Sanitation solutions for a refugee camp: Field trial of sanitation for the vulnerable

DISSERTATION STUDY

MASTER IN HUMANITARIAN WASH

Presented and publicly supported on December 15th, 2011 by:

YAMOSSOU GNAGNY GUSTAVE

Work conducted by

DAVID MOYENGA

Research Professor, Water-Sanitation and Ecotoxicology

2IE FOUNDATION

LISA RUDGE

Water, Sanitation and Hygiene Advisor

ACF - FRANCE

Jury

President : Mariam SOU

Member : David MOYENGA

Ynoussa MAIGA

Promotion 2010-2011

THANKS

2iE Foundation's professor and administrative staff

ACF-Liberia's expatriate and national staff, specifically Saclepea base expatriate and national staff

Lisa RUDGE, Water, Sanitation and Hygiene Advisor, ACF-France

Lassana DOSSO, Water Sanitation and Hygiene Coordinator, ACF-Liberia

Tom HEATH, WASH Program Manager Nimba, ACF-Liberia and his wife

David MOYENGA, research professor, 2iE Foundation

These people contributed for project success and report writing

DEDICATION

TO:

GOD

MY FAMILY

MY FIANCEE LENA

SUMMARY

In most of the emergency project, we just provided facilities to help people in need to have some living environment. The vulnerable people are always forgotten in this environment. That the case of those (4% of refugees) in the Bahn camp.

In order to help them to fully exercise their rights, NGO Action Contre la Faim initiated a construction of specific latrines which will best answer the needs of the vulnerable.

Knowing that the success and sustainability of sanitation projects is largely dependent on choosing an appropriate technology, and planning to ensure that the ongoing and long-term operations and maintenance requirements of the technology chosen will be met, beneficiaries were involved in all phases of the project. Focus groups, mini focus groups and individual interviews allowed vulnerable people to propose solution to their sanitation needs. Then, three models of vulnerable people latrines were designed and constructed.

To allow all the vulnerable people in Bahn camp access to the latrines, ten specific latrines were constructed and 17 public latrines rehabilitated.

Monitoring the use of the latrines (final phase of the project) shows us that beneficiaries have taken ownership of the latrines.

Keywords: Emergency project - vulnerable people - Individual sanitation - Design - monitoring the use of the latrines

RESUME

Dans la plupart des projets en situation d'urgence, l'on fournit juste des installations pour aider les personnes dans le besoin à avoir un cadre de vie. Cependant, très souvent, les personnes vulnérables sont omis dans ce cadre de vie. Ce qui est le cas des personnes vulnérables du camp de Bahn qui représente 4% des refugiées.

Ainsi, dans l'optique d'aider cette population vulnérable à jouir pleinement de ses droits, l'ONG Action contre la faim a initié la construction de latrines spécifiques qui répondra au mieux aux besoins de ces derniers.

Par ailleurs, Sachant que le succès et la pérennité des projets d'assainissement dépendent largement du choix de la technologie appropriée et d'une planification visant à s'assurer que les opérations en cours et à long terme et les exigences d'entretien de la technologie choisie, sera atteint, les bénéficiaires furent impliqués dans toutes les phases du projet. Les focus groups, mini focus groups et interviews individuels permirent aux personnes vulnérables de proposer des solutions à leur besoin sanitaire. Ainsi, trois modèles de latrines pour personne vulnérables ont été conçus et construits.

Afin de permettre à toutes les personnes vulnérables du camp de Bahn d'avoir accès à des latrines, 10 nouvelles latrines spécifiques furent construites et 17 latrines publiques, réhabilitées.

Enfin, le monitoring de l'utilisation de ces latrines révéla que les bénéficiaires se sont bien appropriés des latrines.

Mots clés: Projet en situation d'urgence - Personnes vulnérables - Système d' assainissement individuel - Conception - Suivi de l'utilisation des latrines

CONTENTS

GLOSSARY

2iE : Institut International d'Ingénierie de l'Eau et de l'Environnement

ACF : Action Contre la Faim

ACF-IN: Action Contre la Faim International Network

APCPD : Action to Positive Change on People with Disabilities

HIV/AIDS: Human immunodeficiency virus / Acquired Immune Deficiency Syndrome

NGO : Non-Governmental Organisation

PVC : Polyvinyl chloride

UK : United Kingdom

WASH : Water, Sanitation and Hygiene

WEDC : Water, Engineering and Development Centre, Loughborough University

TABLE LIST

PICTURES LIST

DRAWING LIST

FIGURES LIST

INTRODUCTION

The Ivory Coast political crisis arose after the elections held in December 2010. It led to thousands of people leaving the west part of the country to take refuge in some Liberian villages near to the border which separates both countries.

By mid- January of this year, the refugees in those villages numbered about 20 000. In order to help them, a camp which can receive 15 000 people has been built in Bahn, situated in Nimba County in the east part of Liberia. Currently, there are 4533 refugees in this camp.

A refugee camp needs certain infrastructure to help people to live properly, such as health centers, schools for children, hydraulic equipments for safe water, sanitary installations, etc.

In this camp, ACF is responsible for providing safe water and building latrines and showers. It also has to provide some laundries and waste collection facilities and do hygiene promotion.

In order to respond in the best way to the refugees' needs ACF has chosen the solutions described below :

- Water Supply

ACF built a water treatment station which provides 75 m^3 per day. The water treated in this station is transported by tankers from a river to the camp. The water treatment process involves coagulation, flocculation and chlorination. After treatment, the water is stored in bladders and then distributed by tankers to 12 others bladders equipped with tap stand. Alongside this, there are also six boreholes with hand pumps which were installed to support the water trucking.

- Sanitary installations and hygiene promotion

Sanitation consists of separate blocks of 2, 4 or 8 cubicles for men and women. The latrines are VIP, made of plastic sheeting, timber frame, and concrete lining for the upper part of the pit. Bathing and washing areas include a private cubicle and drainage as well as a slab for clothes washing. Waste is disposed of in pits, and burned. 15 hygiene promoters are working in the camp.

Sanitation solutions are always difficult to find in an emergency context. The groundwater table is at approx 15 – 20 m in the camp, and the soil is 'easy to dig'. Therefore the technical choice of VIP latrines was relatively straightforward. Initially sanplats were in stock and used on a wooden flooring, reinforced (mesh) slabs are now constructed with cement (1:2:2) and laid upon a course of concrete bricks. The design choice was not discussed with the beneficiaries, due to the emergency.

In addition, no solution has been adapted for people with special needs (handicapped, pregnant, small children, elderly, people living with HIV/AIDS). Currently, those groups of people represent 1% of the refugees living in this camp. This percentage is significant, therefore ACF decided to build ten additional latrines which will better address the needs of these vulnerable people, in order to avoid the high risk of problem associated with their sanitary behaviours.

This task was undertaken as a research project, which represented part of the practical training for the authors' Masters in Humanitarian WASH at the 2IE Foundation.

The tasks assigned to us are as follows:

Task 1: Design project and approach of the study:

- Identify respectful and ethical approach of project
- Define targeting of project participants, and approach.
- Formalize project methodology

Task 2: Design appropriate sanitation solutions together with the beneficiaries:

- Work with hygiene team to organize meetings with vulnerable groups to determine appropriate design
- Offer different sanitation solutions and designs in order to help make a choice

Task 3: Construct and test different sanitation facilities:

- Construct sanitation facilities alongside WASH Programs involving beneficiaries along the way
- Test the sanitation facilities with the beneficiaries them and setup system for feedback and improvements.
- Monitor use and performance of a new design.

Task 4: Replicate successful design and capitalize on experience:

- Work with Sanitation Project Manager to replicate appropriate sanitation facilities
- Monitor the use of the latrines
- Write a final report

CHAPTER I: GENERALITY

I-1- ACTION CONTRE LA FAIM

I-1-1- HISTORY

Action against Hunger was founded in 1979 by a group of French intellectuals in response to the emergency in Afghanistan. While the fight against hunger had previously been an element of more general humanitarian action (the fight against poverty, promoting better health, etc.) the creator of ACF founded an organisation that was exclusively dedicated to ending hunger. Action against Hunger is now recognised as one of the leading organisations in the fight against hunger worldwide.

The organisation forms part of a new generation of independent NGos (non governmental organisations) that reject silence surrounding injustice and seek to bear witness and report on atrocities, while taking action to end them.

In 1995, Action Against Hunger has developed within the framework of an interdependent international network (ACF-IN) and has opened two additional headquarters in Madrid and London to better respond to the needs of populations. In 1997, the network expanded with the opening of a fourth headquarters in New York. And in 2005, it was opening a fifth headquarters in Montreal.

ACF-IN has 350 international volunteers and 4,000 national staff working in over 40 countries and responds in all four areas involved in the fight against hunger and malnutrition: nutrition, health, food security, and water, sanitation and hygiene.

I-1-2- ACF - FRANCE IN LIBERIA

ACF France has been implementing programmes in Liberia since 1991.

Nowadays the ACF team works in collaboration with Government bodies and local entities to increase the coverage of water, sanitation, hygiene, nutrition, food security services. Specific focus is paid to long term, sustainable assistance to underprivileged people in both remote rural areas and impoverished urban areas.

In addition the above, the organization maintains a significant capacity to react in emergency situations, such as the influx of Ivorian refugees in early 2011

I-2- ADMINISTARTIVE AND GEOGRAPHICAL SITUATION OF STUDY'S AREA

Bahn refugee camp (see Annex 0) is locating in Nimba county in east part of Liberia (see figure 1).

It is one of 15 counties that comprise the first-level of administrative division in the nation. It has six districts. Sanniquellie serves as the capital with the area of the county measuring 11,551 square kilometres, the largest in the nation. As of the 2008 Census, it had a population of 462,026, making it the second most populous county in Liberia.

Nimba is bordered by Bong and Grand Bassa counties to the west, River Cess County to the southwest, and Grand Gedeh County to the southeast. The northern and northeastern parts of Nimba borders the nation of Guinea, while the northeast lies along the border of Côte d'Ivoire.

The climate is tropical humid and hot all the year, with two distinct seasons. Dry season is november to march and rainy season, may to october.

Vegetation consisted of dense forest.

Figure 1: Bahn camp location

I-3- MATERIALS AND METHODOLOGY OF THE STUDY

I-3-1- MATERIALS

To carry out this project, certain materials were needed. Material were ACF's car, telephone and computer, camera and camp's map.

I-3-2- METHODOLOGY

The methodology of that study starts by the preliminary work, then come the phase of designing of latrines, the phase of latrines' construction and at the end the phase of monitoring of latrines' use. The preliminary work include the literature review, the inventory of WASH facilities in Bahn refugee camp, the survey of vulnerable people and the focus group meeting.

Each component of this methodology represent a chapter in the report and each chapter have it methods and it results.

CHAPTER II: PRELIMINARY WORK

II-1- METHODS

II-1-1- Literature review

The literature review was the first element of the study approach, enabling us to get information about the topic. Its main focus was on the process of constructing facilities for the vulnerable. However, we also collected information on how to work effectively with the vulnerable groups, including how to organize focus group meetings with them, and appropriate attitude when working with vulnerable people.

II-1-2- Assessment 1: Inventory of WASH facilities in Bahn refugee camp

This assessment involved making an inventory of the sanitation infrastructure in Bahn refugee camp and identifying their accessibility for vulnerable people. This was facilitated by the map of the camp and the database of the sanitation infrastructure given by WASH department of ACF-Nimba. A visit in the field has permitted the inventory of the access constraint.

II-1-3- Assessment2: Survey

This survey was done in two phases, the first was to locate the disabled people, the elderly and the pregnant women and the second was to determine the number of children from 0 to 5 years, 5 to 10 years and 10 to 15 years in the camp.

To do this assessment, some preliminary activities were made as follows:

- Designing the data collection sheet
- Testing the data collection sheet with the hygiene promotion team to ensure their understanding

The information sought during phase 1 were:

- the location of the vulnerable people in the camp
- their gender
- their type of vulnerability
- their means of moving

The data sought during phase 2 were the number of children by shelter with the following ages: 0-5 years, 5-10 years and 10-15 years.

The survey sheet used are included in Annexes 1 and 2.

II-1-3- Focus groups with vulnerable person

the organized focus groups aimed to gather vulnerable people together in order to discuss the design of a latrine that could meet their sanitation needs.

To promote full participation, these focus groups clustered people according to gender, ages and type of vulnerability (see Pictures 1, 2, 3 and 4 below).

The focus groups start by presentation of the meeting moderator who introduce himself and introduce also his colleagues (one who take note and one other who translate in dialect for the participants). He gives also the rules of focus group which are that everyone will have speech; there are no wrong answer; every answers are correct; we should not make fun of the speaker; we should listen him speaking etc.

