



**Technical Manual
on community
water supply, hygiene
and sanitation facilities**



Jean Simon Mahalomba, a resident of Mandrivazo, collecting water on his own for the first time ever.

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Introduction : Our learning path

The Handicap International training held in July 2009 on Equity Inclusion has increased WaterAid Madagascar and partners' awareness concerning the various disabilities. The training was also an opportunity to become familiar with disability vocabulary and to re-structure water, hygiene and sanitation designs and plans.

The concept of accessibility for people with a disability is a tool to allow participation in social life and development. It seeks to initiate measures to equip and accommodate a given space so that they can freely access these facilities alone.

Accessibility is what can be reached, approached or come close to.

Accessibility involves everything to equip and accommodate space and facilities so that people with physical challenge can easily have access.

The following barriers hamper the access, free and safe movement of people :

- Institutional-related barriers : laws, cultures
- Attitudinal and behavioural barriers : our presumptions and stereotypes, ...
- Environmental : buildings, transport.

Accessibility involves the following concepts and dimensions :

- Occasional disability,
- Access and use without reliance upon others,
- Barrier-free designs,
- Space .

The different variations of accessibility are as followed :

- Accessibility of the physical environment in the use of private and public buildings and facilities, open spaces;
- Geographic accessibility relates to movement: one should be free to choose one's means of transport for moving from one place to another based on one's own needs and means;
- Access to information and means of communication (e.g., the signs in public buildings).

Based on the training and facility designs provided by Handicap International, the Core Team which includes engineers and technicians from WaterAid and partners, has modified the standard designs of WaterAid in Madagascar to ensure that these are more accessible to the "less-able" groups. Following this, each individual partner has worked on these new designs to develop more accessible public facilities.

To strengthen learning, to prepare the transfer management to users, an accessibility audit of facilities built in 2009-2010 was organised to check the quality of the improvements made towards accessibility. With the support of CPH -Disabled People's organisation, this audit was under the leadership of Handicap International focal person for accessibility and attended by 20 technicians from partners, 02 others from WSUP project and the programme team of WaterAid in Madagascar. In turn, the two participants from CPH have tested and shared their feedback and comments on the accessibility level of the facilities. Their comments guided us to put in practice theoretical knowledge on inclusive facilities



Jean Claude, visually-impaired, is testing the first improvements on a stand pipe. With no marker available at the door, he is assisted by his wife



Andry, a physically-disabled woman, faces two challenges: lack of access ramp and a door which opens outward.

The findings of the audit were used to review the facility designs and to make them even more accessible and to ensure that all partners and staff uptake accessibility.

1 Community Water Points

1.1 Our learning stages :

Initially :



A 20cm difference between the ground and the level area. No access ramp for wheelchair users.

The sharp end door opens outward and is not user-friendly to some people.

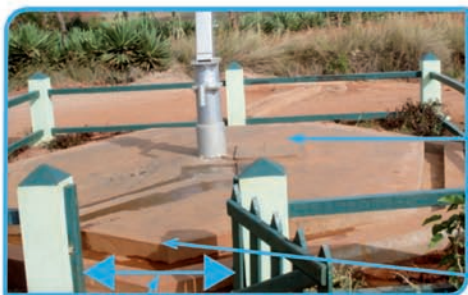
No easy access so it is impossible for people with disability to use.



A person with disability cannot use this tap (with a ring).

The drainage Area covered with carefully selected gravel. Limited space due to the down-the-middle position of the standpipe.

Uncovered bucket stand.



• Plenty of space but the down-the-middle position of the pump reduces possibility to turn/move around.

• The upper level of the access/service panel is higher than the Pollution Prevention Area and thus not favourable to disabled persons.

• No riser or base to support in lifting heavy water.

• Very narrow width of the entrance door.

• Door leaf opening.

• No access ramp and there is a step to climb

• Access to the drainage area is through a discharge channel.

Before the audit



Access ramp with a steep slope; big difference with the natural ground level.

No rest area, no wheel-guide, no arch tracing signal.



Drainage Area is still covered with gravel (to act as a mud-free device).

Bucket stand with spaced screen bars.



Very sharp ends of the door: so unsafe for a visually impaired person.

Door still opens outward.

Door width is less than 80 cm.

Currently :



- Wider door which opens inward.
- Wider access ramp and adjusted slope.
- Wheel guide.
- Arch tracing signals.



More spacious rotation.

Enlarged drainage Area.



- Adjustment made in the type and height of the tap.
- The bucket stand is now a low slope with a flow drain.
- Harmonized slope of the drainage area.



- Door :
Larger width;
No sharp ends.
- Ramp :
A rest area is created
Larger width;
Slope < 7%
Zero spot grade to the natural ground.
- Ramp :
Wheel Guides
- Ramp :
Clutch Guide



- The pump has been relocated to create a bigger pollution prevention area also used as a rotation area.

1. 2 Accessibility norms :



Access Ramp

Podotactile guide

Rotation area

Access ramp :

It is a sloping lane with 2 different levels. It helps a less able person to confront any obstacle which may reduce or challenge his/her access to a given location. Location and position of a ramp depend on the needs, but standards recommend the slope to be between 4 to 6% and less than 1.20 m wide.

Wheel guide:

A security device added to the ramp and used as a safeguard to a wheel chair user or a signal to the visually impaired using a blind cane :

Height = 10 cm ; width = 10 cm

One leaf door

(Weight bearing) base



Rest area

Wheel Guide

Rotation area :

A space of at least 1.5m x 1.5m for a wheel chair/clutch user to move without obstruction.

Arch tracing guide :

This is designed for the exclusive use and guidance of the visually impaired with/out a blind cane. It is made up of two raised, yellow, curved lines. These lines are 20 cm spaced and in the middle of the ramp.

Line dimensions: height = 2 cm; width = 5 cm.

Rest area :

A flat area, as wide as the ramp which disabled people can use to stabilize before opening a door or continue climbing the ramp. Length: at least 1m long.

Riser/weight bearing base :

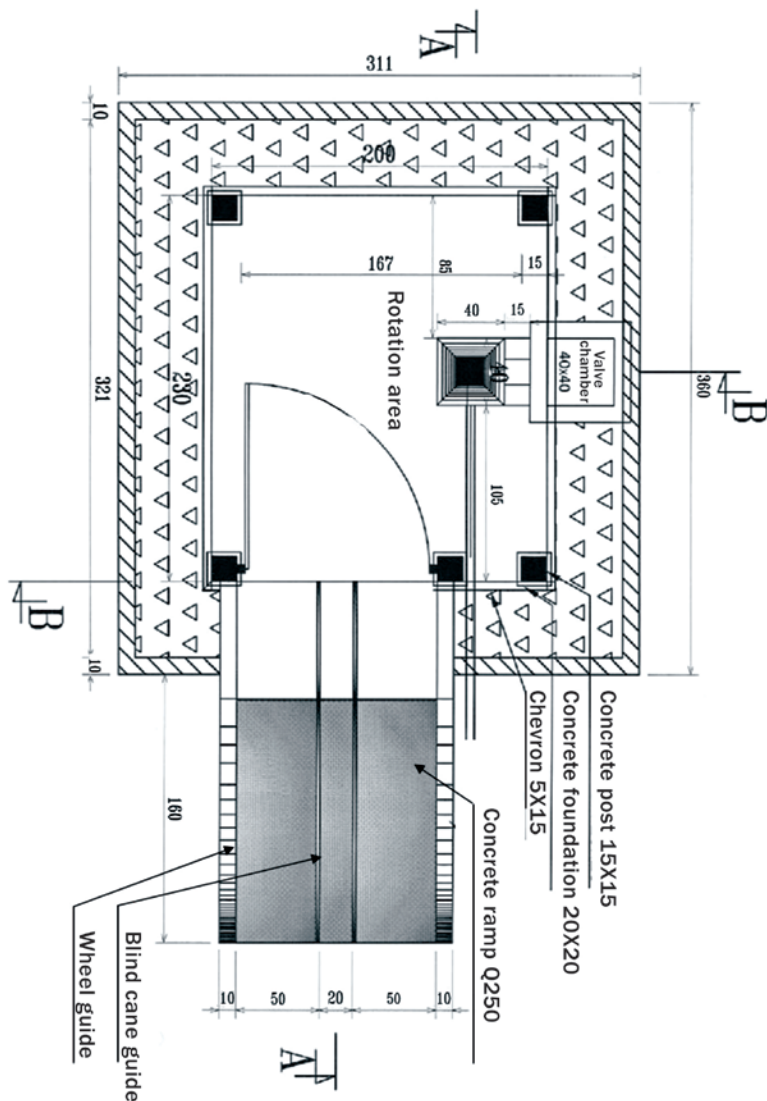
A device to ease lifting the water container

