COMMUNITY PLUMBING CHALLENGE

INDIA 2015

BRIEF#1 MEMORY/REPORT

BASQUE TEAM
FP EUSKADI

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DANIELA ROJAS
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CONTENTS

OVERVIEW

Description

About

India huge and fast growing population is putting a severe strain on all of the countrys natural resources.

Most water sources are contaminated by sewage and agricultural runoff. India has made progress in the supply of safe water to its people, but gross disparity in coverage exists across the country.

Although access to drinking water has improved, the World Bank estimates that 21% of communicable diseases in India are related to unsafe water. In India, diarrhea alone causes more than 1,600 deaths daily.

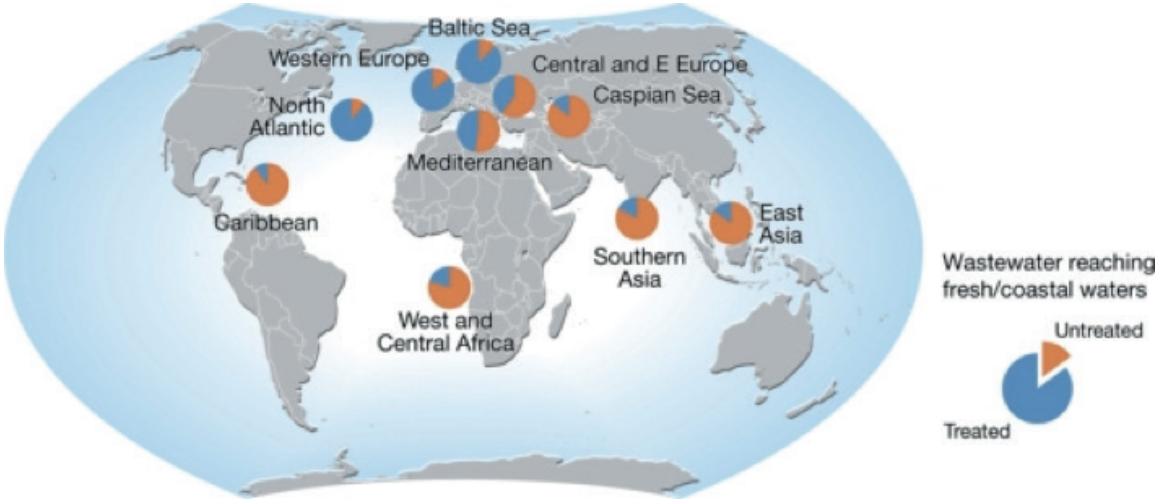
Hygiene practices also continue to be a problem in India. Latrine usage is extremely poor in rural areas of the country; only 14% of the rural population has access to a latrine. Hand washing is not very commun increasing the spread of disease.

Objective

Our challenge is:

- Enable a class of 60 school stents (between the ages of 5–15 years old) to wash their hands after toilet use and before meals (one meal on site, per day).
- Supply water to the handwash facility and dispose of wastewater safely.
- Engage and inspire stents via lessons and activities relating to the health aspects of plumbing and sanitation.

In order to acomplish this objectives we have designed a solution for a new handwashing facility at the School 125, in Mukiti Dham, Nashik, which will be explained in the following pages.



Situation and location

Coordinates of Nashik.

Latitude: 19.9974533

Longitude: 73.78980229999999

DESIGN SOLUTION
Description

Design Solution

Our design solution for a new handwashing facility is thought to be an easy, cheap and replicable one.

The starting point is to remove part of the existing facilities in order to redistribute the space, including new ones.

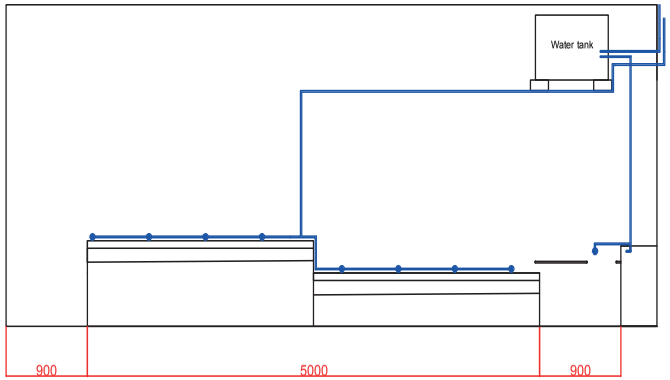
The key point of the proposal will be an affordable water filtration that is at the same time efficient and, as whole, very easy to mantain.

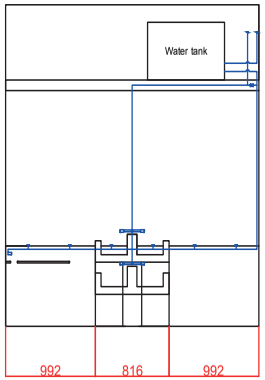
A set of plumbing and bricklaying works will make possible the improvement of the space as well as its maintenance.