After that, we ask to the participants to introduce themselves. Then, we start by the first question which is the sanitation habit of the participants before leaving Côte d'Ivoire. This question include their defecation's place and their means of anal cleaning. We also asked the design of their defecation place when it is not opening defecation. The same question is asked to them for their sanitation habit in the camp. Besides, we asked them who use the latrines of the camp, how they find it? had they problem to use it? What is the problem when there is? What they propose as solution to enable them to use it? Here, to help them to understand the question, we asked them what they want as facilities inside the latrine to help them to use it. We also show them some drawing to enable those who haven't ideas to give their point of view on the question of latrine's design.

Picture 1: Focus group of disabled young men

Picture 2: Focus group of disabled old women

Picture 3: Focus group of elderly men

Picture 4: Focus group of elderly women

II-1-4- Mini focus group meeting and Individual interview

The mini focus group meeting (see Pictures 5 and 6) have the same process as the focus group meeting. It's only the number of participants that is different. The mini focus group have less participants (2-6 person) than the focus group meeting.

Picture 5: Mini focus group with elderly women

Picture 6: Mini focus group with disabled young women

The individual interview (see Picture 7) as it called, is made with one participant. We did that with some of the participants of the focus group meeting who seemed influenced by the other participants and also with the targeting people who can't move.

Picture 7: Individual interview with elderly women

II-1-5- Direct observation

This method aimed to observe directly the sanitation habit of the vulnerable people in the camp. We walked around the camp to observe by ourselves the informations gave by the vulnerable people during the different meetings and also during the survey.

II-2- RESULTS AND DISCUSSION

II-2-1- Vulnerable person in Bahn refugee camp

The term of reference of that study specified the vulnerable person as handicapped person (disabled people), elderly people, pregnant women and children.

On the Figure 1 below, we note that children have the great percentage; 20% for 0 to 5 years, 15% for 5 to 10 years and 8% for 10 to 15 years. Then come the elderly 2% and disabled people and pregnant women who each have 1%. Disabled children come at end with 0.13% of Bahn camp's population.

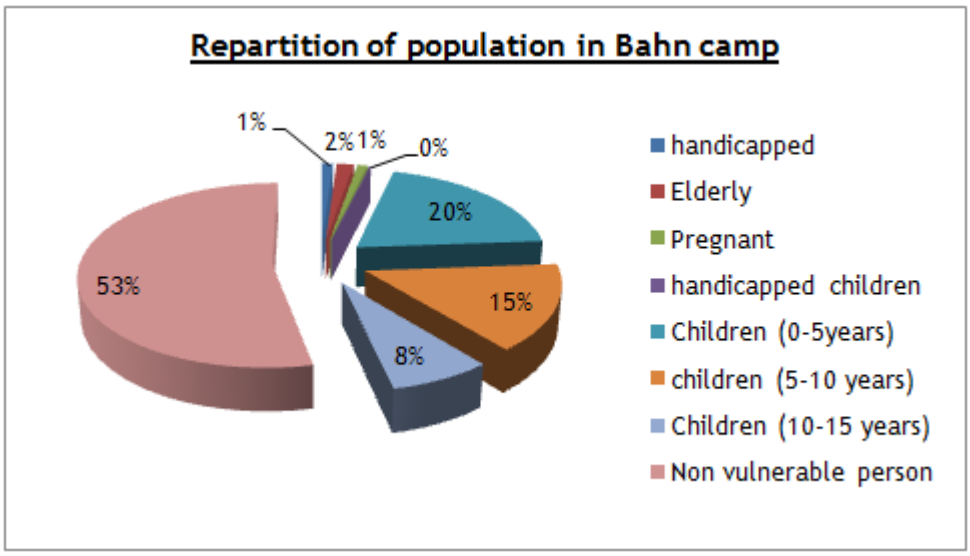


Figure 2: Population of Bahn refugee camp

II-2-2- Camp latrines' accessibility by vulnerable people

The children's survey identified 1933 children in the camp. An interview with the two directors of save the children school permit us to know that 948 children (49% of children of Bahn camp) are in that school. Another interview with the cleaner of school's latrine gave us as information

that all the children from that school used the school's latrine. Those children received an awareness' program. That program aimed to train them about the use of latrine.

The rest of children (51 % of Bahn camp's children) who did not go to school received also the same program of awareness in their communities.

However that program had a limit because an direct observation in the camp permit us to see some children practiced the opening defecation in the camp (see Picture 8 below)

Picture 8: Opening defecation by children in Bahn camp

To fight against that behavior, the ACF hygiene team walked around the camp to monitor the use of water and sanitation infrastructure. They also take advantage to sensitize the parents of the children that practiced opening defecation in the camp.

As the study fixed the number of vulnerable people latrine to ten, we target the group of disabled people, elderly and pregnant women to do the focus group. That group represent 170 persons which is 4% of camp's population. Ten focus group meeting, eight mini focus group and fourteenth individual interview were organized (see table 1) in order to hear all targeting people to have their point of view about the latrine's design.

Table 1: Focus groups and mini focus group

Focus group	Number of focus groups	Number of people in each group	Number of mini focus groups	Number of people in each group	Individual interview
Elderly men	2	14	0	0	3
Elderly women	3	13	2	4	2
Disabled young men	1	12	0	0	2
Disabled old men	1	15	0	0	1
Disabled young women	1	10	1	3	2
Disabled old women	1	12	0	0	1
Pregnant women	1	15	5	6	3
Total	10	131	8	41	14

As information got from the discussion with the targeting people, people in wheelchair (4% of handicapped women an 15 % of handicapped men (see figure 2 below)) didn't use the VIP latrine. The main reason are that around all the latrine of the camp (310 latrines), there are drainage system (see picture 9), the road of getting in the latrine are very bad (see picture 10) and there are nothing in the latrine to allow them to squat on the defecation hole. All of the people in wheelchair used potty to defecate and wait during the night to throw that away.

The people using crutch (5% of handicapped women, 4% of handicapped men and 4% of elderly men (see figure 2)) and walking stick (27% of handicapped women, 18% of handicapped men (see figure 2) , 13% of elderly women and 14% of elderly men (see figure 3 below)) manage to pass away the drainage to use the latrine but their difficulty are squatting on defecation hole. they all had problem to be balanced.

All pregnant women (46 women) said they are able to used the VIP latrine but when their belly start to be big (6 to 9 month) they had problem to be balanced.

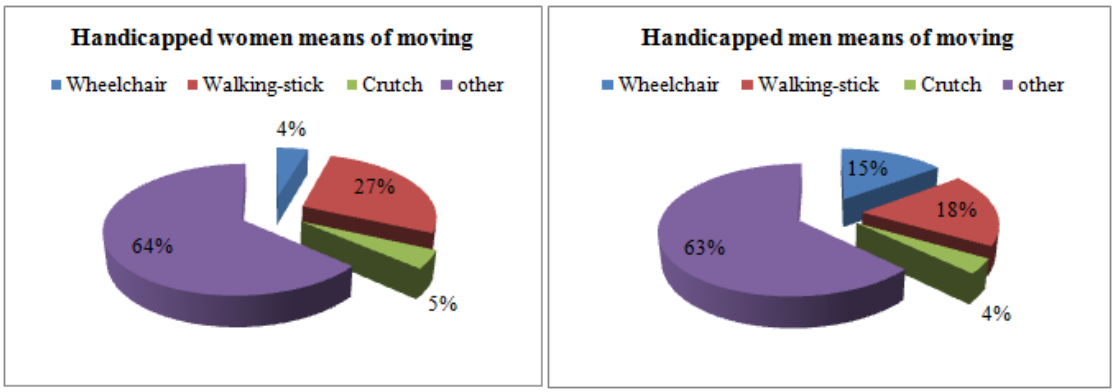


Figure 3: Disabled people means of moving

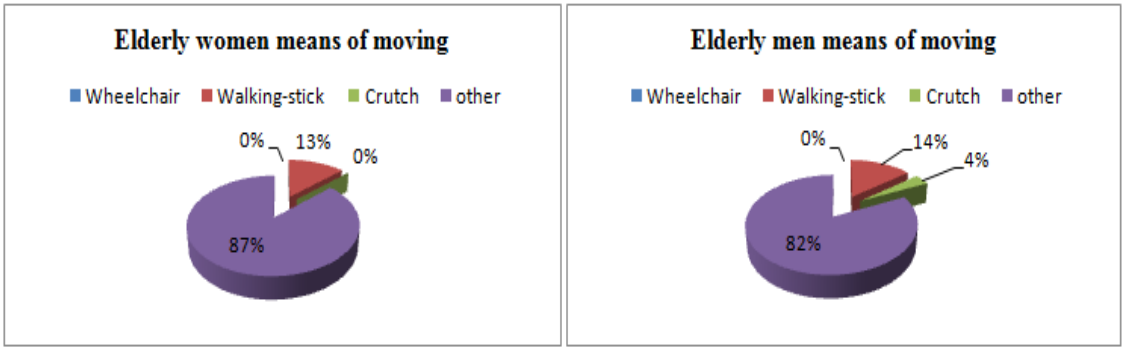


Figure 4: Elderly people means of moving

Picture 9: Drainage system around the latrine

Picture 10: Road to access latrine

II-2-2- Vulnerable people's needs inside latrine

The vulnerable people during the different meeting and interviews proposed solutions(see table 2) of their non accessibility to VIP latrine. In that table, we note that all the disabled people and 1/3 of elderly would like handrails and seat inside the new latrine. 2/3 of elderly and all the pregnant would like only handrails. They said if they had that facilities inside the latrine and they had something to pass away the drainage, they will be able to use the latrine.

Table 2: Needs of vulnerable people

Vulnerable people	Needs inside latrine
Handicapped	Handrails and seat
1/3 of Elderly	Handrails and seat
2/3 of Elderly	Handrails
Pregnant	Handrails

Among the seat design showed to vulnerable people, all of men chose model 1, 75% of women chose model 2 and 25% of women chose model 3 (see table 3 below).

Table 3: Choice of seat design

Gender	Percentage	Model	Description of seat's design
Men	100%	model 1	Rectangular shape with rectangular hole and U shape by front view
Women	75%	model 2	Rectangular shape with rectangular hole
	25%	model 3	rectangular shape with circular hole

Men find model 1 good for their gender and their disabilities and women find model 2 and 3 easy to use according to their gender and their disabilities. A test on all the model will confirm their answer during the construction and the monitoring.

The different models of latrine chose by the vulnerable people will be presenting in the following chapter.

II-2-3- Technical choice

The vulnerable people survey gave us the location of the vulnerable people in the camp. We used this information to locate the latrine in the camp in order to allow more people to access it. And then 44 % of the targeting people access to the new latrine (see figure 4). the percentage is small because vulnerable people are scattered in the camp and it is difficult to have great concentration of vulnerable people around latrine. So, to answer to the needs of the 66% of targeting people who didn't access to the new latrine, we decided to rehabilitate 17 VIP latrines in the camp for them. The construction and the rehabilitation will be more explaining in the construction chapter.

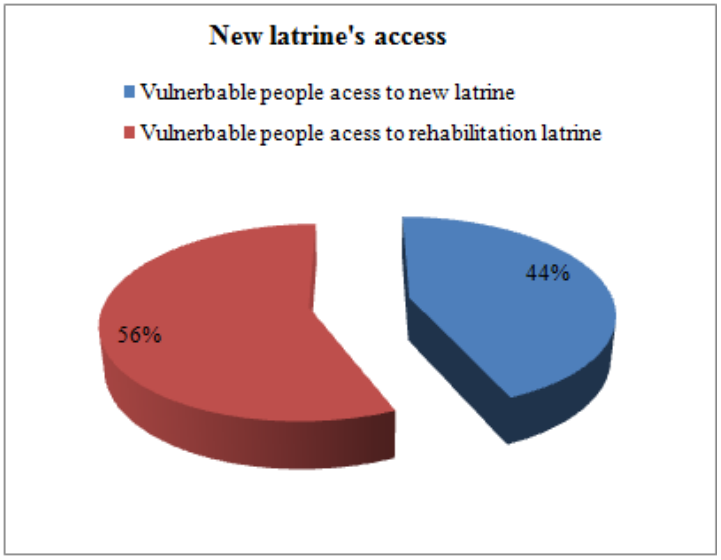


Figure 5: New latrine access

CHAPTER III: STUDY DESIGN OF LATRINES FOR THE VULNERABLE

II-1- Design facilities of Latrine for vulnerable

The designs proposed below were inspired by studies conducted by Handicap International and, WEDC, and by the information collected from beneficiaries, and also draw on a good dose of ingenuity. All these designs were portrayed in 3D with googlesketchup software. Eight designs were originally conceived but only three were approved by the beneficiaries; designs were improved further during the focus groups discussions.

Below, the designs chosen by the beneficiaries are presented. Those which were not chosen are shown in Annex 3 and can be added to ACF 's design databases.