Height = 45cm ; width = 30cm and length = 75cm

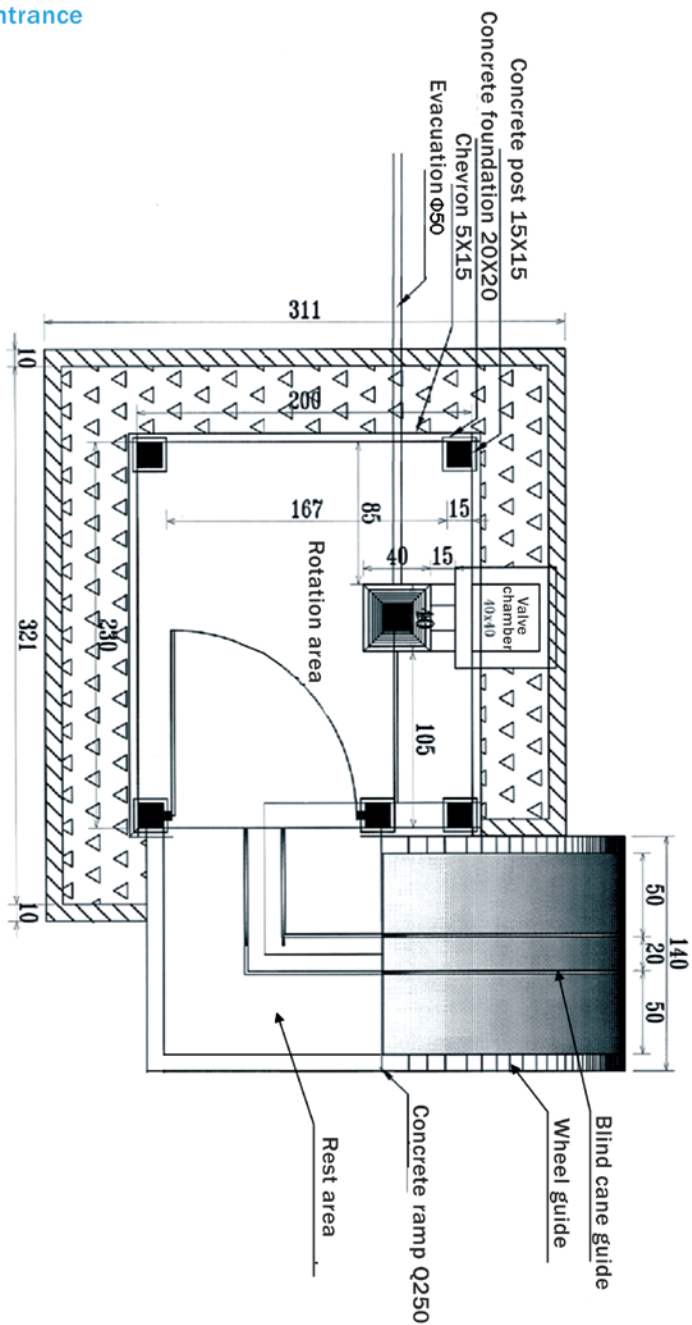
Community water point designs

The plans presented below are simply samples for a standpipe. Elements like the ramp can be adjusted to meet the environmental requirements.