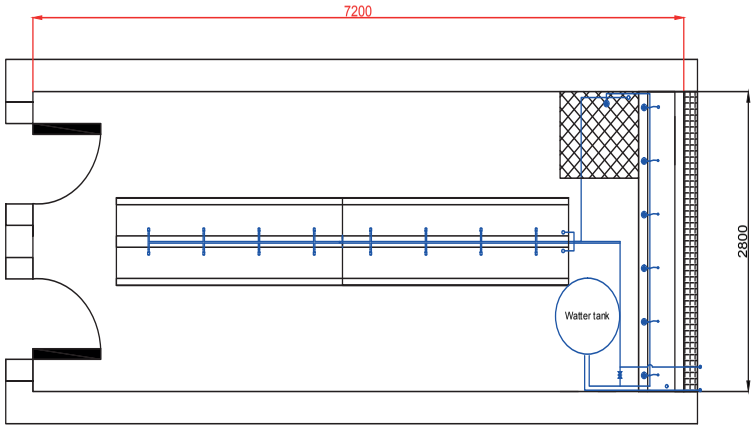
Preview

After the development of our proposal, the space will result in a more usefull handwashing facility.

The following image is a 3D preview of the final result in comparison to the previous one.





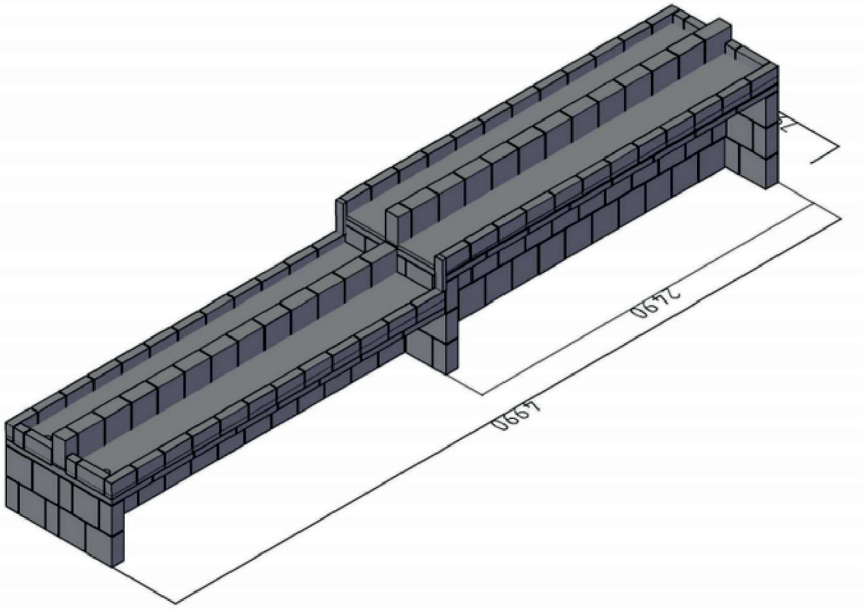


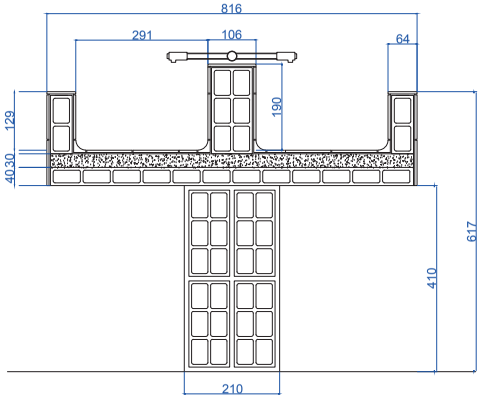
COMMUNITY PLUMBING CHALLENGE

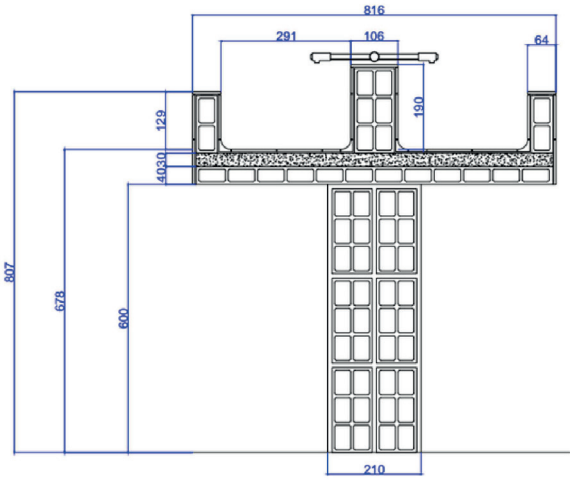
Escale: 50:1