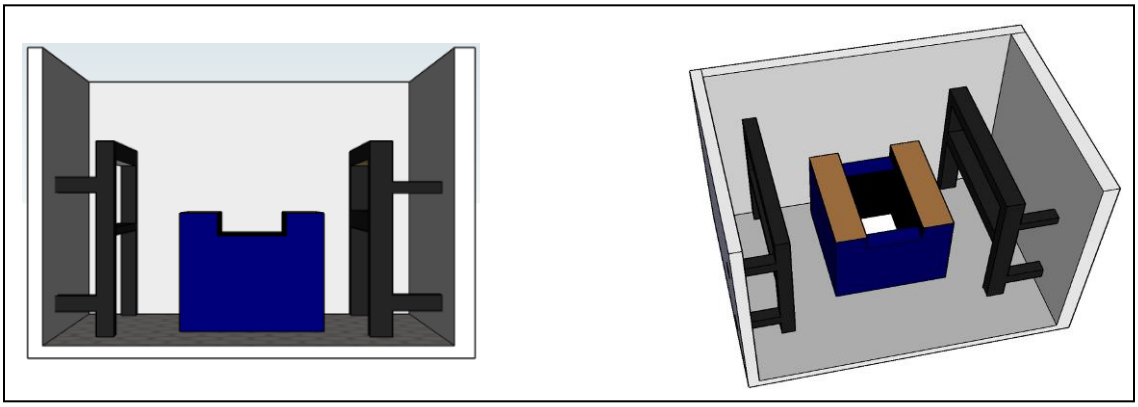
II-1-1- Model 1

Model 1 (drawing 2 below) is inspired by one produced by Handicap International in its manual, «How to build an accessible environment in developing country» published, by Handicap International France, Cambodia Program in December 2008 (shown in drawing 1).

However, the design made by Handicap International has a circular opening and the side walls are much wider than ours.

Drawing 1: Design 1 Source :Handicap International .(2008)

In order to make a locally appropriate design the model 1 is equipped with a rectangular defecation hole according to the preference of the beneficiaries. Viewed from the front, the seat has a U shape (see drawing 2 below).

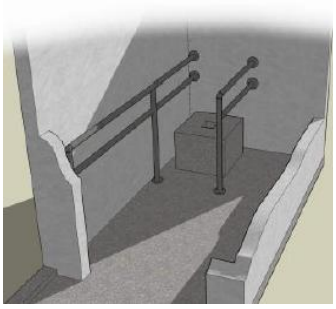


Drawing 2: Model 1- vulnerable people's latrine - Bahn Camp

It is also equipped with a defecation seat covered by leather, and with two handrails. The outside of the seat is painted with a blue oil paint and the inside with a black oil paint. Handrails were treated with carboline. The defecation seat was made with 4" bricks. Handrails were made with timber 2x2x14 or with rafters. These materials are locally and technically appropriate, but other materials may be appropriate elsewhere.

II-1-2- Model 2

Model 2 (drawing 4), especially the seat's shape, is taken from a study led by Handicap International France, always in the manual « How to build an accessible environment in a developing country» . In Handicap International's design (see drawing 3), the handrails are in galvanized tube and the seat in brickwork.

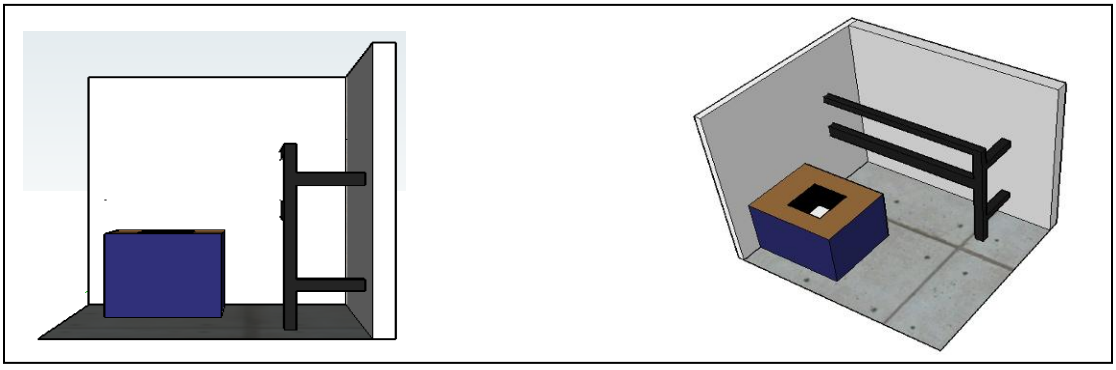


Drawing 3: Design 2 source :Handicap International .(2008)

This shape of seat was made in Kampala, Uganda by some disabled people managing the NGO Action to Positive Change on People with Disabilities (APCPD). It seat was made in brick, covered with cement and painted red (see picture 11).

Picture 11:Source Hazel Jones α Bob Reed.(2005). Disabled people's latrine in Kampala, Uganda

For Bahn Camp, the seat and the defecation hole are rectangular and constructed in masonry covered by leather. Blue paint is used for the external wall of the seat and black for the internal wall. The design is equipped with two handrails treated with carboline.



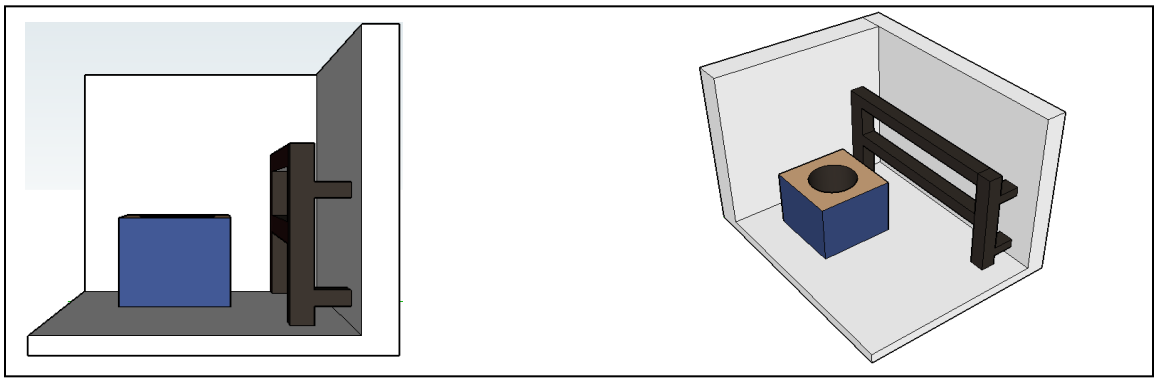
Drawing 4: Model 2- vulnerable people's latrine - Bahn Camp

II-1-3- Model 3

Model 3(drawing 5) is taken from a latrine construction project led by Save the Children UK at the school of Bubajjwe in Kampala, Uganda. The design had a defecation seat made in brick covered with cement and the hole was made with PVC pipe in order to have a round shape (see picture 12). It also had handrails made in iron, on both side of the seat.

Picture 12: Source Hazel Jones α Bob Reed.(2005). Disabled people's latrine at Bubajjwe's school in Kampala, Uganda

For Bahn Camp, the seat shape is also square with a circular dung hole. The shape of the hole will be produced using PVC (removed later). To create a smooth surface in the hole, this will be covered with cement, and later painted with oil paint.Overall, the defecation seat and the handrails have the same look as the two previous models.



Drawing 5: Model 3 - vulnerable people's latrine - Bahn Camp

II-1-4- Door handle

A wrist is an additional feature that is put on the latrine door. It permit the vulnerable to open and close easily the latrine. It is made of wood specifically in timber. It is 20 cm as length. See Drawing 6 below.

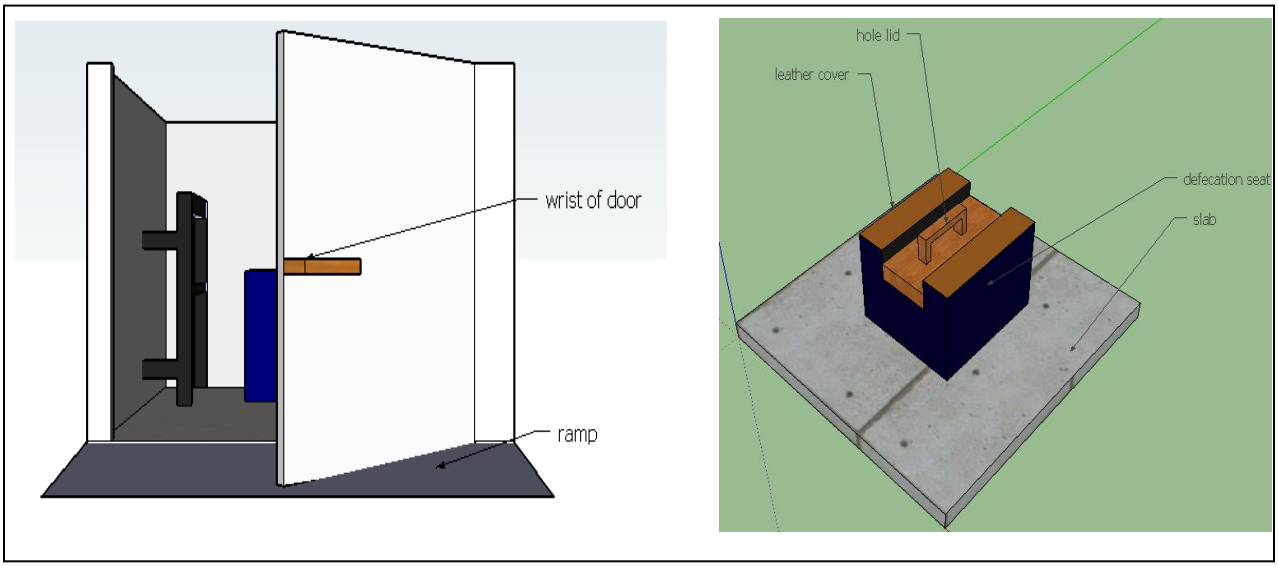
II-1-5- Ramp

A ramp is a feature which is constructed in front of the latrine to facilitate access for vulnerable people. In this project, ramps were constructed only in front of those latrines intended to permit

wheelchair access. The dimensions of the ramp were 150 cm in length and 100 cm in width, with a slope of 5%. See Drawing 6 below.

II-1-5- Hole lids

These are used to cover the defecation hole. Lids prevent odour flies in the latrine. They could be made in masonry, plastic or wood. In this project, they were made of wood. See Drawing 6.



Drawing 6: Vulnerable people's latrine component

II-1-6- Justification of specific material choice

- Leather Cover

Leather is impermeable to water and other liquids. It can be cleaned easily with water and sponge. A leather cover is therefore hygienic, and it also offers comfort to the seat user.

- Shoe glue

Shoe glue was chosen for its power to seal strongly two elements, such as the leather cover onto bricks. It is easy to use, water resistant, and retains its strength over time.

- Oil paint (blue and black)

Oil paint, whatever its color, has the power to seal bricks which have absorbent properties. The paint will prevent urine or water from soaking into the bricks, and allows them to be easily be cleaned.

- Carboline

Carboline is used to protect wood against rodents. It also stain and reinforces the wood, as its thick liquid close the wood's pores. Here carboline is used to treat handrails in order to deter rodents whose action may destabilize the handrail structure.

II-2- Size of latrine

Two sizes of latrine were produced, adapted to the means by which the vulnerable person moves. One size serves people using crutches, and the other, people using wheelchairs.

II-2-1- Size of pit

Sizing of the latrine's pit was based on guidance in the text, `Water, Sanitation and Hygiene for Populations at Risk`, by ACF (2nd edition). The spheres standard were used as an approximate value for the number of people using each the latrine in a refugee camp context.

The latrine pit size takes into account the following parameters:

- The number of users
- The estimated lifetime of the latrine
- The type of pit
- The type of soil
- Anal cleansing practices
- The risk of groundwater table contamination

The volume of the pit was calculated using the following formula:

$V=n*tx*a$

Where V = useful volume in m^3, n = number of users, tx = rate of accumulation of solids (m^3/person/years), a = useful life of the pit (years).

n= 20 people according to Spheres standards

tx=0,06 m^3/person/years

a = 2 years, minimum time for effective decomposition of excreta.

An additional 50 cm was added to the calculated depth, corresponding to the empty space left under the slab.

