temperature and increased pH.

The Centre for Disease Control (CDC) in Atlanta, USA, conducted a study on UDDT toilets in Hiloewn Refugee Camp, Ethiopia. They tested the contents of the vaults of several UDDTs for meeting the 2006 WHO Guidelines for Safe Agricultural Reuse for Agriculture. These guidelines are conservative if the waste is disposed of rather than reused, but there are no other guidelines available for this. The study found that UDDTs in dry, arid, hot environments like Hiloewn have the capability to meet the WHO guidelines after 12 months of storage, although this is not guaranteed. CDC concluded that “findings indicate that the UDDTs in Hiloewn camp could be managed on a 12 month emptying cycle, as the program planned, with care to ensure appropriate precautions are taken to prevent exposure during waste handling and in a secondary storage site location.”

**Adapting for Local Conditions**

The design should be adapted according to the local context. The superstructure in particular should use typical construction materials and methods for the context, ensuring that the solution provides privacy and security for users. A roof is normally required to prevent precipitation, but in particularly dry climates could be omitted. Other parts of the UDDT could also be changed depending on the context, and The Technology Review of Urine-Diverting Dry Toilets (Rieck et al, 2012) provides a good overview of potential alternatives.
Community Engagement

Ensuring the correct use of a UDDT is a much more involving endeavour than for a ‘standard’ pit latrine, thus a person experienced in engaging with communities must be involved throughout implementation. A comprehensive community consultation process should promote a sense of ownership and trust in the UDDTs.

From a user’s perspective one of the key selling points is that UDDTs have no flies and do not smell when used properly.

Step-by-step community engagement

1. Awareness creation on Urine Diversion Dry Toilets
Prior to construction, community meetings should be organized to share information about urine-diversion principles, benefits and the proposed implementation of the UDDTs. These community meetings should provide a forum to identify and dispel rumours and myths associated with the latrine (based on culture), and offer feedback to any questions and concerns that the prospective users may have. Depending on the context, it’s advisable to have flyers with pictures of the UDDTs or a demonstration toilet where the community can see the actual structure. Ideally, meetings with opinion leaders such as community leaders, teachers or health incentive workers should be conducted first; but all members of the community must be involved afterwards: men, women, youth, and people with disabilities. During the discussions, enough time should be allowed for questions and answers to make sure the community digest the idea and express any fears or concerns they may have. Involving these stakeholders from the onset of all discussions regarding UDDTs will not only ensure sustainability, but can also teach new skills and broaden awareness about health and hygiene issues.

If the UDDT is accepted by the community, the next step is to discuss how they’ll be actively involved in problem solving, planning and decision making and as far as possible, taking responsibility for the toilets. Participation enables the community to shape the project so that it works for them.

2. Training of community including community mobilisers to help with follow-up
Community engagement must be led by people from within that community for it to be effective. While creating awareness, the team from the implementing agency should identify (with the help of leaders) people that will be good community mobilisers. Ideally these people should be literate, with good communication skills, and females. It’s advisable to use existing community mobilisers (if any), because they’re well known to the community. The number of community mobilisers will depend on the context – for instance; 2 mobilisers were found to be ideal for a block with 128 households in Jewi Refugee Camp in Ethiopia. Through the community mobilisers, the team should mobilize the community for training while construction goes on. Training should be provided directly to users on appropriate use and maintenance of the UDDTs, including proper explanation of any anticipated re-use of the by-products.
3. Community forums to train and support proper use

As soon as the construction of the latrines is completed, a handover ceremony to the community should be conducted. This event should include distribution of NFIs essential for proper use and maintenance of the UDDTs and practical demonstrations on how to use them, on squatting to use the urine & faeces holes, respectively, anal cleansing (if applicable), addition of ash, cleaning excess ash with a broom before leaving the latrine and washing hands with soap as the final step. These community forums should be segregated by sex to encourage users to participate without inhibition.

4. Routine follow-up

The community outreach agents should carry out routine follow-up on the use of the UDDTs using both focus group discussions and house-to-house visits. The frequency of the meetings/visits will largely depend upon the distance between households. For instance, in a refugee camp setting where 16 households make 1 community (Ethiopia), the best practice is to conduct house-to-house visits in the morning (say from 9 – 12 noon) to observe on-going practices and then conduct a discussion with same household owners in the afternoon (say 3-4pm) on challenges they could be facing or areas that need improvement. This is because one community has 8 HHs on a single stretch opposite another 8 households, sharing a common sanitation corridor. With appropriate skills and practice, it’s possible to conduct a house-to-house visit in an average of 10 minutes (all 16 HHs will take less than 3 hours) and the afternoon focus group discussions in less than 2 hours.