Frontal entrance



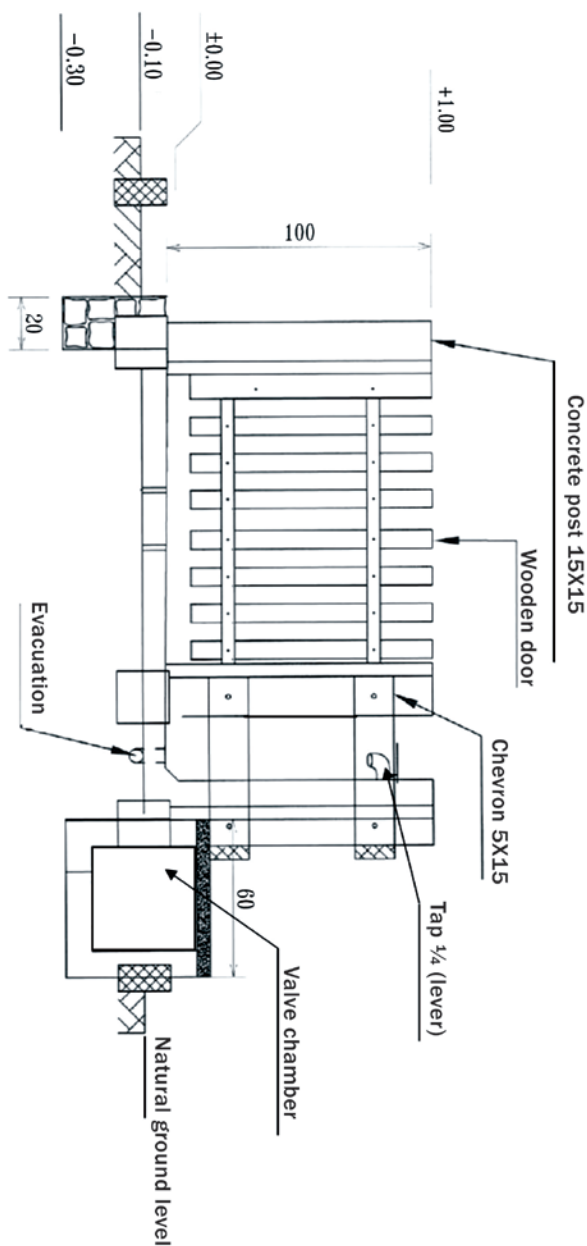
Lateral entrance



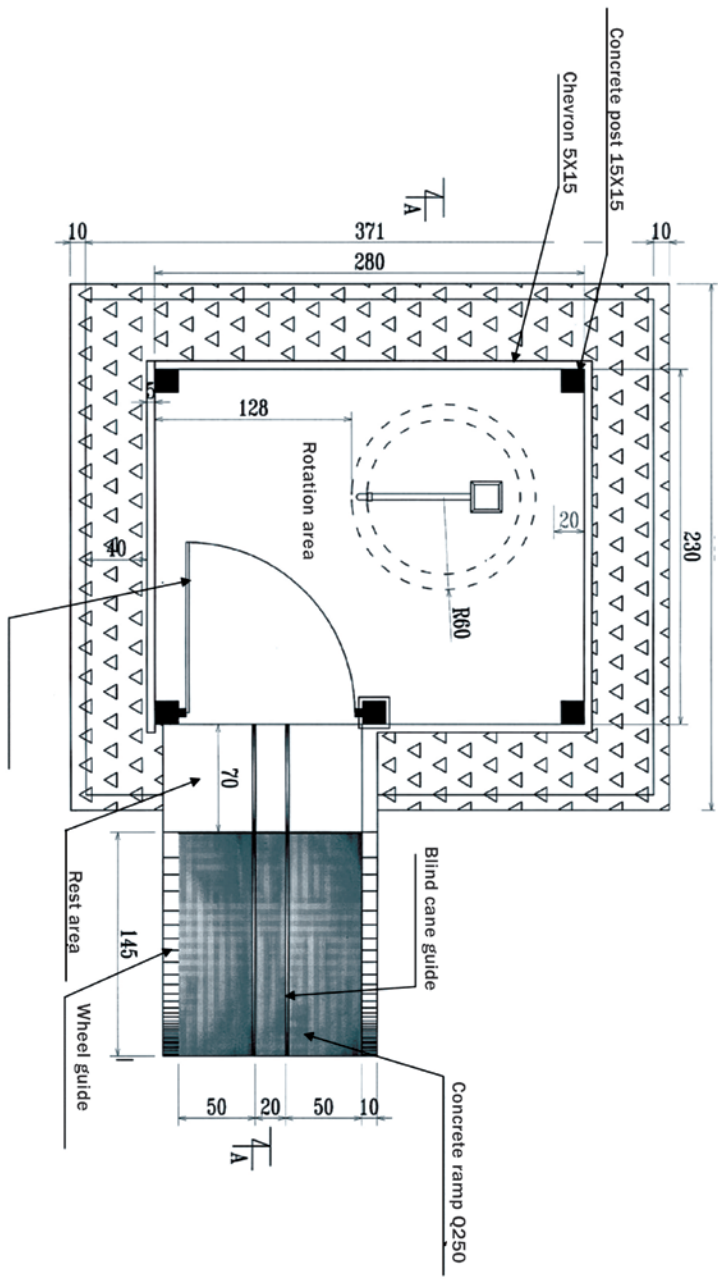
View A-A :



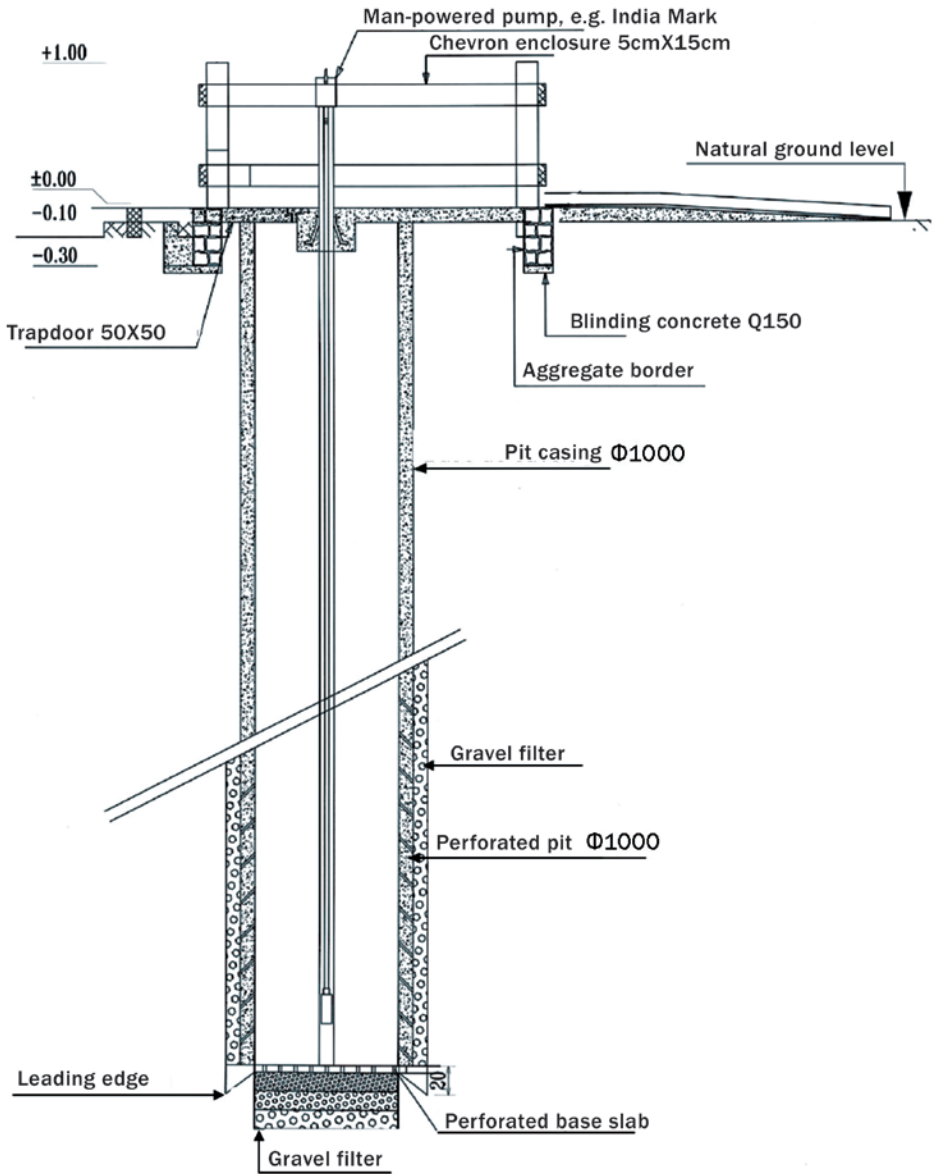
View B-B :



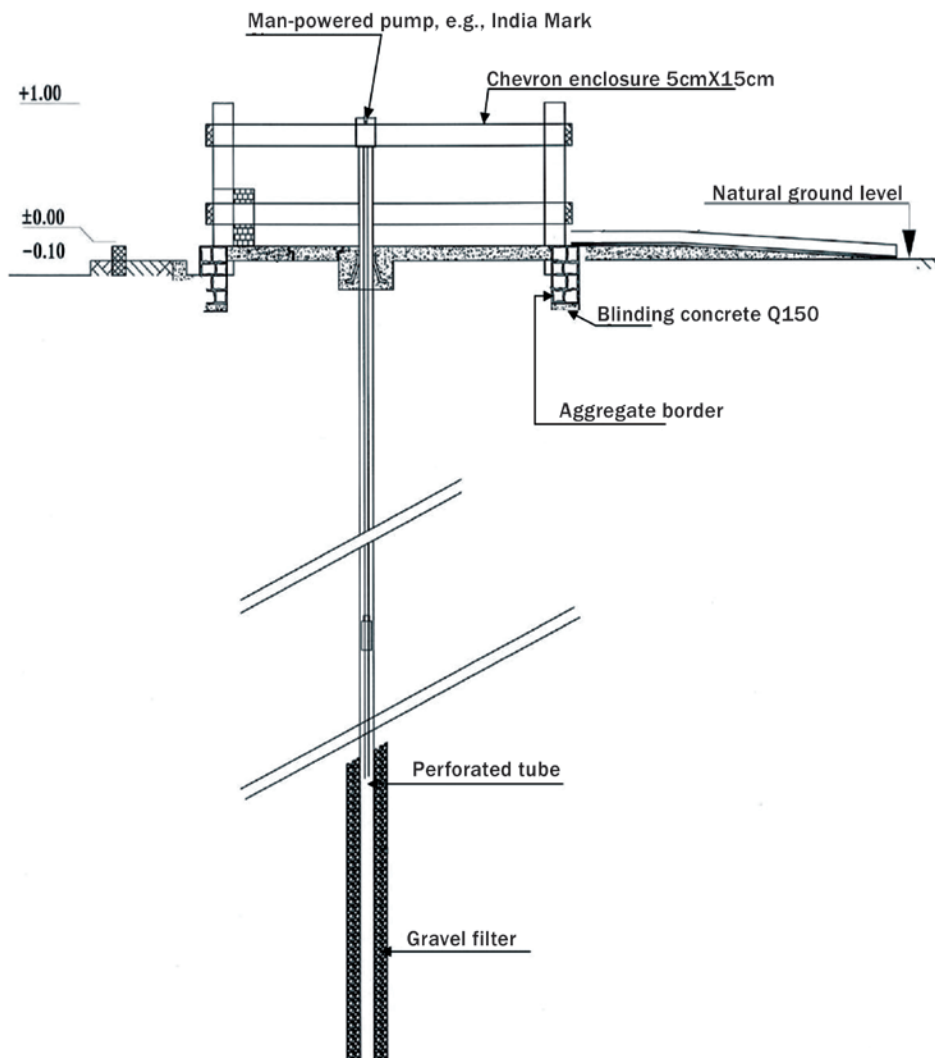
Plan of a well or borehole :