Therefore, the calculated dimensions of the pit are 100 cm x 100 cm x 300 cm (length = width = 100 cm, depth =300 cm)

II-2-2- Dimensions of latrine for person using crutches (see Drawing 7 and 8)

Slab= 150 cm x 150 cm

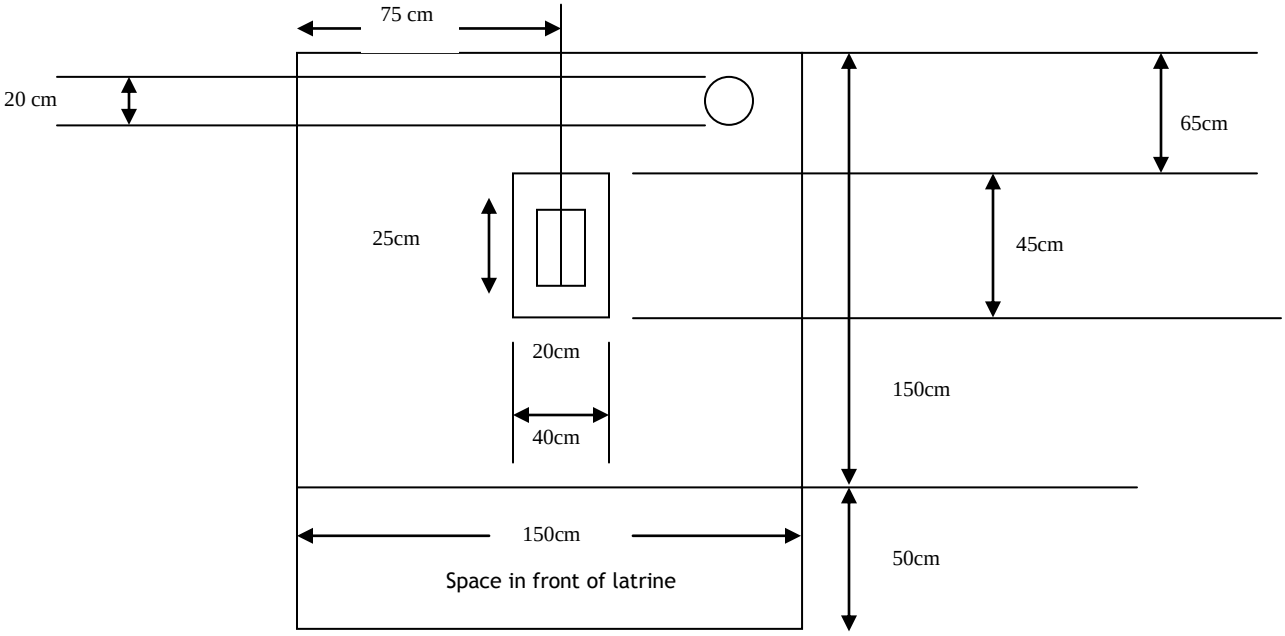
Space in front of latrine (made with compact soil) = 150 cm x 50 cm

Defecation seat = 45cm x 40cm x Height (dimension identified in discussion with specific vulnerable user)

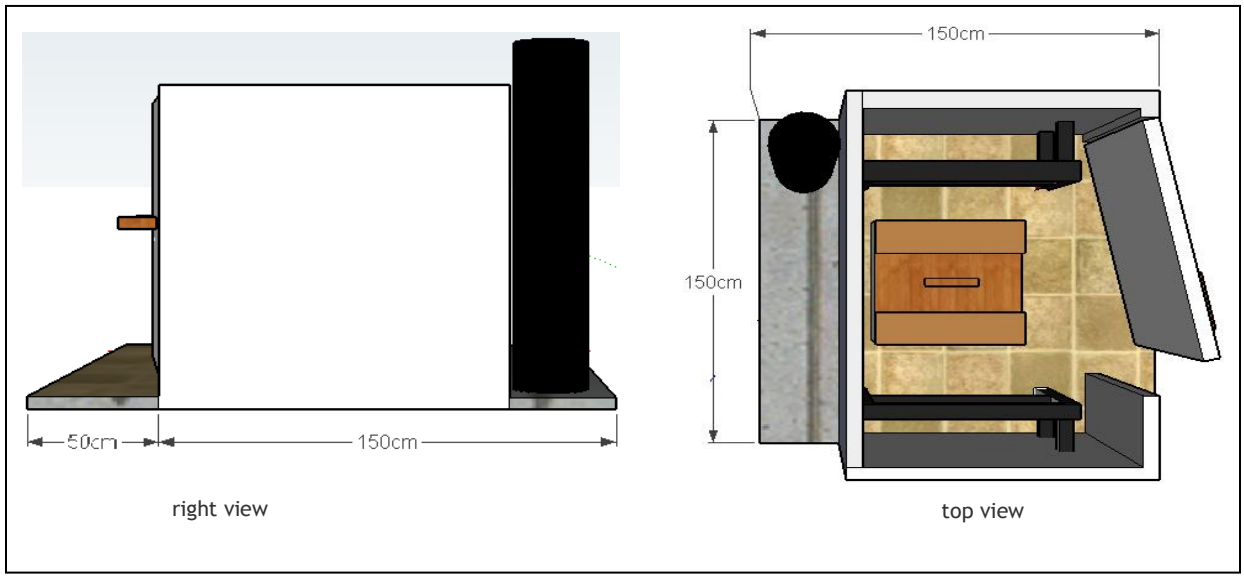
Defecation hole = 25 cm x 20 cm

Handrail height = dimension identified in discussion with specific vulnerable user

Door width = 90 cm (door opens outwards. (see annex4))



Drawing 7: Plan of latrine for person using crutch



Drawing 8: 3D view of latrine for person using crutches

II-2-3- Dimensions of latrine for person using wheelchairs (see Drawing 9, 10, and 11)

Slab = 150 cm x150 cm

Room extension= 100 cm x 150 cm (see Annex 5)

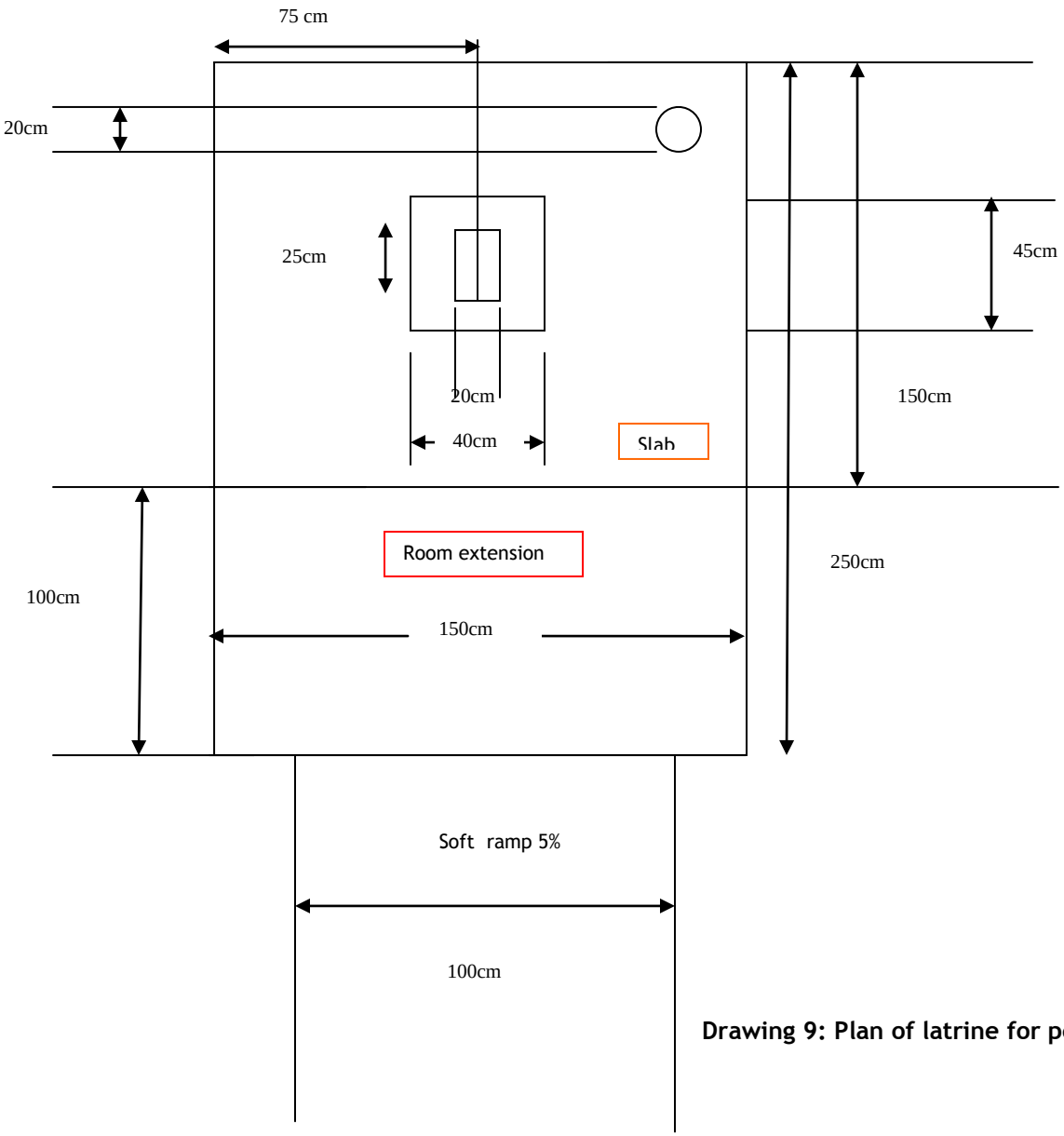
Ramp = 100 cm in width, length depends on the state of latrine access road (see Annex 6)

Defecation seat = 45 cm x 40 cm x Height (dimension identified in discussion with specific vulnerable user)

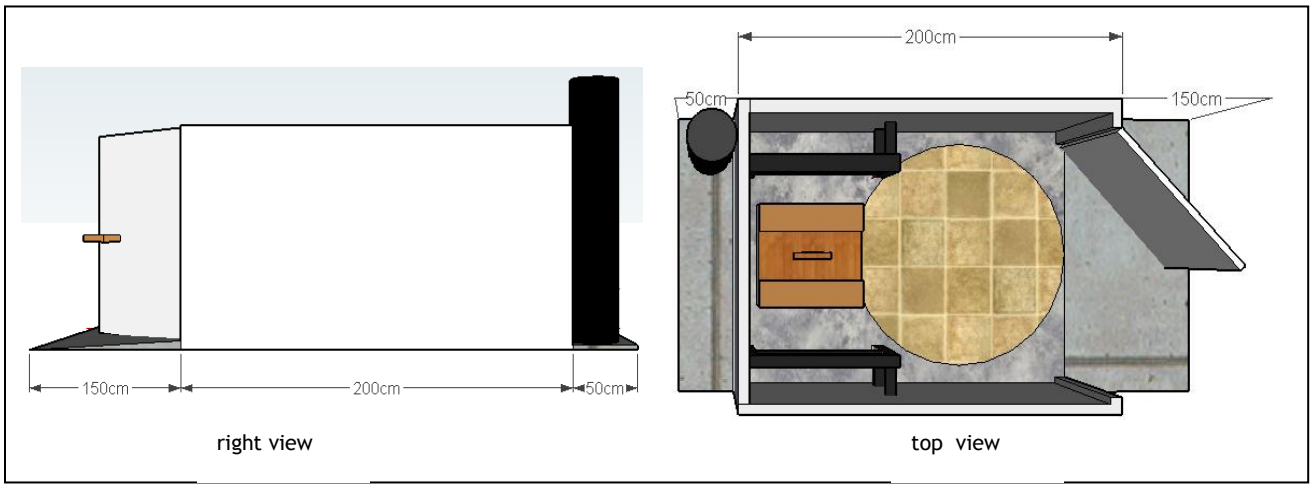
Defecation hole = 25cm x 20cm

Handrail height = dimension identified in discussion with specific vulnerable user

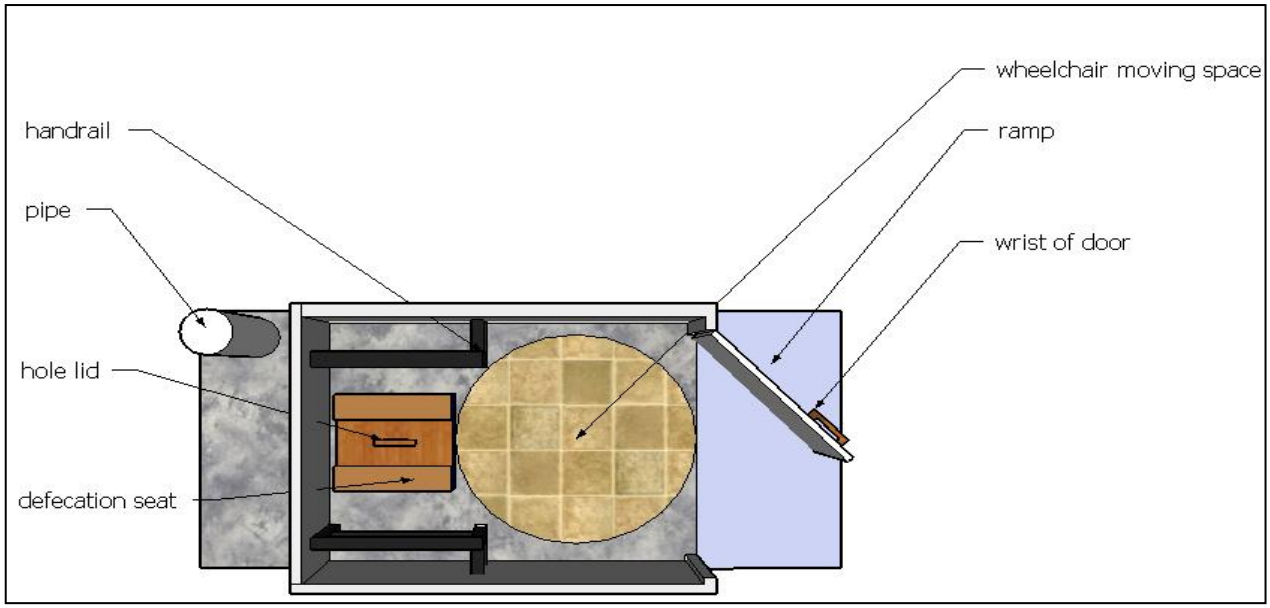
Door width = 90 cm (door opens outwards. (see annex4))



Drawing 9: Plan of latrine for person using



Drawing 10: 3D view of latrine for person using wheelchairs



Drawing 11: Features of latrine for person using wheelchairs

CHAPTER IV: CONSTRUCTION AND REHABILITATION OF LATRINES

III-1- Construction of latrines

The construction of any structure requires preliminary work, and the effective completion of standard planning steps. This includes producing an activities schedule, a plan for human resource requirements, cost estimate and bill of quantities. All these steps are described in the sections below.