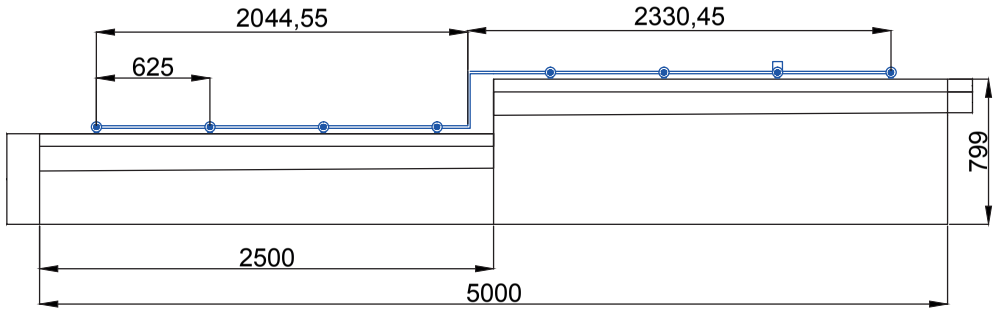
3 Views of hand washroom and inside instalation

Name and surname: Kevin Sande	Name and surname: Ruben Garcia	Name and surname: Daniela Rojas	Name and surname: Pau Verdaguer	Nº2





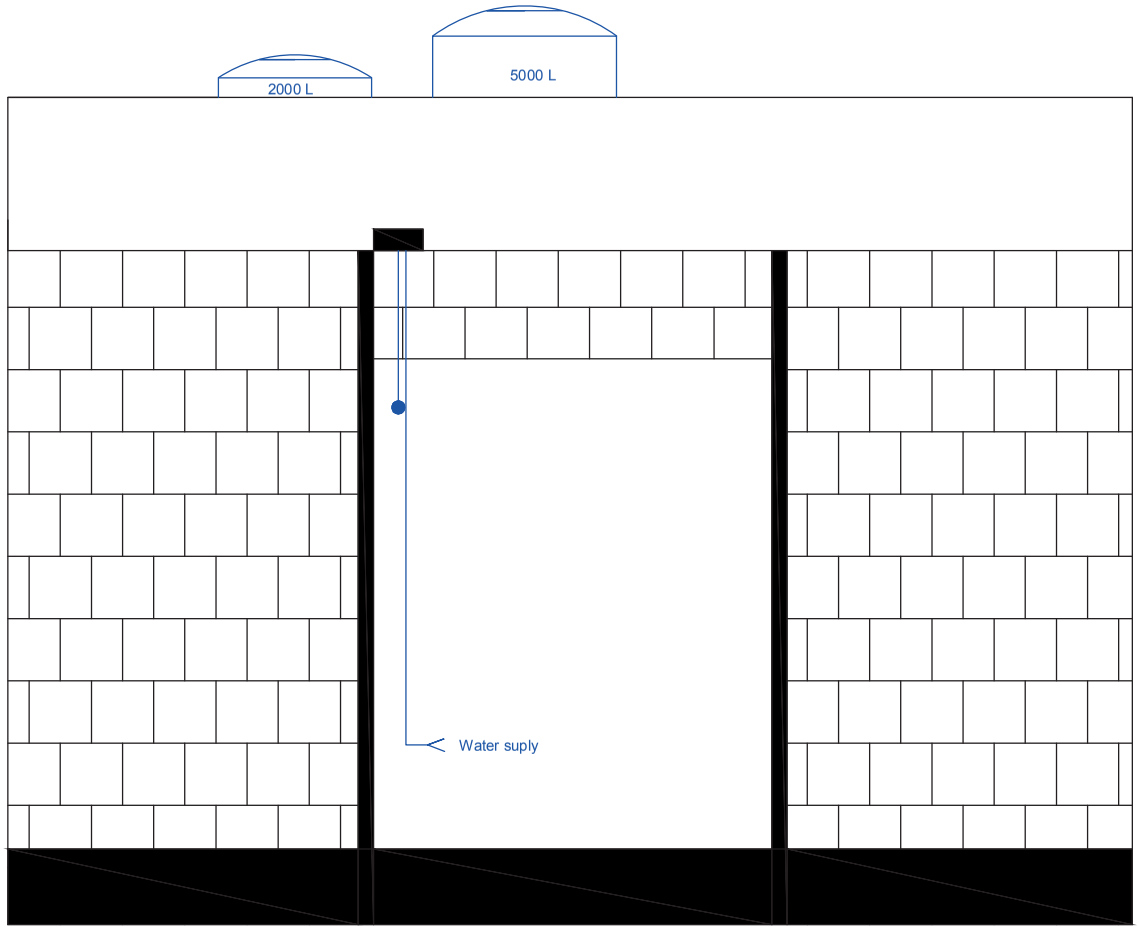




COMMUNITY PLUMBING CHALLENGE

Dimensioning of hand wash

Name and surname: Kevin Sande	Name and surname: Ruben Garcia	Name and surname: Daniela Rojas	Name and surname: Pau Verdaguer	Nº3