Sectional view of a well :



Sectional view of a borehole :



1.3 Estimated quantity and costs :

| Item | Unit | Quantity used before | Quantity used now | Difference |
|--|----------------|----------------------|-------------------|------------|
| Pollution Prevention Area | | | | |
| Cleaning and clearing | m ² | 25 | 25 | 0 |
| Excavation | m ³ | 0,8 | 0,8 | 0,05 |
| Earth work | m ³ | 0,8 | 0,8 | 0,05 |
| Disposal of residue excess | m ³ | 0,8 | 0,8 | 0,05 |
| Blinding concrete (150 kg/m ³) | m ³ | 0,17 | 0,11 | -0,06 |
| Stone pitching | m ³ | 0,4 | 0,47 | 0,07 |
| Hydrolytic water proofing (400 kg/m ³) | m ² | 8 | 7,1 | -0,9 |
| Rubble work | m ³ | 0,2 | 0,34 | 0,14 |
| Cost for the drainage Area (in Ariary) | | 190 300 | 121 000 | |
| 1€ = 3 100 Ariary | | 61 | 39 | |
| Access Ramp | | | | |
| Excavation | m ³ | 0 | 0,05 | 0,05 |
| Backfill | m ³ | 0 | 0,05 | 0,05 |
| Disposal of residue excess | m ³ | 0 | 0,05 | 0,05 |
| Blinding concrete (150 kg/m ³) | m ³ | 0 | 0,06 | 0,06 |
| Simple concrete (250 kg/m ³) | m ³ | 0 | 0,61 | 0,61 |
| Stone concrete | m ³ | 0 | 0,47 | 0,07 |
| Coating (300 kg/m ³) | m ² | 0 | 7 | 7 |
| Hydrolytic water proofing (400 kg/m ³) | m ² | 0 | 0,14 | 0,14 |
| Brick work | m ² | 0 | 0,24 | 0,24 |
| Cost of the access ramp (Ariary) | | | 63 000 | |
| 1€ = 3 100 Ariary | | 0 | 20 | |
| Accessories | | | | |
| Facility frame | U | 1 | 1 | 0 |
| Tap (¼ tours 20/27) | U | 1 | 1 | 0 |
| Water pipe PEHD 50 | ml | 10 | 10 | 0 |
| GALVA pipe 20/27 | ml | 1,2 | 1,2 | 0 |
| GALVA 20/27 bend 90° | U | 2 | 2 | 0 |
| Stop valve 20/27 | U | 1 | 1 | 0 |
| Galvanized sleeve 20/27 | U | 2 | 2 | 0 |
| Nipple 20/27 | U | 2 | 2 | 0 |
| Union fitting | U | 2 | 2 | 0 |
| Sealing plug 20/27 | U | 1 | 1 | 0 |
| SR 14-20/27 | U | 1 | 1 | 0 |
| Cost of accessories (Ar) | | 174 700 | 144 700 | |
| 1€ = 3 100 Ariary | | 56 | 47 | |
| Fence | | | | |
| Timber fence (5x15) | ml | 0 | 15,12 | 15,12 |
| Single-leaf door made with Australian gum tree 1,00*1,00 | U | 1 | 1 | 1 |
| Bolt (GM) | U | 0 | 10 | 10 |
| Hinge 140 | U | 4 | 3 | -1 |
| Slide/door bolt | U | 1 | 1 | 0 |
| Reinforced concrete (350 kg/m ³) | m ³ | 0,12 | 0,2 | 0,08 |
| Formwork | m ² | 8 | 5,52 | -2,48 |
| Steel reinforcement | kg | 12,15 | 20,25 | 8,1 |
| Coating (300 kg/m ³) | m ² | 7 | 7 | 0 |
| Round washer | U | 10 | 10 | 0 |
| Padlock | U | 1 | 1 | 0 |
| Hinge 140 | U | 4 | 3 | -1 |
| Door bolt | U | 1 | 1 | 0 |
| Hinge 140 | U | 4 | 3 | -1 |
| Door bolt | U | 1 | 1 | 0 |
| Oil paint | m ² | 5,76 | 1,89 | 3,87 |
| Cost for the fence (Ar) | | 205 000 | 281 300 | |
| 1€ = 3 100 Ariary | | 66 | 91 | |
| Total cost for the stand pipe (Ar) | | 570 000 | 610 000 | |
| 1€ = 3 100 Ariary | | 184 | 197 | |
| Variance | | | 7% | |

The above figures are the average costs of materials purchased from suppliers. Transport and labour related costs are not included . These costs increase with the reinforced concrete used for new facilities-boreholes. To minimise these, the pollution prevention area has been reduced and the pump relocated to increase the rotation space.

The costs for these materials to ensure accessibility represent a 6 % increase for a new facility. For rehabilitation works, this rate rises to 25% of the initial cost. Also note the high cost of the fence but absence of which facilitates accessibility. The fence is optional and so that the figures .

2 Hand Washing Facility

2. 1 Our learning steps :

Initially :



The grey colour used for the entire infrastructure makes it a challenge for the visually impaired to identify the various parts of the facility.

The tap is less than 85cm high.

A wheelchair cannot use the facility given the position of the sink. Suggestion was made to change the sink into an apron.

The step up to the facility is a barrier for with disability people.

The first designs & initiatives for accessible hand washing facilities :



Tap is less than 85 cm high.

Changing the sink into an apron. The height under the apron does not exceed 60cm and yet, this should be at least 75cm.

Slope of the ramp is very steep and there is no wheel/blind cane guide.

Lateral water point remains inaccessible.

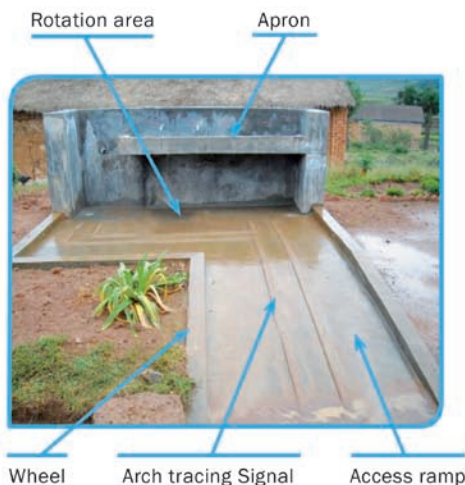
After the audit and the development of new designs :



Handwashing facility with a lateral door



Handwashing facility with a front view of the ramp



Access ramp:

A sloping path between two different levels. Removes all obstacles for people with disability to access anywhere. The orientation and the position of the ramp are very flexible depending on the requirements to facilitate access. According to accessibility norms, the slope should be less than 8%, and the inner width = 1.20 m.