The routine follow-up should focus on sharing the key information as well as the linkage to the proper use of the NFIs provided. For example, a UDDT requires one vault to be used at a time - the observation during house-to-house visit should check that there is one vault, with a concrete cover slab, that is not in use and another vault, with an easily moveable cover, that is in use. Observation of the pit in use should confirm that ash is visible, and the latrine should be visibly clean and without noticeable odors or flies.

<table>
<thead>
<tr>
<th>Key aspects for community engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provide correct and accurate information on UDDTs including expectations regarding contribution towards construction, operation and maintenance.</td>
</tr>
<tr>
<td>• Consult targeted households on the items to be included in the latrine cleaning kits – especially the appropriateness in relation to cultural beliefs.</td>
</tr>
<tr>
<td>• The requirements of men, women, young people, children, those with special needs and disabilities in relation to UDDT will be different. Therefore, consult these groups of people and address their needs as much as possible within budget limitations.</td>
</tr>
<tr>
<td>• Prioritise the right messages, reinforcing doable, practical and evidence-based actions, tailored to community member’s information gap (based on monitoring over several months of use of the UDDTs by the community).</td>
</tr>
</tbody>
</table>
User Operation and Training

Items to be distributed with the UDDTs
To facilitate proper use of the UDDTs, several items should be distributed during the handover process. These may be contextualized but could include:

- metal bucket for ash,
- a scoop (e.g. plastic cup) for ash,
- child’s potty,
- broom or mop,
- container (e.g. jug) for anal cleansing water if appropriate,
- hand washing container/station,
- soap (cheapest available locally to maximise the chance the user will purchase replenishments).

Training
Every household should be trained in the use of UDDTS. Messages to cover include the following:

- Only defecate in the faeces hole (avoid water/urine here) and urinate/dispose anal wash water in the urine hole.
- Use one chamber at a time – cover the chamber currently in use with a cover that’s easy to lift; cover the other chamber not in use with a concrete slab.
- Maintain an adequate amount of ash in the metal bucket provided – the ash should be added to fresh faeces using the plastic scoop after defecation to reduce smells and flies.
- Dispose children’s faeces into the latrine – use potties for children who are unable to use the UDDTs.
- The UDDT should be kept clean - the urine area can be cleaned with soap and water once a week (especially if the people are not washers) to remove/prevent bad smells. Care should be taken during cleaning that water does not splash into the faeces vaults.
- If people practice anal cleansing with water, then they should ensure the wash water goes into the urine hole and not in the vault.
- If people practice anal wiping, then bio-degradable materials such as paper or grass should be used.
- Ensure that the handwashing container always contains water and that all users wash their hands with soap or ash after using the latrine.
- The UDDTs should not be used for bathing or showering.
- Avoid disposing non-degradable materials such as disposable pads, bottles, dry cell batteries, broken glass, metal etc in the toilet.
- If a cone of faeces and cover material is forming inside the vault this should be flattened to increase the space available.
Pictorial Guide

A pictorial guide (see Annex 6) should be placed on the door of the UDDT. This can be useful to reinforce key messages, and for visitors or members of the household who have not undergone training. This poster should be laminated and cover the key messages for using the latrine:

- Only faeces and cover material should enter the vaults.
- Use the urine hole for urination, anal wash water and toilet cleaning water.
- Pour enough cover material in the latrine after each use to stop smell and flies.
- Wash your hands with soap or ash after using the latrine.
Emptying and Maintenance

Vault Closing Procedure

To simplify monitoring and emptying operations, UDDT vaults should be closed in groups – this could be ‘communities’, ‘blocks’ or ‘zones’ in the camp. The procedure for closing a vault is as follows:

1. The drop hole covers are switched, and the vault cover of the closed vault is sealed with a cement mortar to physically prevent it from being used.

2. Ensure that if cones of faeces and cover material have formed inside the vault these have been flattened before considering that the vaults are full.