COMMUNITY PLUMBING CHALLENGE

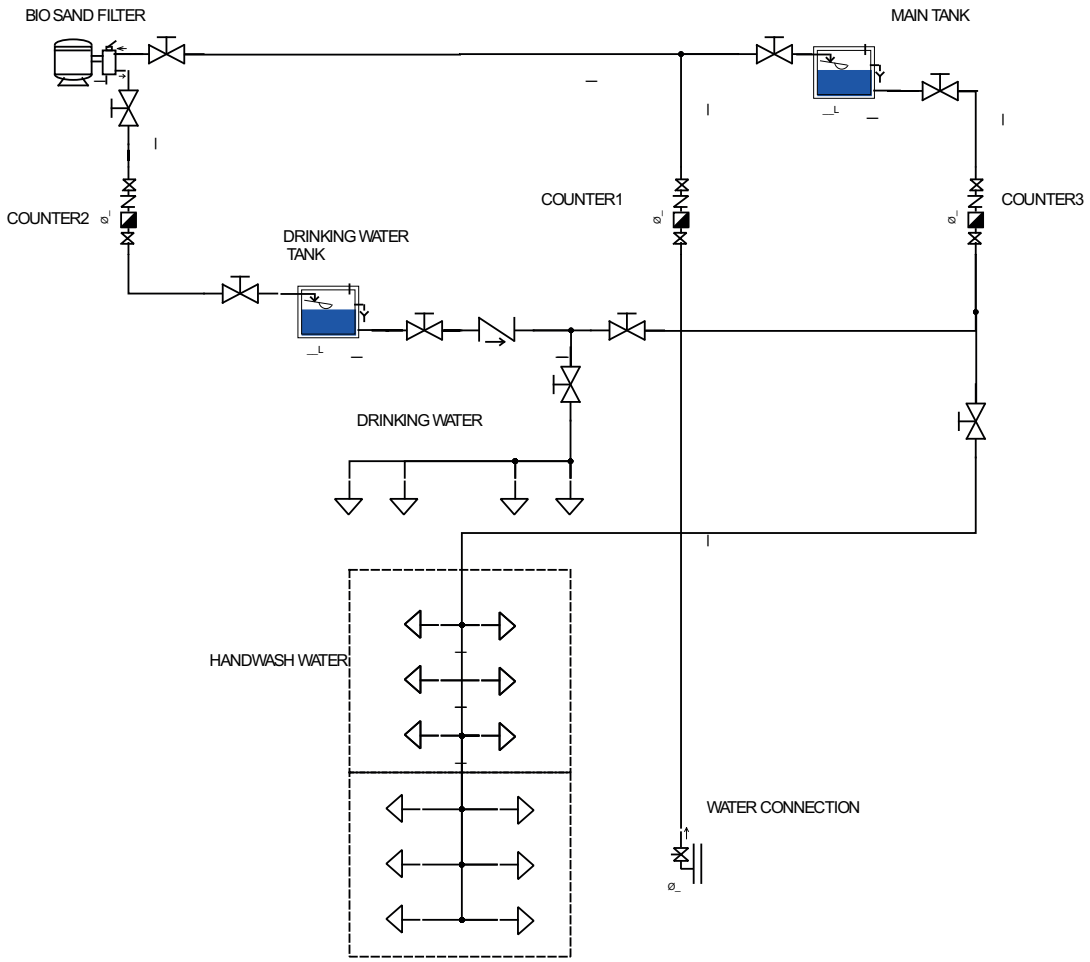
Escale: 30:1

Facade and external installation

Name and surname: Kevin Sande	Name and surname: Ruben Garcia	Name and surname: Daniela Rojas	Name and surname: Pau Verdaguer	Nº1