III-1-1- Vulnerable people latrine construction schedule

Table 4 below shows the construction schedule for one latrine.

Table 4: Latrine construction schedule

Reference	Activity	Duration
A1	Pit digging	2 days
A2	Slab fabrication	3 days
A3	Building of latrine's foundation	1 day
A4	Slab installation and building of latrine's superstructure	1 day
A5	Fabrication of seat, handrail and hand washing table	1 day
A6	Installation of tarpaulin, door, door handle, sliding lock and padlock	1 day
A7	Seat painting and handrail treatment	1 day
A8	Ramp fabrication and creation of latrine drainage	1 day

Presenting this information as a Gantt chart allows the critical path to be clearly seen (see table 5 below). The critical path is a series of tasks, called critical tasks, that determines the end date of the project. Any delay affecting a task within the critical path is fully reflected in the project duration.

Table 5: Gantt Chart

Ref.	Activities	Day 1	Day 2	Day 3	Day 4	Day 5
A1	Pit Digging					
A2	Slab fabrication					
A3	Building of latrine's foundation					
A4	Slab installation and building of latrine's superstructure					
A5	Fabrication of seat, handrail and hand washing table					
A6	Seat painting and handrail treatment					
A7	Ramp fabrication and creation of latrine drainage					
A8	Installation of tarpaulin, door, door handle, sliding lock and padlock					

Critical path

The expected timeframe for the construction of one latrine for the vulnerable is five days. We need to pay particular attention to activities A1, A2, A3, A4 and A8 because any delay in these will impact the project duration.

III-1-2- Human resources for latrine construction

The construction team for one vulnerable people's latrine composed of :

One mason and his assistant

One carpenter and his assistant

For this project, we used two teams as described above (see Figure 5 below for the horizontal chart).

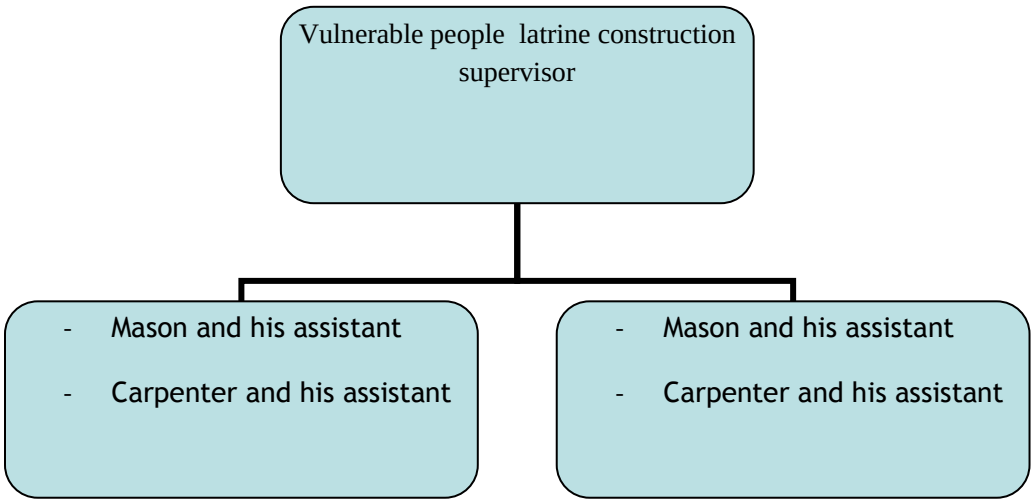


Figure 6: Organizational chart for latrine construction team

III-1-3- Site selection and latrine location

The criteria below were considered in siting latrines:

- the latrine is at least 30m from any source of ground water
- the latrine is located as close to the shelters of vulnerable people as possible
- The maximum distances that can reasonably be travelled by various vulnerable people without taking a rest (see Table 6 below)
- take into account the most severe vulnerability's location
- the main facade of the latrine should face the wind
- the back facade of the latrine, where there is the vent pipe, must be exposed to the sun

Table 6: Maximum distance of movement without rest

Group	Recommended maximum distance without rest
Visually impaired or blind person	150m
Person using wheelchair	150m
Person with impaired mobility and not requiring or not using walking aid	100m
Person with impaired mobility and using walking aid	50m

III-1-4- Stage of vulnerable people latrine construction

Vulnerable people latrine construction involves three major steps, structural work, finishing work and facilities testing.

A- Structural work

The structural work consists of pit digging (1), building of latrine's foundation (2), slab casting (3), superstructure construction (4), seat construction (5), handrail construction (6), as shown in Picture 13 below.

Picture 13: Structural work stages for vulnerable people's latrine construction

- Building of latrine's foundation (2)

The column of bricks is made with 6" bricks which are sealed on soil by thin mortar. The technique employed is to leave a gap of 10 cm between the edge of the pit and the brick column. This acts as a safety margin to avoid landslide. In addition to the brick column around the pit, the latrine for vulnerable people that use wheelchairs includes 1m extension (indicated by the arrow in Picture 14). This extension is also made in 6" brick. We fill the extension with concrete (sand-gravel-cement) to create a level base for the slab.

Picture 14: Column of bricks

- **Slab casting (3)**

The slab casting needs a formwork. This is made with boards 5cm wide. In this formwork we need to have 1.5 squares in to in. the steel is cut to leave 2.5cm of coating, and arranged with 15cm gap between each piece of steel.

The material for slab fabrication is shown in Table 7 below.

Table 7: Estimate of slab materials

Items	Unit	Quantity
Cement	bag	1
Sand	wheelbarrow	1
Gravel	wheelbarrow	1.5
Steel ½”	rod	1.5
Steel 3/8"	rod	1.5

- **Superstructure construction (4)**

The latrine structure is composed of structural elements (round poles) and load balancing elements (rafters). Round poles are vertical elements of the structure, supporting the frame of the latrine roof. The rafters are the horizontal elements of the structure, reinforcing the structure. They provide the frame of the roof.

- **Seat and handrails construction (5 & 6)**

The seat and handrails are the most important features in the vulnerable people latrine. To create them, it requires the beneficiaries' presence and participation in some measuring tests in order to identify the dimensions appropriate for them.

The seats are made in 4" bricks. This type of brick is less cumbersome in terms of thickness and offers good comfort to the user of the latrine.

Handrails were made with rafters for some latrines and for others, with timber 2x2x14, according to the availability of materials during the construction period.

However, the best material in terms of cost and durability is rafters.

B- Finishing Works

Finishing work is composed of tarpaulin laying (1), leather cover placing (2), seat painting (3), handrail treatment (4), hand washing table manufacturing (5), drainage digging and bridge construction over the drainage channel (6), (see Picture 15 below)

Picture 15: Finishing works for vulnerable people latrine

- **Elements of latrine access**

The elements of latrine access are the small bridge and the ramp. The small bridge is done with round poles as shown in picture 6 in Picture 15 above. Its length is 100 cm and its width, 60 cm. The ramp is made with 6" (15 cm) bricks and concrete. The process is as follows (see Picture 16):

- lay 2 lines of 6" bricks in order to have 100 cm as the ramp width and 150 cm as the length
- take away the bad soil
- concrete (sand-cement-gravel) formulation and ramp fabrication

Picture 16: Ramp construction

- try to create a slope of 5% (easy for a wheelchair to climb)

- **Hand washing table (5)**

The hand washing table is made from round poles and rafters. The round poles are used to make the structure of the table, and rafters for the connection between the round poles (see picture 5 in Picture 15). The top of the table is done with planks 1x8x14.

- **Door handle**

The handle of the door is very important for the vulnerable people latrine because it helps users to easily open or close the latrine. It was made with one piece of timber 2x2x14, fixed on the door as shown in Picture 17.

Picture 17: Latrine door handle

- **Leather cover plating process (2)**

This begins with spreading the glue on the edge of the defecation seat. The glue is applied gently so that it penetrates the pores of the brick. After the passage of the glue, wait 5 minutes and gently put in place the leather cover, pre-cut according to the dimensions of the seat. The 5 minutes wait allows for the setting time of glue.

To create a good seal between the glue and the leather cover, during the bonding, drag the edges of the palms across the leather cover, applying pressure

Note: Use a coarse mortar for plastering the seating part of the seat, it allows a good adhesion between the glue and bricks.

- **Seat painting (3)**

Two coats of paint are necessary for the seat painting. The first coat, called the adhesion coat, permits the penetration of the paint into the bricks. The second coat called the final coat, gives the brightness and softness of the seat. In this project, black paint was used for the interior of the seat and blue paint for the outside (see picture 4 of Picture 15).

Note: During the plastering, after smoothing the mortar with the trowel, wait awhile, then sprinkle the inside and outside of the seat with cement and smoothes again with the trowel. This technique softens the different parts of the seat, to facilitate the cleaning of the seat.

- **Handrail treatment (4)**

Put a coat of carboline on the handrail and wait for a while to allow the wood to absorb the product. After, apply the second and final coat.

C- Facilities testing

This phase is very important and plays a critical role in the construction phase. During the construction period, we involve the beneficiaries in order to adapt the dimensions of the facilities to their shape. Tests were then done to check the dimensions of the defecation seat and, the height of the handrails, the hand washing table, the padlocks, the door handle and the sliding lock. Picture 18 below shows these steps.

Picture 18: Facilities testing

III-1-5- Cost estimate for vulnerable people latrine construction

The estimate for vulnerable people latrine provided here is according to the cost of materials in Liberia. The material quantities given in these estimates will help the reader to do their own costing of this kind of latrine according prices in the country where they live.

In our project, we had two kind of latrines differing in size, as discussed in Chapter III. So we produced estimates for a bigger latrine for vulnerable people in wheelchair (see Annex 7) and for a smaller latrine for vulnerable people using crutches (see Annex 8).

After estimation, latrine for wheelchair users cost 273 USD and those using crutches, 246 USD

III-2- Rehabilitation of latrines

Latrine rehabilitation involves adapting public latrines, adding features that can help vulnerable people access at these.

To that end, two types of rehabilitations were done in the camp, in accordance with the needs of the vulnerable - latrines rehabilitated with handrails, and those rehabilitated with seat and handrail.

III-2-1- Latrines rehabilitated with handrails

This involved installing handrails in existent public latrines, in order to help people to balance in the latrines (see Picture 19 and 20 below).

To do that, we used two pieces of rafters that we cut into sections. The handrails themselves were 90 cm in length. These were fixed to vertical rafters, and supported by a triangular framework also made with rafters. This configuration formed a solid and rigid handrail that can support a mass of 90 kg. Tests were done during the rehabilitation with beneficiaries to identify the appropriate height for the handrail and also to check the structure's rigidity.

Picture 19: Before rehabilitation

Picture 20: After rehabilitation

The materials estimate for this rehabilitation is shown in the table 8 below.

Table 8: Materials estimate for latrine rehabilitation with handrails

Item	Unit	Quantity
Rafter or timber 2x2x14	pcs	2
Nails 3'	pks	2

III-2-1- Latrines rehabilitated with seat and handrail

This rehabilitation involves installing a defecation seat and handrails in existent latrines (see Picture 21).