The addition of hydrated lime (2-5% by weight), also known as calcium hydroxide or slaked lime, at the time of vault closure will increase the pH. While laboratory studies indicate an increase in microbial inactivation with the addition of lime, this is currently untested in the field. Under certain circumstances, the addition of hydrated lime should be considered if it is available at an affordable price. Examples of circumstances where this is recommended are:

- Where vaults will be emptied after a period of much less than 12 months, for example where the number of users is large relative to the vault size, for whatever reason;
- Where the waste will be reused as a soil conditioner;
- Where handling risks are increased for any reason.

Figure 3. A closed vault (left) and a long spade for emptying the vaults (right).
Vault Emptying Procedure

The vaults should be emptied after twelve months. At this point the vault contents will have a significantly reduced pathogen load, but pathogens will not be eliminated completely and safe handling practices should be followed. The content of the vault should be inoffensive in terms of smell and aesthetics (Figure 4).

Technicians emptying vaults should be trained and equipped to undertake the procedure safely. As a minimum, liquid-repellent overalls, splash-proof face shields, respirators, boots and gloves should be provided. Workers should also be provided with Tetanus – Diphtheria immunisations. It is important that protective equipment is cleaned and disinfected thoroughly between uses or it will not serve its purpose. Disinfection could either be through boiling or washing with a disinfectant product. Training should include the following:

- Personal protective equipment should be worn at all times during the vault emptying process.
- Keep wounds covered with clean, dry bandages.
- Change into clean work clothing on a daily basis and reserve footgear for use at worksite or during waste transport.
- Wash hands thoroughly with soap and water after contact with waste; before you eat, drink, or smoke; and before and after using the toilet. Hand-washing stations with clean water and mild soap should be readily available whenever contact with waste occurs.
- Avoid touching face, mouth, eyes, nose, genitalia, or open sores and cuts while working with waste.
- Eat in designated areas away from waste-handling activities.
- Do not smoke or chew tobacco or gum while working with waste.
- Remove excess waste from footgear prior to entering a vehicle or a building.
- Do not wear work clothes home or outside the work environment.
- Thoroughly, but gently, flush eyes with water if waste comes into contact with eyes.

Long-handled shovels are required to extract the waste from the vault, and either wheelbarrows or donkey carts are required to move the waste to its disposal site. These should be covered and not be used for any other purpose.

After emptying, the vault should also be securely re-sealed for future use, and the date on which the vault was closed should be removed to avoid confusion.

Disposal Site

The disposal site will typically be a pit, sized appropriately according to the number of UDDTs to be emptied. To avoid flooding it may be necessary to dig the pit in phases so that only a small section is open at any one time. The pit should be at least thirty metres from all water sources and sixty metres from all dwellings and other camp facilities. The bottom of the pit should be at least 1.5 metres above the water table. The disposal site needs to be secure whilst the pit is open to prevent unauthorised access, and the site should not be used for other purposes for some time afterwards. The top 25 centimetres of the pit should not be filled with the waste and should instead be backfilled with soil.

Urine Pipe Cleaning

The urine pipe may block periodically. It can easily be cleared using a piece of wire either from the top of the urine pipe. This is a simple operation and it is possible to train members of the community to do this.
Monitoring

The monitoring of the toilets has several objectives:

1. To check that they are being used properly, and ensure any problems with use are rectified.
2. To determine the filling rate of the toilets, to assist in the plans for emptying of the vaults.
3. To determine improvements that can be made to the UDDTs or to the community mobilisation.

The monitoring system should consist of continuous surveillance of the toilets, a systematic survey and focus group discussions.

Continuous surveillance
Community mobilisers should be on the ground continuously, and through their routine visits they will have a good understanding of how the latrines are being used. Systems should be in place to capture any issues so that they can be dealt with in good time.

Systematic Survey
Conducting a systematic household survey every three months is useful to establish filling rates, trends and provide clear evidence of the performance of the UDDTs. Systematically sampling can provide representative information. An example checklist that can be used is included in the Annex. If the survey is installed on phones or tablets it is easier to track the data.

UDDTs will be emptied in groups, and so the monitoring should reflect this. For example, if the camp has blocks of 100 households, then all of the toilets in a block can be on the same emptying cycle, and therefore the same monitoring cycle. Every three months ten toilets from within the block can be surveyed and this taken as representative of the block.

Conducting a survey of UDDTs will typically require at least two people: one to fill in the forms whilst another checks inside the toilets and measure the depth of faeces in the vault. The vault doors at the back should not be opened during the survey: measurements of filled depth should only be taken through the faeces hole of the vault that is in use.