DESIGN SOLUTION

HYDRAULIC SYSTEM



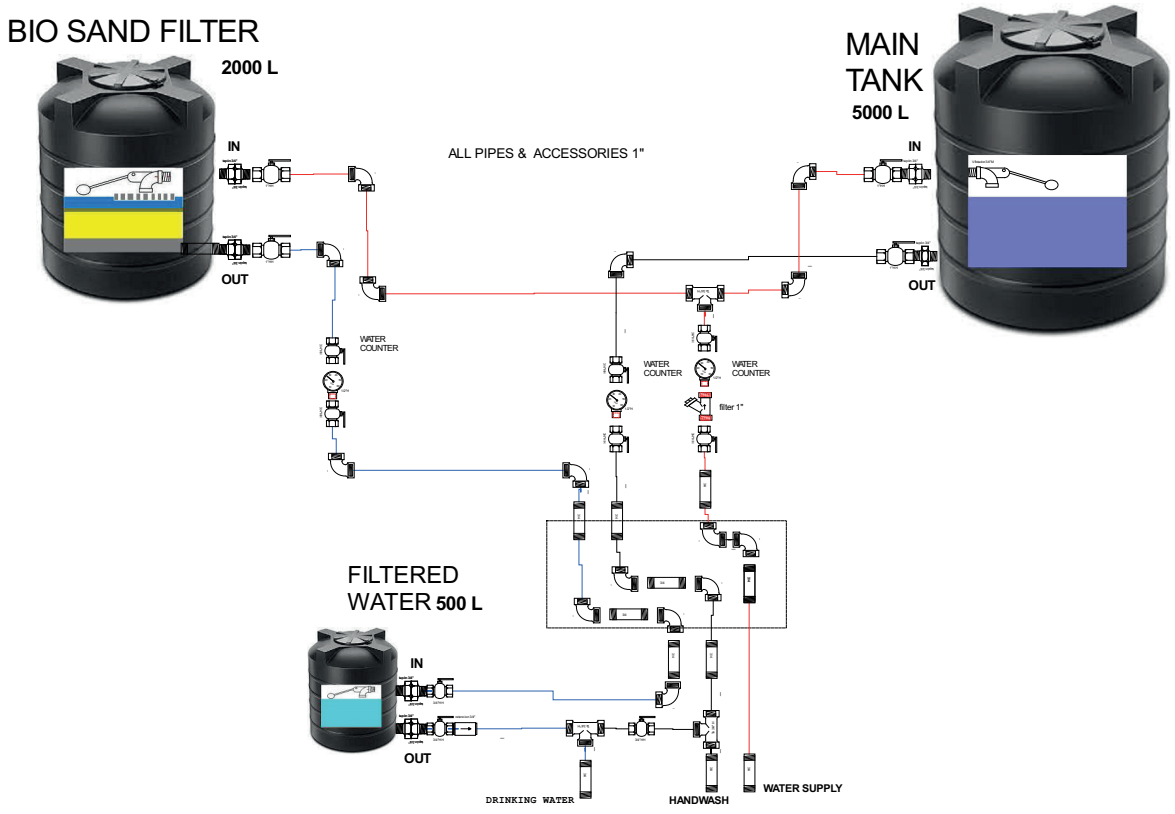
The hydraulic system has two parallel installations. One focuses on suppliying drinkable water for consumption.

The other distributes water for the hand wash. The pipes will be made out of galvanized pipes, which be installed in the surface, which will make it easy to detect leaks.

All of the tanks have valves on each input and output that allows to disable them in case its needed. It also functions as a security system that doesn't allow the water to overflow. Meaning, once the tank is full the entrance valve will close itself.

Water supply network

The tanks will simultaniously fill up through a galvanized steel pipe, who will have meters in the water supply connector and in each and everyone of the derivations that supply both tanks. They will be used to control and identify leaks in the rest of the installation.



DESIGN SOLUTION
Bio Sand Filter

Description

We want to enphasis on the sand biofilter explanation because it is the key element of the system.

The Bio sand filter consists of a box, made of plastic in which a bed of sand is placed over a layer of gravel and perforated pipes.

Process

The basic principle of the process is very simple.

Contaminated freshwater flows through a layer of sand, where gets physically filtered and biologically treated.

Hereby, both sediments and pathogens are removed. This process is based on the ability of organisms to remove pathogens.

In this context, it is important to distinguish slow and rapid sand filtration.

The difference between the two is not simply a matter of the filtration speed, but of the underlying concept of the treatment process.

Slow sand filtration is essentially a biological process whereas rapid sand filtration is a physical treatment process.