The process is as follows:

- To modify the shape of the defecation hole to have a rectangular shape with dimensions, L=25 cm and W= 20 cm

Picture 21: Rehabilitated latrine with seat and handrails

- To build the defecation seat
- To fabricate the handrail

The materials estimate for this rehabilitation is shown in Table 9 below

Table 9: Materials estimate for latrine rehabilitation with seat and handrails

Item	Unit	Quantity
Rafter or timber 2x2x14	pcs	02
Nails 3'	pks	02
Bricks 4'	pcs	07
Cement	kg	02
Sand	litre	10

II-3- Summary

By the end of the project, ten new latrines were built and 17 rehabilitated (see details in Table 10 below and further pictures in Annex 9).

Table 10: Number of latrines built and rehabilitated

Latrine types	**Number**
Latrines for people using crutches	6
Latrines for people using wheelchairs	4
Latrines rehabilitated with seat and handrails	6
Latrine rehabilitated with only handrails	11

CHAPTER V: MONITORING THE USE OF THE LATRINES

IV.1.Workshop on latrine use and hygiene promotion with vulnerable people

After completing the construction work, a two day workshop was organized for the beneficiaries and their families before turning over the latrine keys to them. This workshop had two objectives.

The first was to discuss the use and maintenance of the latrine. These discussions were concerning what to do and not to do in the latrine. As well, several posters (see Annex 10) were made to clarify and emphasize these messages.

The following items were dealt with:

- The function of the defecation seat is to sit on
- Clean the slab twice a week and only use water when necessary
- Clean the leather cover regularly with sponge and water with soap
- Clean inside the defecation seat with a toilet brush when it's dirty
- Clean the sides of the seat with the sponge and water with soap if it's dirty

The second objective was the promotion of hand washing, which is a very important hygiene behaviour. The debate was focused on the health consequences of not washing your hands after using the toilet. After becoming aware of these, the beneficiaries concluded to always wash their hands after using the toilet.

To do the cleaning of the latrine, a toilet brush, one broom, one sponge and one bar of soap were given to the beneficiaries of each latrine.

IV.2. Daily follow up of vulnerable people latrine facilities

The hygiene promoters who were previously trained on vulnerable people latrine monitoring, follow up every day the use of the latrines. Therefore a monitoring sheet (Annex 11) was created in order to identify all the problems observed on the latrines. These problems are construction errors and problems of care and maintenance. As soon as care and maintenance problem is noticed, the intention is to appeal directly to the beneficiaries to clean the latrine, and remind

them about the maintenance of the latrines. If there are errors, a report will be made to the technicians in order to improve the construction of the latrines.

I highlight that during three weeks of monitoring, the ten latrines have not experienced any problems regarding care and maintenance (see Annex 11). These latrines are always being cleaned. We suggest that this is because all the beneficiaries were quite involved in the project. They have taken ownership of the latrines.

IV.4. Focus groups with vulnerable people about the use of the latrines

Every week, a focus group is held with the beneficiaries of the latrines. The purpose of the focus group is to discuss the use of latrine as well as the hygiene promotion. As a result, the beneficiaries find the latrine appropriate for them (see Annex 12). They feel comfortable in the latrines.

IV.5. Experience capitalization

The results reported during the three weeks of monitoring show that design 1, 2 and 3 are well adapted to the beneficiaries, according to their particular vulnerabilities. Designs 2 and 3, chosen by the females, are appropriate to them. Design 1, chosen by males, is also appropriate to them.

To confirm these results, we made two witness latrines which were rehabilitate according to designs 1 and 2. we asked group of disabled women (36% of disabled women) and disabled men(22% of disabled men) to use each type of latrine for one week (See table 11 below).

Table 11: Latrine experimentation

	Design 1	Design 2
Week 1	Men	Women
Week 2	Women	Men

The test was not done on design 3 because it is only different from design 2 in shape of the hole.

The men preferred design 1 because they feel comfortable when sitting. Contrary to that, the women preferred design 2 because found it easier to use. From their preferences, and by extrapolation of percentage of test's participants we can conclude that design 1 is for men design 2 and 3 are for women for this project.

RECOMMENDATIONS

ACF-Liberia:

- Because of the departure and arrival movements of the refugees, we recommend a new assessment in November 2011, regarding the newly built latrines to allow new vulnerable camp residents entrant to access these
- We recommend that the hygiene promotion team always continue to monitor the latrines daily and to do the weekly focus group meeting, as this ensures the proper management of the latrines by the beneficiaries
- For ACF technicians, we highlight that appropriate solutions differ according to the type of vulnerability, culture, morphology and sex of the person etc. However, if they should replicate such a project, they must always involve the beneficiaries
- In future, if ACF-Liberia should again have such a project, it should not be limited only to the latrines, but it should also include the showers, the washing area, and the water points, because these components are also important and vital for the vulnerable

The camp manager:

- Work with agencies responsible for water, sanitation and hygiene in the camp to house vulnerable people close to the water and sanitation facilities

GENERAL CONCLUSION

Access to water infrastructure and sanitation facilities for vulnerable people is now a high relevant matter in all water and sanitation projects. This study conducted in the Bahn refugee camp in Liberia has been very rewarding for the ACF- Liberia staff who were made aware of the specific needs of vulnerable people for the first time. The aim to introduce them to this new way of building, was successfully met, as the technicians are able to replicate the work done. In total, ten news latrines were built and 17 rehabilitated, and vulnerable people (4% of refugees) access to these.

The benefit is passed onto beneficiaries who were involved in all phases of the project. Taking this approach, also meant that the latrines are properly used by the beneficiaries. The monitoring has confirmed this.

However, this project was limited only to latrines, while it is clear that a great need is felt regarding the level of access to showers and water points for the vulnerable. Such a project must take into account all aspects of water and sanitation to enable vulnerable people to fully enjoy their dignity.

REFERENCES

1. **Handicap International.(2009).** How to design and promote an environment accessible to all? 36 pages

2. **Handicap International.(2008).** How to build an accessible environment in developing countries, Manual#2-Acess to water and sanitation facilities, Part 1- Toilets and closed showers 42 pages

3. **Hazel Jones α Bob Reed.(2005).** L'alimentation en Eau et les Installations Sanitaires pour les personnes Handicapées et autres Groupes Vulnérables 326 pages

4. **Jeff Conant.(2005).** Assainissement et proprété pour un environnement sain 52 pages.

5. **Action Contre la Faim.(2006).** Eau-Assainissement-Hygiène pour les populations à risque 785 pages.

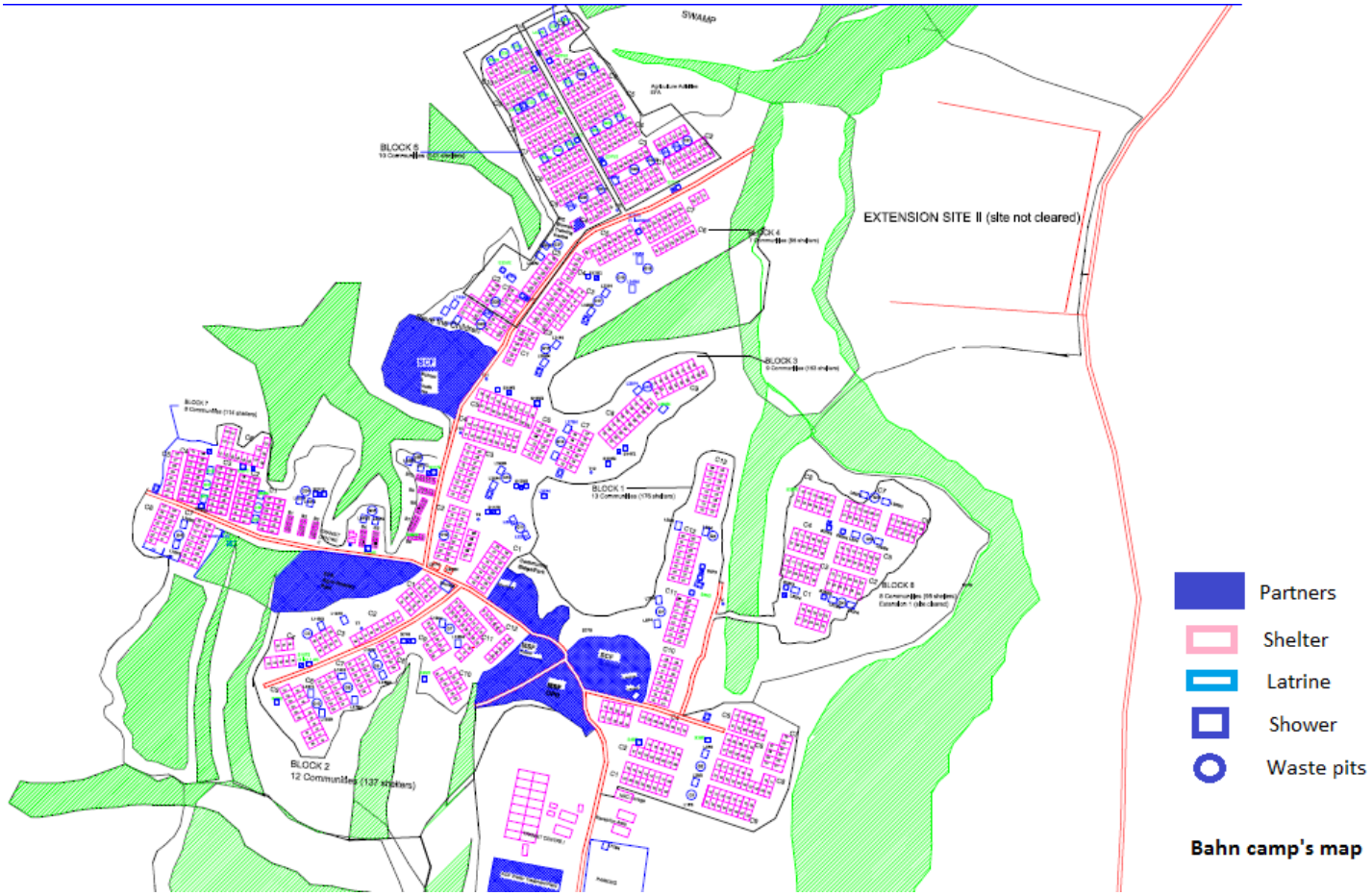
6. **Ministry of Public Work.(2010).** THE GUIDELINES FOR WATER AND SANITATION SERVICES IN LIBERIA 41 pages

7. **Peter Morgan.(2007).** Toilets That Make Compost Low-cost, sanitary toilets that produce valuable compost for crops in an African context

8. **Normes Sphères**. Chapitre2: Les normes minimales dans le secteur de l'approvisionnement en eau, de l'assainissement et de la promotion de l'hygiène

ANNEX

Annex 0



Annex1: Vulnerable location form

ACF-Liberia Form N:.....

Date :...../...../..... Name of surveyor :.....

Name and surname	sex	Shelter N	Block	Persons in shelter	Family heads in shelter	Age	Type of vulnerable								Means of moving			
							elderly	pregnant	Cripple	Amputated arm	Amputated Foot	Paralysed arm	paralysed foot	Blind	Wheelchair	Walking-stick	Crutch	other

annex 2: Children form

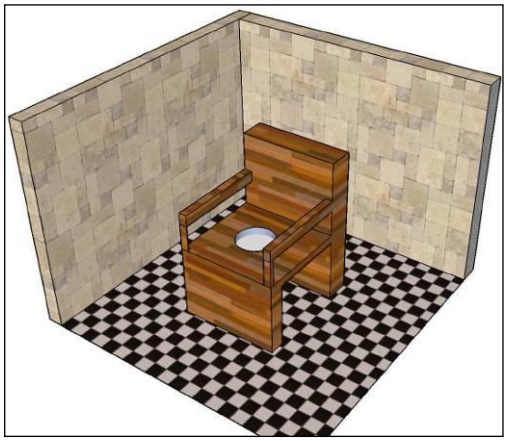
ACF SURVEY FORM
BAHN CAMP

SURVEYOR:..... DATE:/...../...../.....

Shelter N°	Block	Persons in shelter	Family heads in shelter	Number of children in shelter		
				0-5 years	5-10 years	10-15years

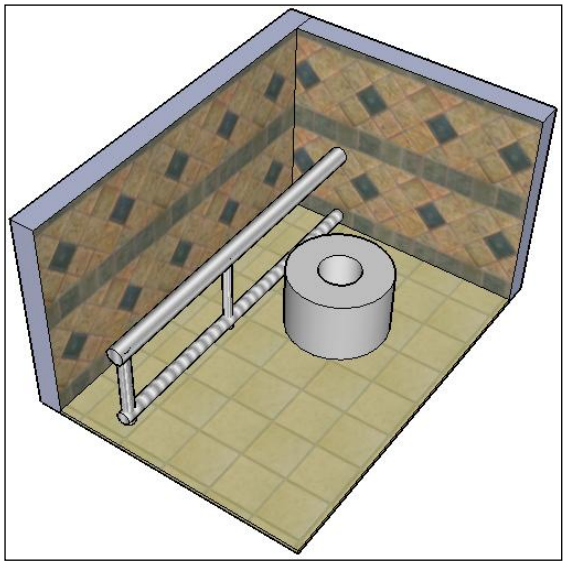
Annex3 : Other design made for the Bahn Camp study

Model 4



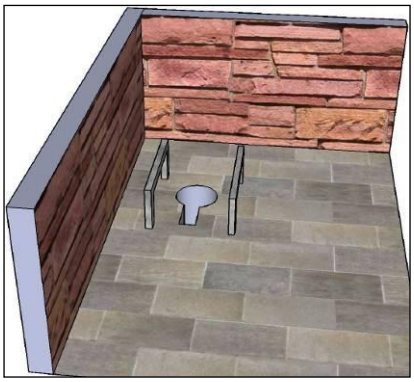
This model is the defecation chair. It has the chair shape in which we did a hole. The chair could be made in wood or concrete or iron. The easy way is the wood because easy to manage. In Liberia context wood is cheaper than concrete and iron. the hole is done with pipe. The edges of the chair are like handrails, and vulnerable can rely on it.