Focus Group Discussions
A sample focus group discussion template is in the Appendix. Given the personal nature of toilet use, focus group discussions should be held in small homogenous groups (men, women, children). Initially focus groups should be held regularly as attitudes and understanding may change quickly and changes are likely to be made as a result – either to aspects of the design such as the squatting hole arrangement, or changes to the way community engagement is conducted. Once the toilets have been established for some time it is easier to include questions about UDDTs into other monitoring activities, for example into focus groups held as part of an annual knowledge, attitudes and practice study.

Figure 5. Monitoring the UDDT latrines: Getting user feedback in Gambella.
References

CDC (2002), Guidance for Controlling Potential Risk to Workers Exposed to Class B Biosolids


Annexes

1. Drawings
2. Construction Guide
3. Bill of Quantities
4. Monitoring Focus Group
5. Observation Checklist
6. Pictorial User Guide
7. Cost Analysis
1. Drawings

- **A. Front Elevation**: Door and frame made with timber purlin, with nail for holding door closed inside and out.
- **B. Side Elevation**: Prefabricated vault door.
- **C. Back Elevation**: Exterior walls to be plastered with cement mortar.
- **D. Section Plan**: Vault door slides to side.
- **E. Section Elevation**: Foundation slab cast in situ.
- **F. Foundation Slab**: Foundation slab cut away block for easy emptying.
- **G. Urine Diversion**: Dry toilet.

---

**Cement and Concrete Mixes**

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Volume (L)</th>
<th>Mix</th>
<th>Cement</th>
<th>Bags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation slab</td>
<td>60</td>
<td>1:3</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Main slab (per half)</td>
<td>50</td>
<td>1:2</td>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td>Urine pot</td>
<td>2</td>
<td>1:3</td>
<td>&lt; 0.1</td>
<td></td>
</tr>
<tr>
<td>Brick mortar</td>
<td>100</td>
<td>1:3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Plaster - walls</td>
<td>100</td>
<td>1:4</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Plaster - main slab</td>
<td>50</td>
<td>1:4</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>
Urine Diversion Dry Toilets - Standard Operating Procedures for Refugee Camps

FOOTREST

FOOTREST SECTION

SLAB FRONT ELEVATION

SLAB PLAN

REINFORCEMENT PLAN

VAULT DOOR

SLAB IS PRECAST IN TWO SYMMETRICAL PIECES TO REDUCE THE WEIGHT FOR TRANSPORT.

SLAB PLASTERED AFTER INSTALLATION FOR A SMOOTH FINISH AND A FALL TOWARDS THE URINE POT.

URINE POT ATTACHED TO SLAB ON SITE USING A CEMENT MORTAR.

POLES FOR SUPPORTING DOOR FRAME INSERTED HERE.

POLES ARE INSERTED THROUGH SLAB INTO HOH THEN CEMENTED IN-SITU.

0.1 CM THICK STEEL PLATE PAINTED ON BOTH SIDES.

0MM REINFORCEMENT IN BOTH DIRECTIONS 2CM FROM BOTTOM OF SLAB.

Ø12.5 PIPES CONNECTED TO PVC ELBOW WHEN INSTALLED.

URINE POT PRE-CAST USING CEMENT MORTAR.

URINE POT ATTACHED TO SLAB ON SITE USING A CEMENT MORTAR.

REINFORCEMENT IN BOTH DIRECTIONS 2CM FROM BOTTOM OF SLAB.

REINFORCEMENT PLAN

FOOTREST CAST IN-SITU USING A CEMENT MORTAR AFTER INSTALLATION OF THE SLAB ON SITE.

FOOTREST SECTION

SLAB PLASTERED AFTER INSTALLATION FOR A SMOOTH FINISH AND A FALL TOWARDS THE URINE POT.

URINE POT ATTACHED TO SLAB ON SITE USING A CEMENT MORTAR.

POLES FOR SUPPORTING DOOR FRAME INSERTED HERE.

POLES ARE INSERTED THROUGH SLAB INTO HOH THEN CEMENTED IN-SITU.

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0MM REINFORCEMENT IN BOTH DIRECTIONS 2CM FROM BOTTOM OF SLAB.

Ø12.5 PIPES CONNECTED TO PVC ELBOW WHEN INSTALLED.

URINE POT PRE-CAST USING CEMENT MORTAR.

URINE POT ATTACHED TO SLAB ON SITE USING A CEMENT MORTAR.