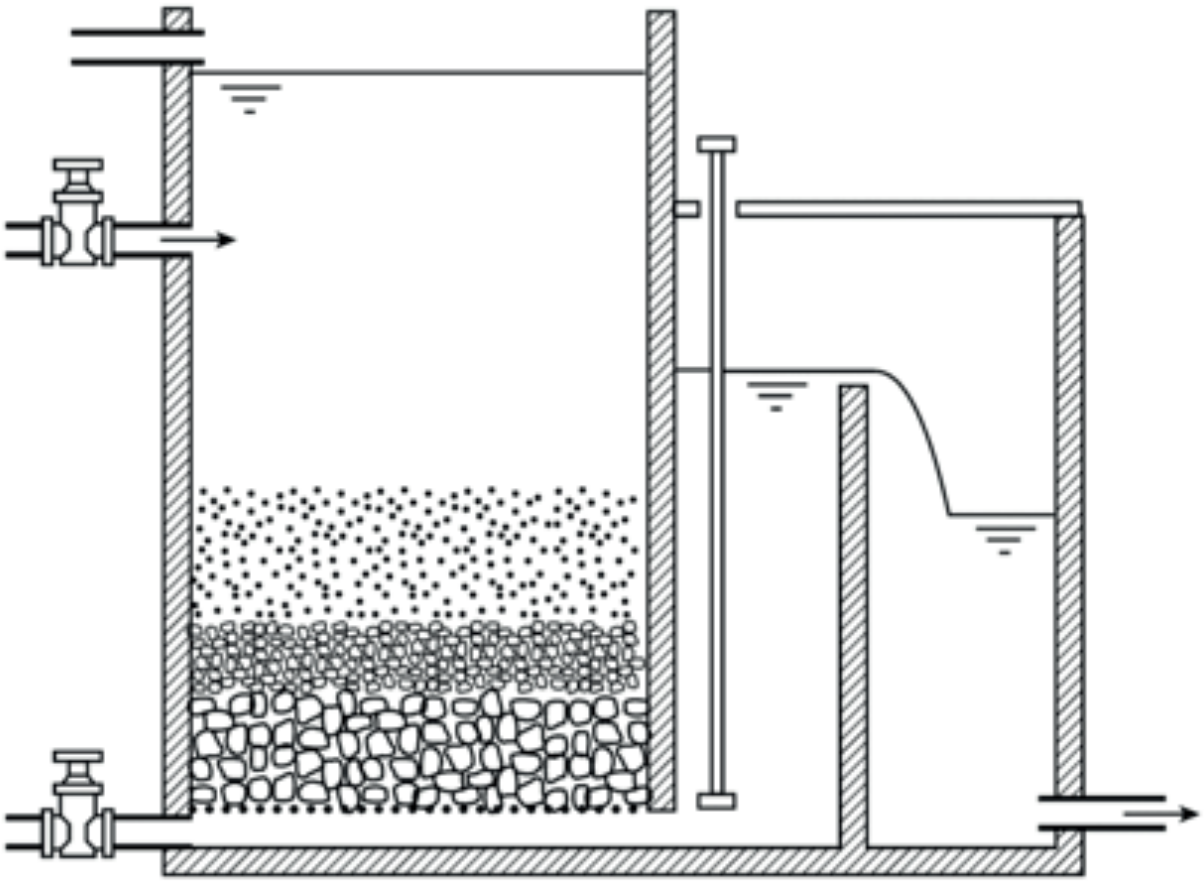
Although the physical removal of sediments is an important part of the purification process, the relevant aspect is the biological filtration.

The top layers of the sand become biologically active by the establishment of a microbial community on the top layer of the sand substrate, also referred to as "schmutzdecke".

These microbes usually come from the source water and establish a community within a matter of a few days.

The fine sand and slow filtration rate facilitate the establishment of this microbial community.

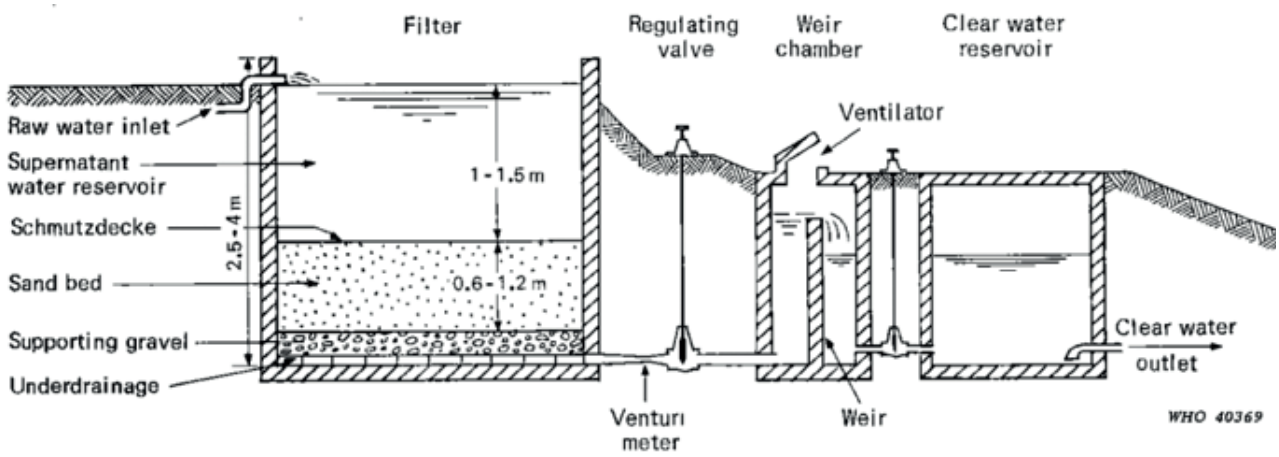
The majority of the community are predatory bacteria that feed on water-borne microbes passing through the filter.



Structure

As the process itself, the basic structure is very elementary. Essentially, only the filter chamber, a reservoir and pipes are required. Since its a warm climate an open tank can be used as well as a closed one and the heat accelarates the appearance of the microorganisms.

Once a slow sand filter facility is built, only clean sand is required for occasional replacement. The sand layers are put in gradually according to their grain sizes: rather coarse grains at the bottom and fine grains at the top. The sand-bed is usually covered with one meter of supernatant water. As the process of biological filtration requires a fair amount of time in order to purify the water sufficiently, usually operate at slow flow rates between 0.1 – 0.3 m^3/h per square metre of surface.