Model 5



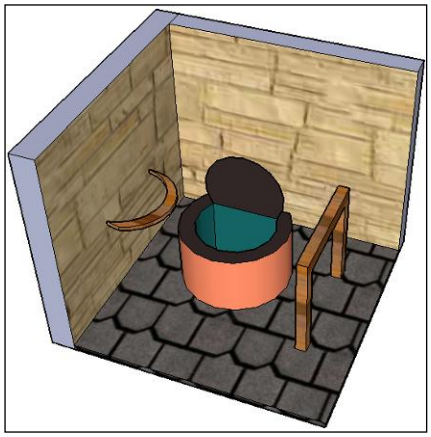
This model is circular design. the defecation seat and the defecation hole are all circular. It should be done in concrete. It was equipped with galvanized tube as handrails. in some area where wood is easy to find it could also be done with wood.

Model 6



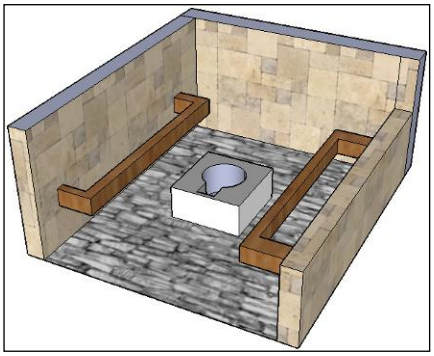
This design is equipped with two handrails on the both side of defecation hole. the handrails could be done with wood or iron. Here, there is no defecation seat. This model is recommended for someone who is able to squat but have problem to be balanced.

Model 7



this design is equipped with two handrails and a defecation seat. The materials proposed for the handrails fabrication are wood or iron. The seat is done with 20l bucket. the bucket is reinforced with wire and it is gradually add cement mortar around the bucket in order to have the shape of the seat. On the top of the seat, we put the plastic toilet seat. Later we paint the external facade of the seat.

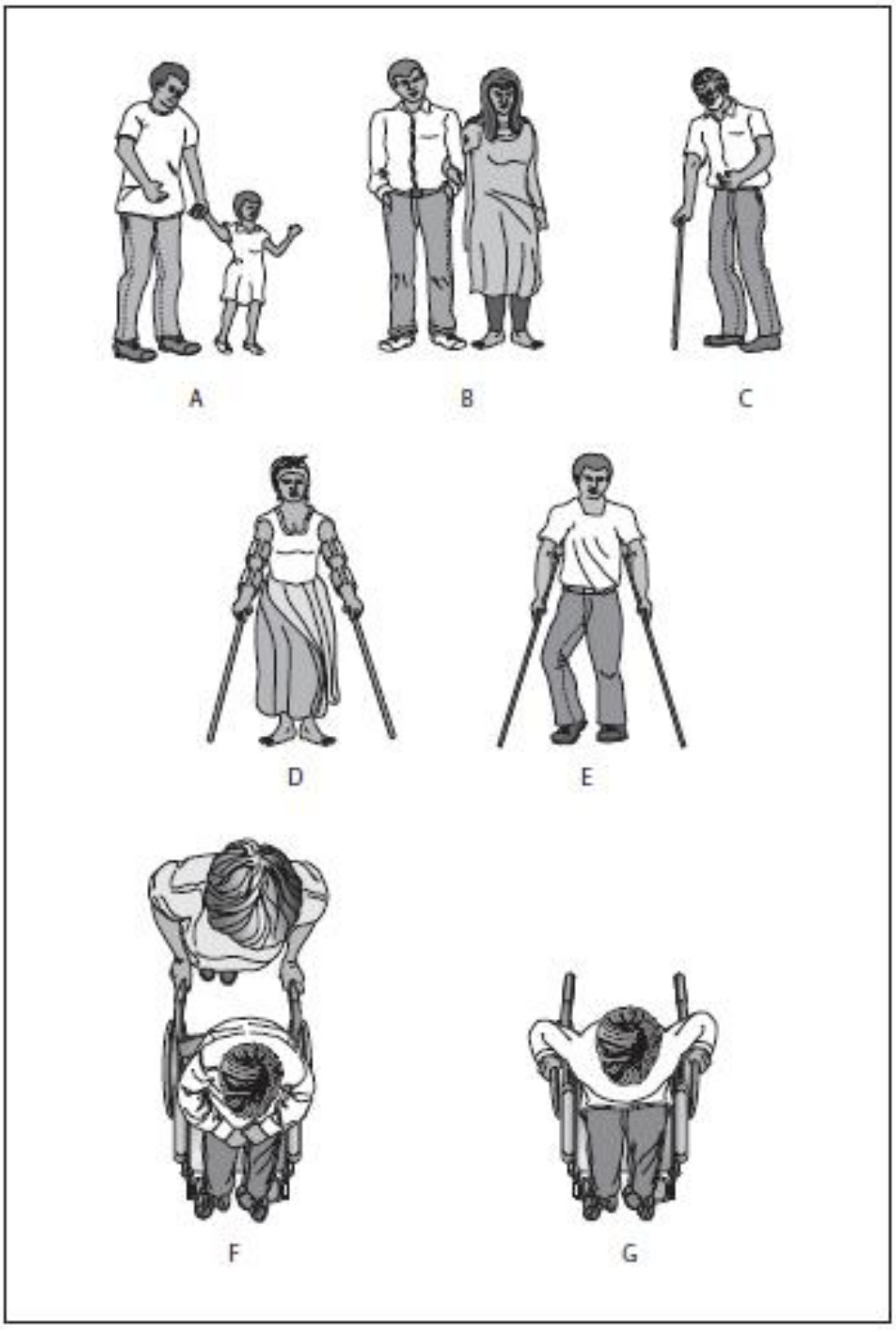
Model 8



This design is equipped with a defecation seat and two handrails. Handrails could be done with wood or iron. The defecation has a rectangular shape and the shape of the hole is like the "Sanplat".

Annex 4 : space occupied by people with disabilities and

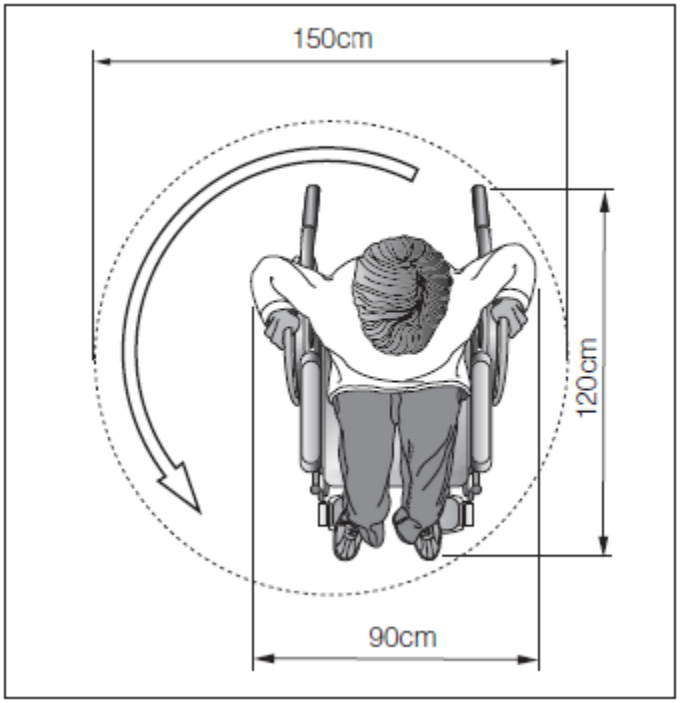
their support



space that can occupy the disabled and mobility support

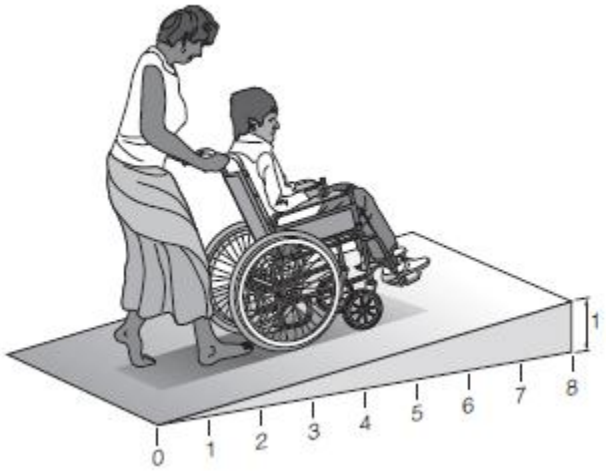
		Measurement (cm)				
		Bangladesh	India	CESAP-ONU	Uganda	united kingdom
A	width of an adult and a child walking side by side					110
B	width of two adults walking side by side					120
C	width of an adult walking with a cane					75
D & E	width of a person walking with crutches			92		90
F	length of a wheelchair and an attendant					175
G	length of a wheelchair and a user	112	130	120	110	114
G	width of a wheelchair and a user-propelled	90	88		87	90

Annex 5: space occupied by Wheelchair movement

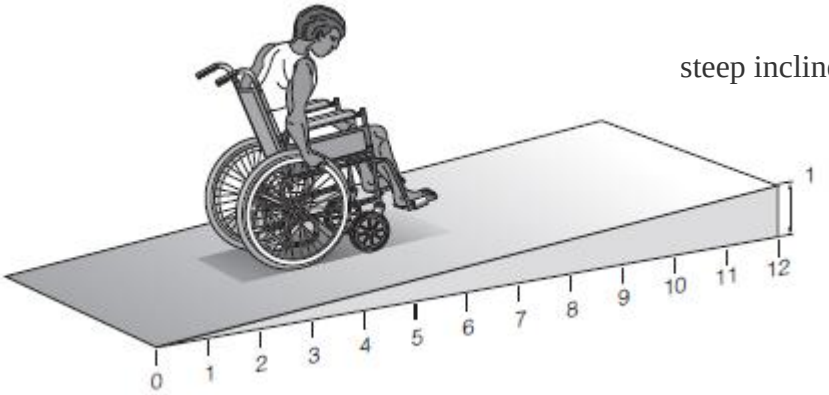


the dimensions of the wheelchair depend on their design and play a role in the necessary width that should have paths and doors, in the dimension inside the latrine and in the location of handrails.