POLES FOR SUPPORTING DOOR FRAME INSERTED HERE.

POLES ARE INSERTED THROUGH SLAB INTO HOH THEN CEMENTED IN-SITU.

0.1 CM THICK STEEL PLATE PAINTED ON BOTH SIDES.

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2. Construction Guide

Off-Site Construction

Several parts can be made off-site:

1. The slab is made in two halves so that it is easier to move. By making it centrally it is possible to produce a lot of slabs quickly and ensure good curing of the concrete by keeping them in the shade and keeping them wet.

2. The urine pot is cast in a simple mould. To give space for the pipe the mould is raised above ground during casting.
3. The cover for the vault which is to remain closed. This is also made in a simple wooden mould.

4. The vault door can be made by a local fabricator. It should be painted to prevent rust.

5. The door for the superstructure can be made off-site to ensure quality.

6. The hollow concrete blocks can be produced at the site or procured and elsewhere. If made on site care should be taken to ensure they are properly cured.
On-Site Construction

1. Clear the site and dig a foundation 25cm deep.

2. Lay a foundation of 5cm lean concrete inside the foundation. If the foundation excavation is correctly sized, no formwork is necessary.

3. The vaults are built using hollow concrete blocks. If the dimensions specified in the drawing are used it should be possible to build the vaults with little, if any, splitting of the blocks.

4. The steps are made of either stone or hollow concrete block, depending on local availability.
5. The urine pipe should be installed at a 45 degree angle through the hollow concrete blocks.

6. Below the space for the vault door the blocks are partially knocked out and a cement plaster is used to create a smooth slope into the vault. The vaults are plastered inside and out with 0.5cm cement mortar.

7. The slabs are installed on top of the vaults, and held in place with cement mortar.
8. The poles for the superstructure are inserted through gaps left in the slab into the hollow concrete blocks.

9. The superstructure is built using more poles and iron sheet.

10. The vault doors at the back are installed securely by cement-mortaring their frames in place.

11. The urine diverter is installed inside the UDDT and the floor is plastered smooth.
12. The footrests are cast inside the UDDT.

13. A hand washing station can be installed inside or outside the toilet.
## 3. Bill of Quantities

<table>
<thead>
<tr>
<th>Item description</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation and Vaults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>4.5</td>
<td>50kg bags</td>
</tr>
<tr>
<td>Sand</td>
<td>0.6</td>
<td>m³</td>
</tr>
<tr>
<td>Aggregate</td>
<td>0.25</td>
<td>m³</td>
</tr>
<tr>
<td>Hollow Concrete Blocks, 40x20x20cm</td>
<td>62</td>
<td>pieces</td>
</tr>
<tr>
<td>Stone</td>
<td>0.2</td>
<td>m³</td>
</tr>
<tr>
<td>PP / PVC Pipe 50mm</td>
<td>2</td>
<td>metres</td>
</tr>
<tr>
<td>PP / PVC 45° elbow 50mm</td>
<td>1</td>
<td>pieces</td>
</tr>
<tr>
<td>Vault Doors</td>
<td>2</td>
<td>pieces</td>
</tr>
<tr>
<td><strong>Slab and Urine Pot</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>1.5</td>
<td>50kg bags</td>
</tr>
<tr>
<td>Sand</td>
<td>0.08</td>
<td>m³</td>
</tr>
<tr>
<td>Aggregate</td>
<td>0.12</td>
<td>m³</td>
</tr>
<tr>
<td>Reinforcement bar, Ø6mm</td>
<td>7.5</td>
<td>kg</td>
</tr>
<tr>
<td>Binding Wire</td>
<td>0.5</td>
<td>kg</td>
</tr>
<tr>
<td>Floor Drain Cover</td>
<td>1</td>
<td>piece</td>
</tr>
<tr>
<td><strong>Superstructure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus pole Ø10cm</td>
<td>6</td>
<td>pieces</td>
</tr>
<tr>
<td>Eucalyptus pole Ø8cm</td>
<td>2</td>
<td>pieces</td>
</tr>
<tr>
<td>Timber 5 x 4 x 200 cm</td>
<td>2</td>
<td>pieces</td>
</tr>
<tr>
<td>Timber 15 x 2.5 x 200cm</td>
<td>1</td>
<td>pieces</td>
</tr>
<tr>
<td>Burned engine oil / anti termite paint</td>
<td>1</td>
<td>litre</td>
</tr>
<tr>
<td>Corrugated iron sheet, 2 x 0.9 m, 32 gauge</td>
<td>11</td>
<td>pieces</td>
</tr>
<tr>
<td>Nails, roofing</td>
<td>0.5</td>
<td>kg</td>
</tr>
<tr>
<td>Nails, 12 cm</td>
<td>0.1</td>
<td>kg</td>
</tr>
<tr>
<td>Nails, 10 cm</td>
<td>0.25</td>
<td>kg</td>
</tr>
<tr>
<td>Nails, 9 cm</td>
<td>0.1</td>
<td>kg</td>
</tr>
<tr>
<td>Butt Hinge, 15cm</td>
<td>2</td>
<td>pieces</td>
</tr>
</tbody>
</table>
### 4. Monitoring Focus Group