HIGHLY EFECTIVE FOR	SOMEWHAT EFFECTIVE FOR	NOT EFFECTIVE FOR
• *Bacteria* • *Protozoa* • *Viruses* • *Turbidity-Heavy metals (Zn,Cu,Cd,Pb)*	• *Odour,Taste* • *Ironm Manganese* • *Organic Matter* • *Arsenic*	• *Salts* • *Fluoride* • *Trihalomethane (THM)* • *Precirsors* • *Majority of chemicals*

Health Aspects

Slow sand filtration is an extremely efficient method for removing microbial contamination and will usually have no indicator bacteria present at the outlet.

This is also effective in removing protozoa and viruses. Could have a 90 to 99% of a reduction in bacteria and viruses. Yet, slow sand filtration is generally not effective for the majority of chemicals.

Advantages

- Very effective removal of bacteria, viruses, protozoa, turbidity and heavy metals in contaminated fresh water
- Simplicity of design and high self-help compatibility: construction, operation and maintenance only require basic skills and knowledge and minimal effort
- If constructed with gravity flow only, no (electrical) pumps required
- High reliability and ability to withstand fluctuations in water quality
- No necessity for the application of chemicals
- Easy to install in rural, semi-urban and remote areas, Simplicity of design and operation
- Long lifespan (estimated >10 years) Conclusions
- Easy to replicate in others places

In case of malfunction

In the case the tank with bio-filter becomes unusable due to a breakdown or obstruction, water can be managed from the non drinkable water tank through a by-pass even if this fact would mean that water becomes non drinkable but it is acceptable to increase the volume of people washing their hands simultaneously.

FILTER IMAGES

1- TANK

2- GRAVEL

3- STONES & SAND

4- REQUIRED PIPES

BEFORE

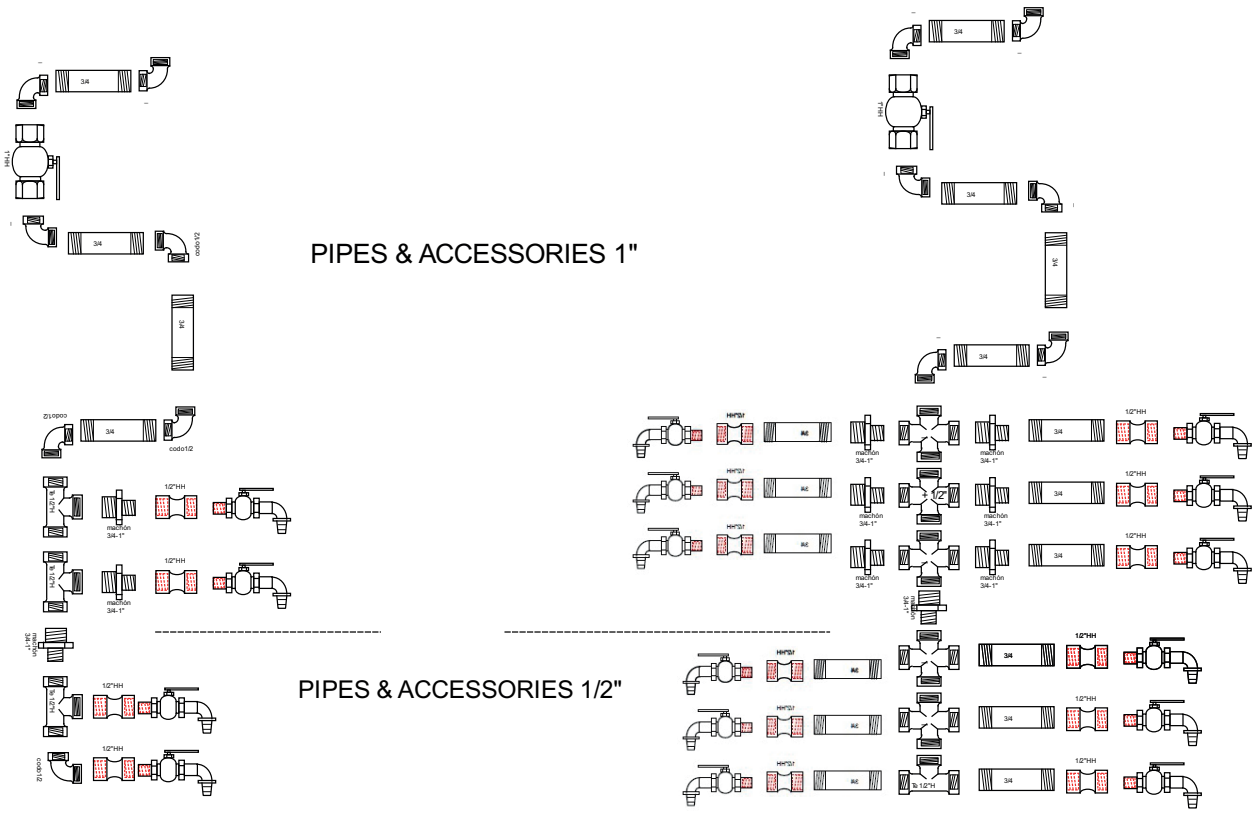
AFTER

DESIGN SOLUTION
New Handwash Facility

Non drinkable water

The already explained hydraulic system will provide a new handwash facility within the existing hand wash room. Provided by non drinkable water.