Annex 6: type of ramp

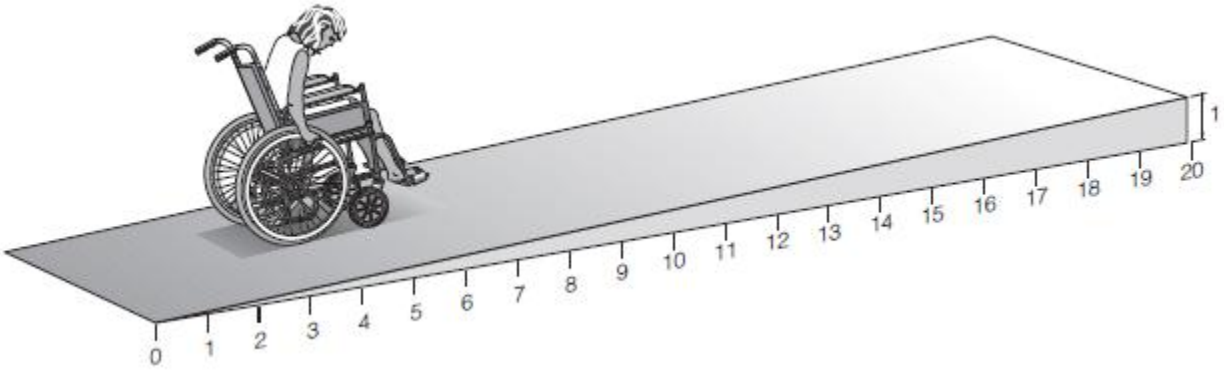


very steep slope of 12% (1:8, not recommended)



steep incline of 8% (1:12)

soft slope of 5% (1:20)



Annex 7 : Estimated cost of latrine for wheelchair users

item	Unit	Quantity	Unit Price (USD)	Total Price (USD)
Cement	bag	3.5	11	38.5
Rafters	pcs	17	0.42	7.14
Round Poles	pcs	13	0.35	4.55
Timber 2x2x4	pcs	4	2	8
Plank 1x 8x 14	m	1	1.2	1.2
Nails 4”	pks	5	1	5
Nails 3”	pks	5	1	5
2" wire nails	pks	2	1	2
Nails ½”	pks	2	1	2
Screen wire	m	1.5	0.6	0.9
PVC 8” pipe	pcs	1	17	17
Hinges 3"	pairs	1	0.7	0.7
Hash & stipple (small size)	pcs	1	0.7	0.7
Crush rock	m3	0.2	165	33
Sand	m3	0.32	13.38	4.2816
Steel rod ½”	pcs	1.5	12	18
Steel rod 3/8”	pcs	1.5	6.25	9.375
Tie Wire	roll	0.1	20	2
Black paint	gal	0.1	2	0.2
Tarpaulin	m	10	3.6	36
Shoe Glue	btle	0.5	6	3
Blue paint	gal	0.1	2	0.2
Leather cover	m2	0.15	5	0.75
Padlock	pcs	1	3	3
Thinner	gal	0.1	10	1
Carbolin	gal	0.1	12	1.2
Sliding lock	pcs	1	2	2
Pit digging labour	hole	1	10	10
Brick 6"	pcs	25	0.5	12.5
Brick 4"	pcs	7	0.5	3.5
Total material cost				232.7
Labour				40
Total latrine cost				272.7

Annex 8: Estimated cost of latrine for vulnerable people using crutches

item	Unit	Quantity	Unit Price (USD)	Total Price (USD)
Cement	bag	2.5	11	27.5
Rafters	pcs	15	0.42	6.3
Round Poles	pcs	10	0.35	3.5
Timber 2x2x4	pcs	4	2	8
Plank 1x 8x 14	m	1	1.2	1.2
Nails 4”	pks	5	1	5
Nails 3”	pks	5	1	5
2" wire nails	pks	2	1	2
Nails ½”	pks	2	1	2
Screen wire	m	1.5	0.6	0.9
PVC 8” pipe	pcs	1	17	17
Hinges 3"	pairs	1	0.7	0.7
Hash & stipple (small size)	pcs	1	0.7	0.7
Crush rock	m3	0.16	165	26.4
Sand	m3	0.2	13.38	2.676
Steel rod ½”	pcs	1.5	12	18
Steel rod 3/8”	pcs	1.5	6.25	9.375
Tie Wire	roll	0.1	20	2
Black paint	gal	0.1	2	0.2
Tarpaulin	m	10	3.6	36
Shoe Glue	btle	0.5	6	3
Blue paint	gal	0.1	2	0.2
Leather cover	m2	0.15	5	0.75
Padlock	pcs	1	3	3
Thinner	gal	0.1	10	1
Carbolin	gal	0.1	12	1.2
Sliding lock	pcs	1	2	2
Pit digging labour	hole	1	10	10
Brick 6"	pcs	14	0.5	7
Brick 4"	pcs	7	0.5	3.5
Total material cost				206.2
Labour				40
Total latrine cost				246.2

Annex 9: New latrine in bahn camp

Latrine for person using wheelchair

Presence of ramp and small bridge on the drainage to allow the wheelchair to access the latrine.

Presence of wrist on the door, water barrel for the hand washing.

Latrine for person using crutch

No ramp

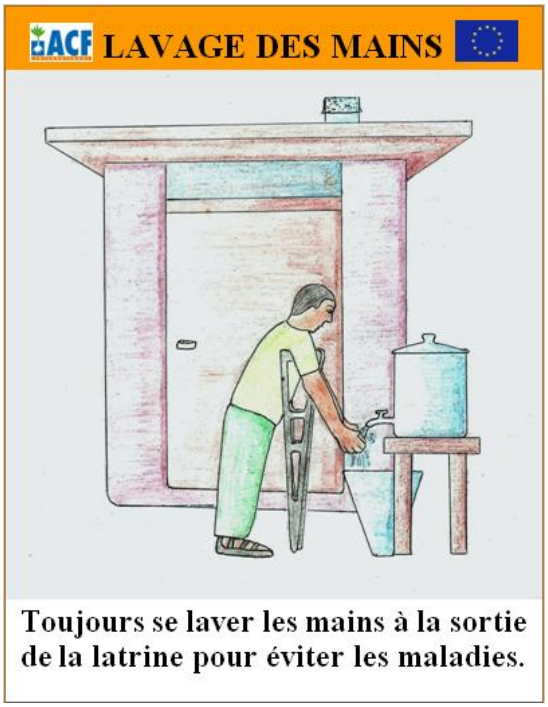
Presence of wrist on the door, water barrel for the hand washing.

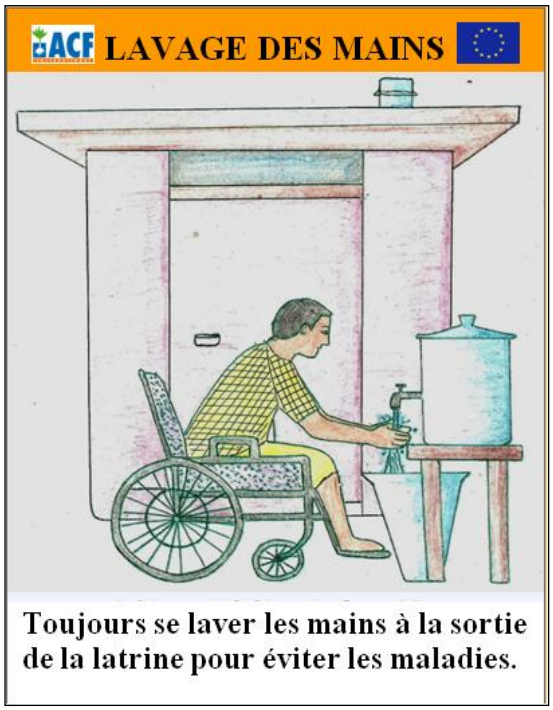
Model 1

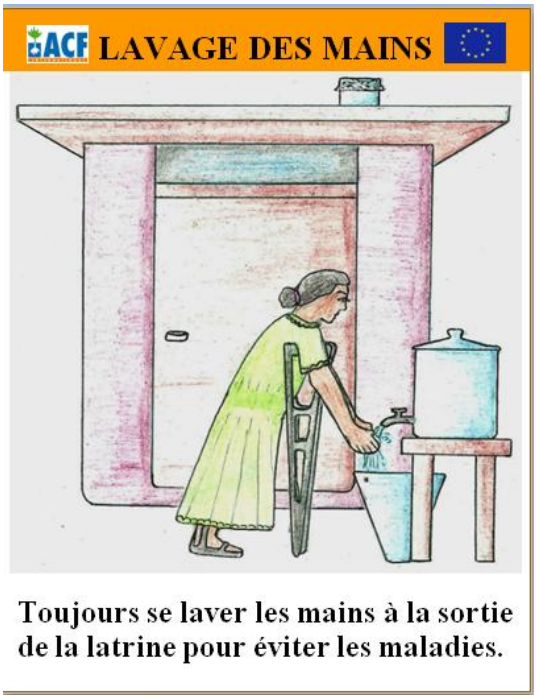
Model 2

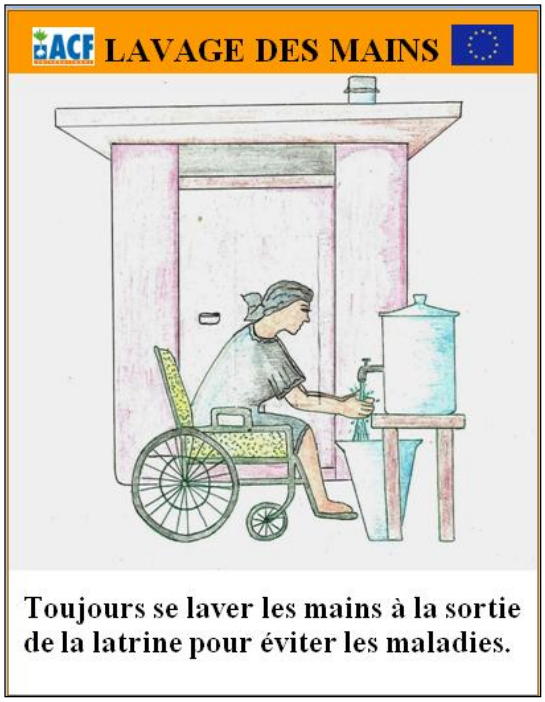
Model 3

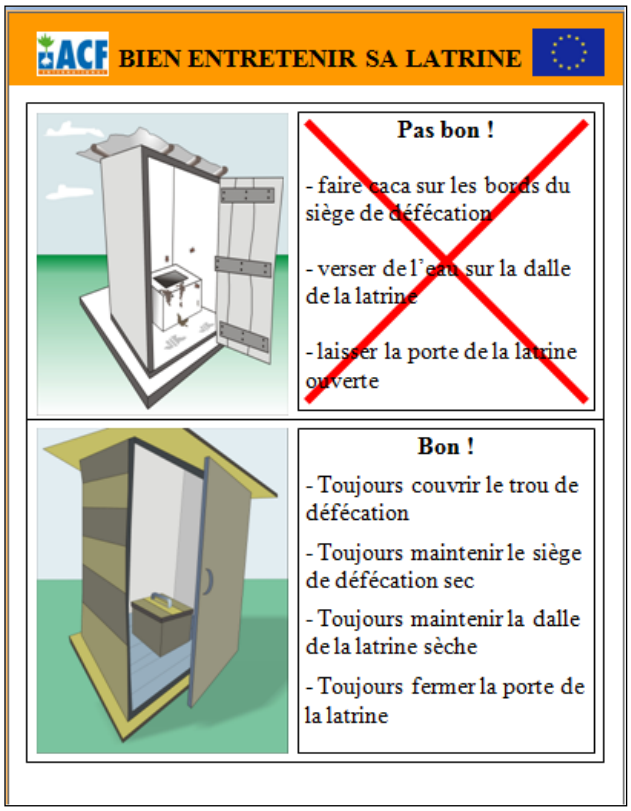
Annex 10 : Poster for monitoring the latrine use






ACF
LAVAGE DES MAINS
Toujours se laver les mains à la sortie de la latrine pour éviter les maladies.


ACF
LAVAGE DES MAINS
Toujours se laver les mains à la sortie de la latrine pour éviter les maladies.


ACF
BIEN ENTRETENIR SA LATRINE
Pas bon !
- faire caca sur les bords du siège de défécation
- verser de l'eau sur la dalle de la latrine
- laisser la porte de la latrine ouverte
Bon !
- Toujours couvrir le trou de défécation
- Toujours maintenir le siège de défécation sec
- Toujours maintenir la dalle de la latrine sèche
- Toujours fermer la porte de la latrine

Annex 11 : Daily monitoring sheet

ACF Daily Monitoring sheet / Bahn Refugee Camp

Form N: …… Latrine iD:……. Promoter Name:……

Date	slab state				defecation seat									Handrail			Flies				Odor		
	wet	dry	presence of 'pupu'	presence of mold	wet	dry	presence of mold	presence of 'pupu' on seat top	presence of 'pupu' on the walls of defecation hole	leather cover is off	leather cover is dirty	leather cover is in good condition	hole lid is off	strong	unstable	presence of rodent ant	much	middle	small	no flies	Strong	less strong	no odor

Date	Remarks	problems

Annex 12: Monitoring result

	slab state				defecation seat									Handrail			Flies				Odor		
Latrines	wet	dry	presence of 'pupu'	presence of mold	wet	dry	presence of mold	presence of 'pupu' on seat top	presence of 'pupu' on the walls of defecation hole	leather cover is off	leather cover is dirty	leather cover is in good condition	hole lid is off	strong	unstable	presence of rodent ant	much	middle	small	no flies	Strong	less strong	no odor
B1VL1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B1VL2	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B3VL1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B3VL2	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B4vL1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B4LV2	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B6VL1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B6VL2	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B7VL1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1
B8VL1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1

Annex 13: Focus group result

Latrines	Block	Seat design		Defecation seat			defecation hole			Handrail			ramp		Facilities cleaning		Latrine comfort	
		difficult to use (1)	easy to use	too high	right height	too low	too wide	good width	too small	too high	right height	too low	good	Bad(2)	Difficult(3)	easy	good	Bad(4)
B1VL1	1	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B1VL2	1	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B3VL1	3	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B3VL2	3	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B4VL1	4	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B4VL2	4	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B6VL1	6	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B6VL2	6	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B7VL1	7	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0
B8VL1	8	0	1	0	1	0	0	1	0	0	1	0	1	0	0	1	1	0