Wheel guide:

A security device attached to the ramp and used as a safeguard for wheelchair users or as a guiding mark for the visually impaired using a blind cane. Height = 10 cm ; width = 10 cm.

Rotation area :

A 1.5m x 1.25m area where wheelchair/crutch users can move easily.

Arch tracing signal :

This is designed for the exclusive use and guidance of the visually impaired with/without a walking stick. The signal is two raised yellow curved lines. These lines are spaced 20 cm apart and in the middle of the ramp.

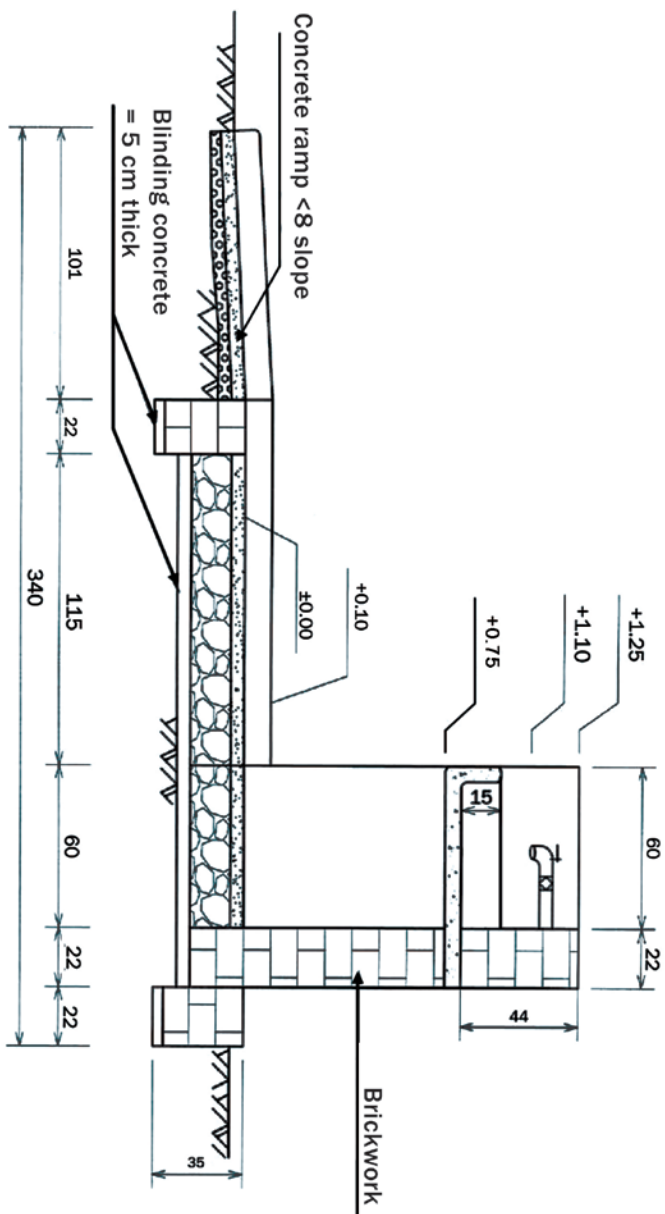
Line dimensions: height = 2 cm; width = 5 cm.

Apron :

It is used as a sink to collect waste water. The shape of the apron allows for a wheel chair user to slip feet under the apron and then to come closer to the tap and wash hands. The height under the apron is 75 cm.

Top view :





2. 3 Estimated quantity and costs :

| Item | Unit | Quantity before | Quantity now | Variance |
|---|----------------|-----------------|----------------|----------|
| Main body of the HaWaD | | | | |
| Cement CEM II | bag | 7 | 7 | 1 |
| Iron 10 | Bar | 1 | 2 | 1 |
| Iron 06 | Bar | 1 | 1 | 0 |
| Sand | m ³ | 1 | 0,6 | -0,19 |
| Gravel | m ³ | 0,4 | 0,77 | 0,33 |
| Block | m ³ | 2 | 0,9 | 1,1 |
| Round wood | Unit | 0 | 5,00 | 5 |
| Pine board | Unit | 0 | 7,00 | 7 |
| Brick | Unit | 850 | 600 | 200 |
| Subtotal for the main body of Handwashing facility | | 343 000 | 351 000 | |
| Rotation area and access ramp | | | | |
| Cement CEM II | Bag | | 1,6 | 1.6 |
| Sand | m ³ | | 0,21 | 0,21 |
| Block | Unit | | 104 | 104 |
| Subtotal cost for Handwashing facility main body | | | 38 000 | |
| Accessories | | | | |
| F 3/4 ¼ Turn Tap | Unit | 5 | 5,00 | 0 |
| Galvanised T F 3/4" | Unit | 4 | 4,00 | 0 |
| Galvanised elbow F 3/4" | Unit | 5 | 5,00 | 0 |
| Galvanised sleeve F 3/4" | Unit | 7 | 7,00 | 0 |
| Galvanized stop valve F 3/4" | Unit | 1 | 1,00 | 0 |
| Galvanized bolting F 3/4" | unit | 2 | 2,00 | 0 |
| Galvanized nipple F 3/4" | unit | 2 | 2,00 | 0 |
| PVC floor drain 40 F | unit | 1 | 2,00 | 1 |
| PVC Elbow MF F 40 | unit | 2 | 2,00 | 0 |
| HDPE pipe 50 | ml | 10 | 10,00 | 0 |
| Galvanized pipe F 3/4" | ml | 6 | 6,00 | 0 |
| Thread | unit | 16 | 16,00 | 0 |
| SR 14 F 25 X 3/4" | unit | 1 | 1,00 | 0 |
| Soft wire | kg | 0,5 | 1,00 | 0,5 |
| Tow | Pack | 1 | 1,00 | 0 |
| Nail 60 | Kg | 1 | 2,00 | 1 |
| Oil Paint (yellow) | Kg | 0 | 1,00 | 1 |
| Subtotal costs for accessories | | 207 000 | 211 000 | |
| Total cost of Handwashing facility | | 550 000 | 600 000 | |

To make access easier for a wheelchair user, a suspended apron is better than the usual sink. The brick sink is replaced by a reinforced concrete apron to allow for space under the apron and construction of a new ramp. As these changes require more concrete, this increases the quantities of materials needed including cement, iron, gravel and round wood.

The new accessible designs and materials needed, increase 10% of non inclusive costs. The above are average costs with suppliers not including transport and labour costs.

3 School and institutional latrine - shower blocks

3.1 Our learning stages :



Initially :

The challenges in terms of accessibility included :

- Access to door requires 2 levels and thus prevents access by "less-able" people;
- The narrow door prevents wheelchair access;
- No convenience facilities such as chairs, grab bars, rotation area;
- Locks are not lever handle type and the height is less than 85cm.

Prior to the accessibility audit :

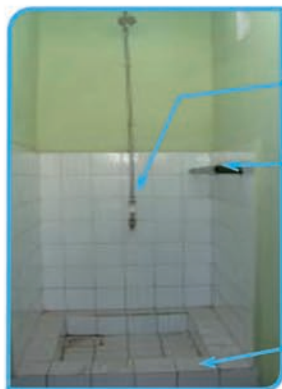


Entrance:

- The ramp's slope is very steep and there is no rest area;
- The door width and the urinal opening do not allow access by a wheelchair;
- The facility has no wheel or blind cane guide.