#### General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Today’s Date</td>
</tr>
<tr>
<td>2</td>
<td>Location?</td>
</tr>
<tr>
<td>3</td>
<td>Participants (men / women / children / elderly / disabled)?</td>
</tr>
</tbody>
</table>

#### Topics for the Focus Group

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 4 | How would you describe the UDDT to your friends/neighbour?  
- How does it work? |
| 5 | When you first used the UDDT did you have any worries?  
- How did you feel using the UDDT? |
| 6 | How is your experience using the UDDT?  
- What do you like about the UDDT?  
- What do you dislike about the UDDT?  
- How difficult or easy it is to use and why?  
- Is there anything that you found surprising about the UDDT?  
- How does the use of the UDDT compare with your previous toilet? |
| 7 | Do you and your family always use the UDDT?  
- What other toilets do you use?  
- When do you use this toilet?  
- Why do you use the other UDDTs?  
- How easy is it for young children to use the UDDT? |
| 8 | What would you change about the UDDT to improve it?  
- What challenges are you facing whilst using the UDDT?  
- What do you propose to solve the challenges? |
| 9 | Of the things we have talked about today, what is the most important to you? |
| 10 | Is there anything else you would like to mention? |
5. Observation Checklist

General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Today’s Date</td>
</tr>
<tr>
<td>2</td>
<td>Latrine Number</td>
</tr>
</tbody>
</table>

Look inside the UDDT superstructure and answer the following questions

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Is there ash in the ash bucket?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is the latrine clean?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are both faeces holes covered?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Does it smell bad inside the latrine?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Are there flies in the latrine?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Look inside the vault and answer the following questions

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Is there ash in the vault?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Are the vaults dry?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>How much space is there from the slab to the top of the pile?</td>
<td>centimetres</td>
<td></td>
</tr>
</tbody>
</table>

Comments / Observations

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
</tr>
</tbody>
</table>
6. Pictorial User Guide

Urine diversion dry toilet

Two chambers and separates urine from faeces for no smell

Please give instructions to visitors on how to use the toilet

Use faeces hole for defecation only

Use the urine hole for urination and anal cleansing

Pour ash in the latrine after use to reduce smell and flies

Wash your hands with soap or ash after using the latrine
7. Cost Analysis

An indicative cost analysis has been undertaken based on prices in Gambella, Ethiopia. In other locations this might be quite different.

In Gambella latrines are dug by the community, whilst NGOs provide dome shaped slabs and iron sheet superstructures, costing around $300. These might last three years on average, before they have to be rebuilt. It is assumed that the rebuilding cost will be half of the initial installation cost, as parts of the latrine are reused.

UDDTs in Gambella cost $500 to build, and using the example costing below it is estimated they might cost $9 to empty. This will be undertaken every year after the first one (during which one of the vaults is sitting empty).

<table>
<thead>
<tr>
<th>Cost for Emptying 100 latrines</th>
<th>Labour</th>
<th>$ 400</th>
<th>6 labourers for 5 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools</td>
<td>$ 20</td>
<td></td>
<td>Replacements / depreciation</td>
</tr>
<tr>
<td>Protective Equipment</td>
<td>$ 50</td>
<td></td>
<td>Replacements / disinfection / depreciation</td>
</tr>
<tr>
<td>Transport</td>
<td>$ 400</td>
<td></td>
<td>4 donkey carts for 5 days</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$ 870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per Latrine</td>
<td>$ 9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These are broad assumptions, but show that over ten years the cost of a UDDT is at least comparable to a pit latrine, and may even be cheaper.
Urine Diversion Dry Toilets
Standard Operating Procedures for Refugee Camps