- The width of the door to the cubicle does not allow access to wheelchairs,
- This is not a lever handle,
- No wheel/blind cane guide,
- The ramp ends with a step,
- The access to the building does not allow free movement of a wheelchair user.



- This type of tap does not meet accessibility standards and height must be 85 cm,
- The grab bar must be on both sides with a height of 85cm,
- There is no soap/towel holder,
- The shape of the shower floor does not allow access by a disabled person.

Currently :



- The ramp slope has been adjusted to less than 8%, with blind cane and wheelchair guides. A rotation area is available in front of the accessible cubicle.



The shower floor is a gradual slope
 $\frac{1}{4}$ turn valve, 85 cm from ground
 Grab bars on both sides.



Set up of a squat latrine and grab bars;
 Interior width equal to 1.50m
 Wrist type locksets.



Soap holder, towel holder and grab bars
 installation.

3.2 Additional designs for making a hygienic School Latrine shower block accessible



- Pictogram
- Wheel Guide
- Access Ramp
- Arch tracing signal

Access ramp, the wheel/blind cane guide, arch tracing signal and rest area

The grab bar :

One or two bars, fixed or mobile, embedded in the wall or attached using supports. Bars are used by disabled people when using latrine or shower

Squat latrine :

It is convenient for a person with limited mobility. It is 45cm high.

Handle, ¼ turn :

The handle and the tap should be user friendly and be used even with elbows or other body parts. This is the importance of using both. Height from the ground: 85cm.



- Grab bar
- Hand grab
- Squat latrine



- Tap worth ¼ turn
- Shower floor with a 2% slope

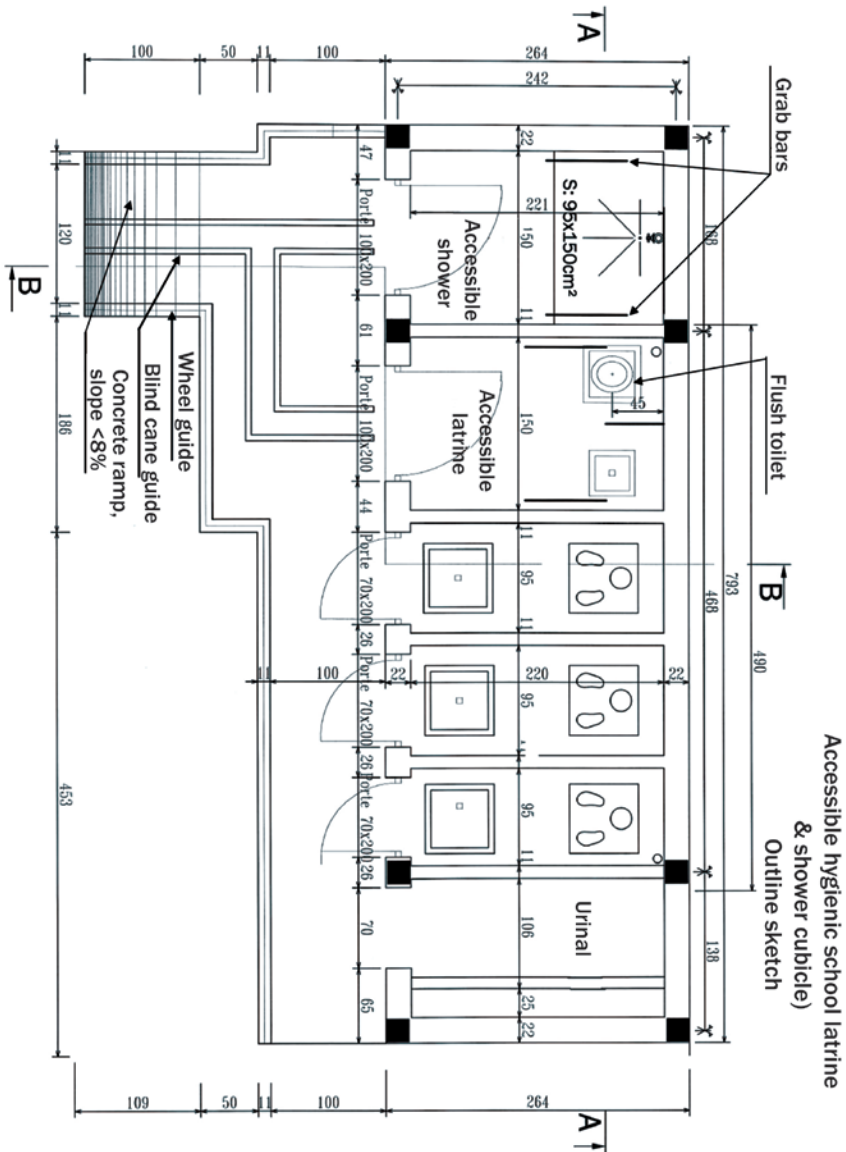
Soap holder, towel holder :

These are facilities in a shower; the most important is the location to facilitate their use.

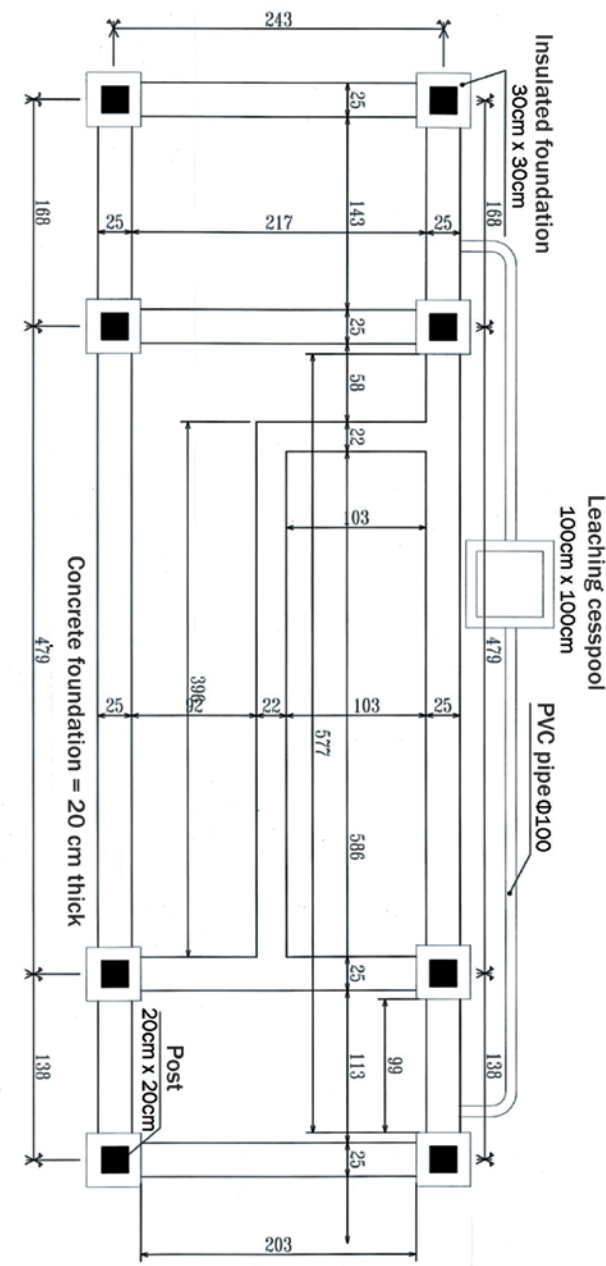


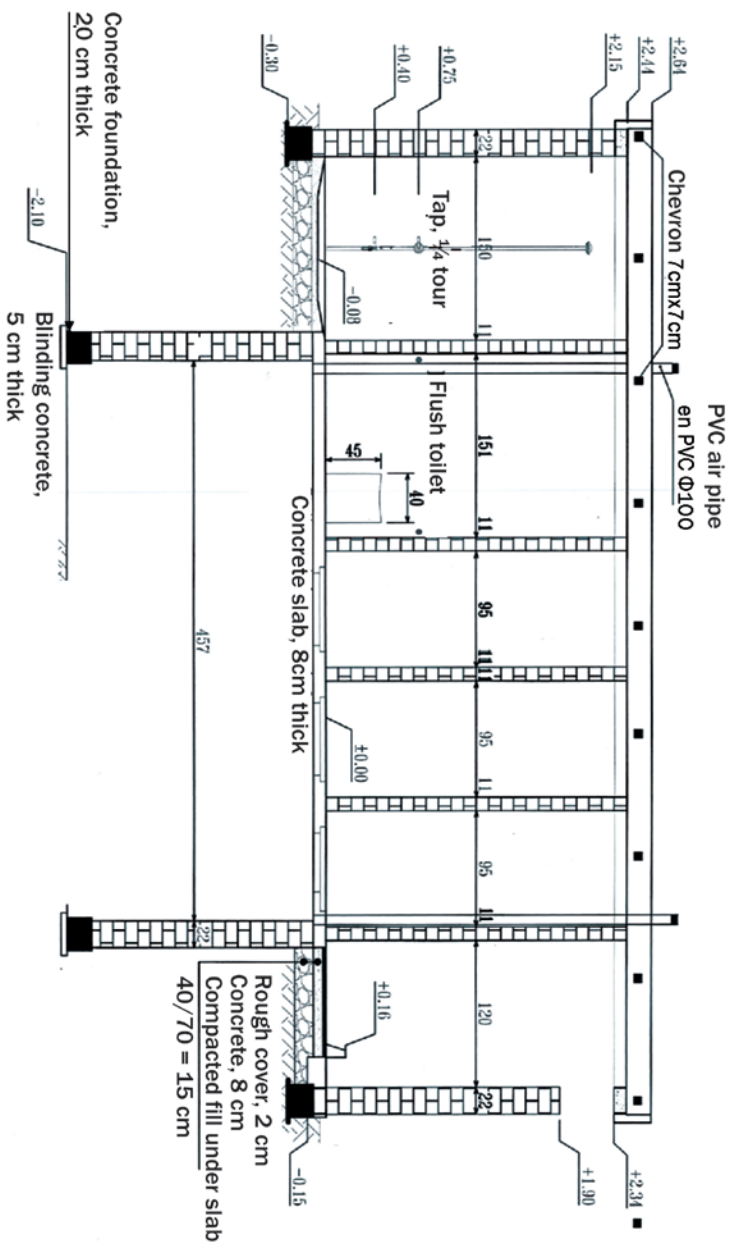
- Towel holder
- Soap holder
- Grab bar

School latrine-shower block : plan

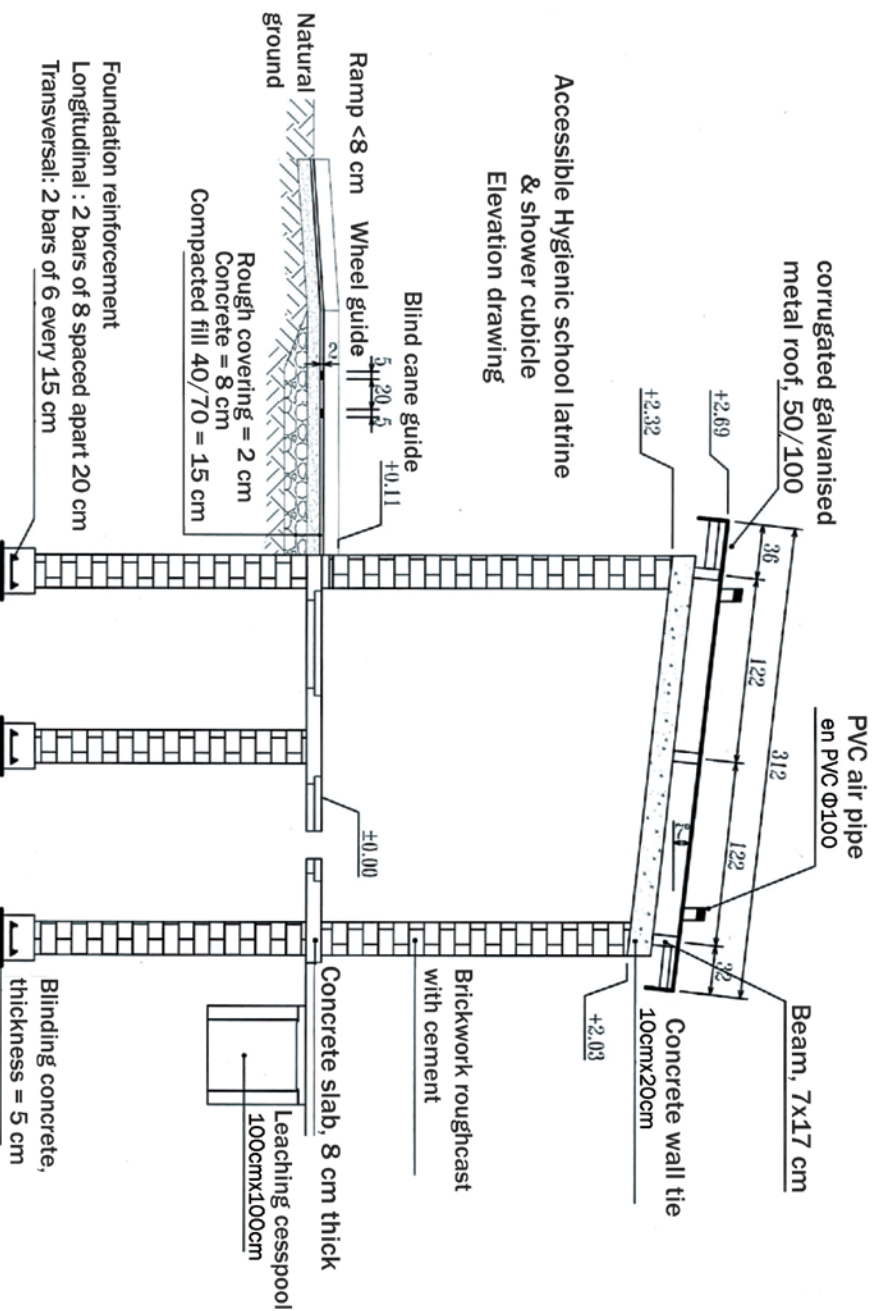


School latrine-shower block : foundation plan

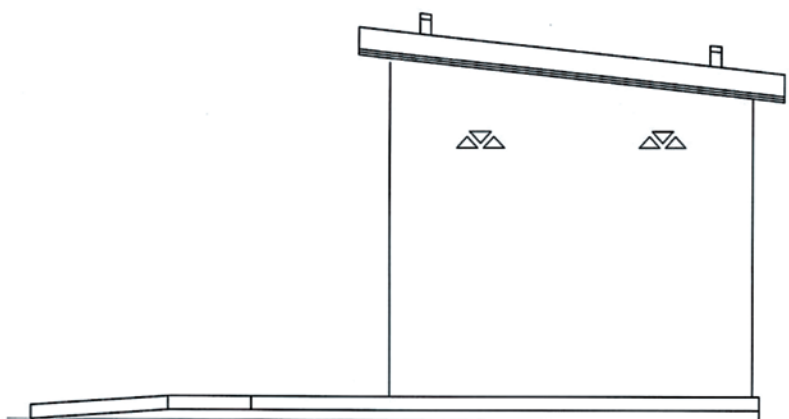




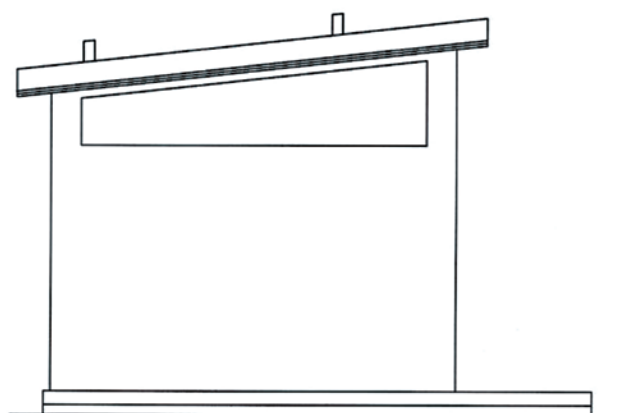
Accessible Hygienic school latrine & shower cubicle Elevation drawing



Right lateral frontage



Left lateral frontage



3.3 Estimated quantities and costs :

| Item | Unit | Quantity before | Quantity now | Variance |
|---|----------------|------------------|------------------|---------------|
| Heavy concrete constructions | | | | |
| Excavation | m ³ | 29 | 29,63 | 0,63 |
| Reinforced concrete Q350 | m ³ | 4,07 | 3,44 | - 0,63 |
| Reinforcement | Kg | 283,1 | 292,25 | 9,15 |
| Formwork | m ² | 81,35 | 68,76 | - 12,59 |
| Sealing coat | m ³ | 0,20 | 0,38 | 0,18 |
| Brickwork | m ² | 100,5 | 63,23 | - 37,27 |
| Coating 300kg/m ³ | m ² | | 139,38 | 139,38 |
| Coating dose 400kg/m ³ | m ² | 150,87 | 50,60 | -100,27 |
| Stone pitching | m ³ | 1,51 | 1,43 | - 0,08 |
| Form Concrete Q250 | m ³ | | 1,12 | 1,12 |
| Screed Q350 | m ² | 26,43 | 25,94 | - 0,49 |
| Frame | m ³ | 0,35 | 0,37 | 0,02 |
| Joinery | m ² | 8,80 | 8,80 | 0 |
| Barge board | ml | 25 | 22,16 | - 2,84 |
| Roof Covering | m ² | 29,7 | 25,32 | - 4,38 |
| Water-based paint | m ² | 241,35 | 278,75 | 37,40 |
| Oil paint | m ² | 60,35 | 30,36 | - 29,99 |
| Cost of heavy concrete constructions | | 4 588 000 | 4 980 000 | |
| 1£ = 3100 | | 1,480 | 1,606 | |
| Accessories | | | | |
| PVC pipe 75 | ml | 12 | 12,00 | 0 |
| Elbow MF PVC 75 | U | 4 | 4,00 | 0 |
| PVC Cap 75 | U | 2 | 2,00 | 0 |
| PVC T 75 | U | 1 | 1,00 | 0 |
| PVC Collar 75 | U | 4 | 4,00 | 0 |
| Floor drain 75 | U | 2 | 1,00 | - 1,00 |
| PVC glue | box | 1 | 2,00 | 1,00 |
| HDPE T 25 | U | 1 | 1,00 | 0 |
| Galvanized pipe 20/27 | Bars | 2 | 1,00 | - 1,00 |
| Galvanized pipe 33/42 | Bars | 1 | 1,00 | 0 |
| Galvanized elbow 33/42 | U | 12 | 8,00 | - 4,00 |
| Stop valve 20/27 | U | 1 | 1,00 | 0 |
| SR13 25x3/4 | U | 4 | 4,00 | 0 |
| Shower nozzle | U | 2 | 1,00 | - 1,00 |
| Door knob | U | 5 | 5,00 | 0 |
| Padlock | U | 5 | 0 | - 5,00 |
| Handle | U | 0 | 5,00 | 5,00 |
| Nail 50 | kg | 10 | 10,00 | 0 |
| Nail 100 | kg | 8 | 8,00 | 0 |
| sheet nail | kg | 4 | 4,00 | 0 |
| Sheet metal screws 4 / 25 | box | 2 | 2,00 | 0 |
| Squat toilet without drain/ removable / made with mould or wood | fft | 0 | 1,00 | 1,00 |
| Grab Bars | fft | 0 | 1,00 | 1,00 |
| Soap holder | U | 0 | 1,00 | 1,00 |
| Towel holder | U | 0 | 1,00 | 1,00 |
| Cost of accessories (Ar) | | 2 812 000 | 3 020 000 | |
| 1£ = 3100 | | 907 | 974 | |
| Total cost of CSL | | 7 400 000 | 8 000 000 | |
| 1£ = 3100 | | 2,387 | 2,581 | |
| Variance for accessibility | | | 8% | |

The principle applied for an accessible school latrine is to obtain less substantial cost difference compared to the former. Increases are mainly noted in the accessories both for latrines and showers and include handle, taps, grab bars, towel and soap holders, for flush toilet, squat toilet and others, an increase of around 7% without transport and labour costs

4 Limits to accessibility :

Despite the efforts to ensure that all our public and institutional facilities are accessible, there are some limits. So the challenge now is to research measures to mitigate these limitations. The main barriers to access are :

4.1 Location of the facilities :

The locations of water points chosen by the community are often challenging and inadequate for accessibility.

To ensure adequate location of the facility, the challenge will be to educate future users on equity and inclusion and accessibility principles.

Illustrations of problems are seen in the pictures below :



EPP Ampanazava, Ambohibary Commune : the Handwashing facility is made accessible but access to school requires climbing a slope of many inconsistent steps.



Same case for the tap stand in Mahaiza Commune the facility is accessible but people must come down a slope of inconsistent steps.

4.2 Quality of accessible facilities :

Quality and precision in the construction of these facilities are all the more important in the success of this accessibility. A small difference in level between the ramp end and the ground surface, a creaking door hard to open are all barriers to accessibility.

4.3 Adapting facilities to users' reality

On completion of the facility shown in the photo, the headmaster of the Antanimena public school noticed that some of the smaller pupils could not reach the tap. Though the facility is built in strict compliance with the accessibility plans and standards, it had to be adjusted with the installation of two steps on one side of the Handwashing facility for smaller children to be able to use it.



Anthropometric adaptation to meet children's needs

4.4 Land tenure and space issues

With these facilities which require more space, land becomes an issue, mainly in urban areas where land properties increase significantly and available spaces are scarce.

The depth of the water table and appropriate technological options also affects the availability of space. This requires building a raised or an Ecosan latrine which theoretically requires a long ramp. Given that this option is not possible, a handrail at the steps is recommended to improve accessibility. It is then recommended to comply with the step sizes.

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- Caritas Madagascar
- Centre National de l' Eau, de l' Assainissement et du Génie Rural (CNEAGR)
- Engineering Consulting Associates (ECA)
- Entreprise Mahavita
- Entreprise Mihaingo
- Sampan' Asa Fampandrosoana (SAF-FJKM)

Under the precious guidance of Aina RAKOTONIRINA, Technical Expert on Accessibility from Handicap International to whom we gratefully thank .



WaterAid transforms lives by improving access to safe water, hygiene and sanitation in the world's poorest communities.
We work with partners and influence decision-makers to maximise our impact.

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