The not drinkable tank of 5000 L is indirectly connected to twelve temporized faucets in four ramifications.



Drinkable water installation

The tank of biofiltration through sand of 2000 L connects through drinkable water of 500 L of drinkable water located inside the bulding in the handwash,not to expose the water to high temperatures.

From this tank drinkable water will be supplied to five temporized faucets.

They will be the same ones than the non drinkable water, but instead they will be installed upsidedown, propelling the water upwards. Except for one which will be enabled for reduces mobility people.

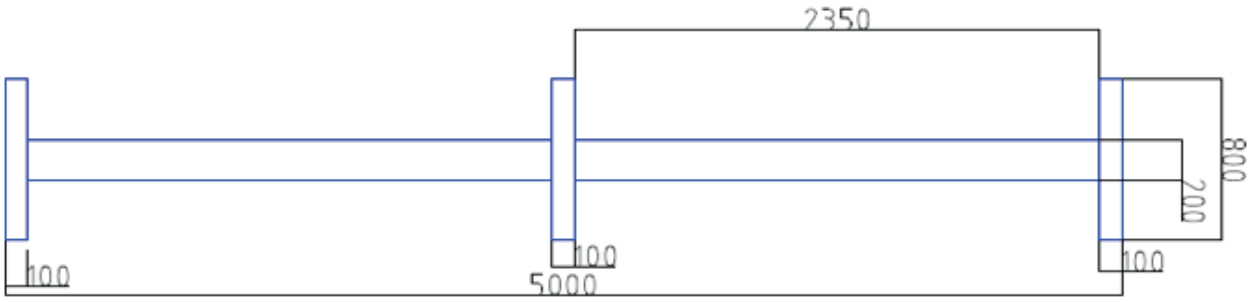
The replacements will be the same ones and wont need to have different ones in case they breakdown.

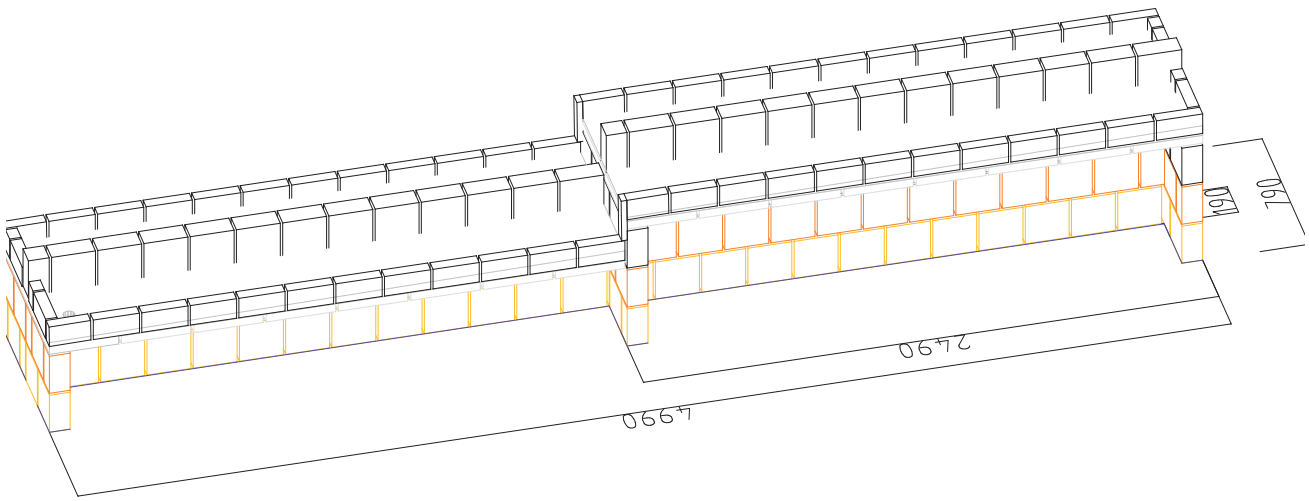
DESIGN SOLUTION
Usability of Space & Access

Improving the space

With the goal of optimizing space, improving accessibility as well as brightness, a new door has been made along with their access ramps in order to make it easier for people with reduced mobility.

Besides, a solid structure has been built in the middle of the room for the maximum optimization of the space; this structure is made of two adjacent units of two different heights specially thought for the oldest and the youngest children. In the middle part of the framework a longitudinally laid support will be built which will hold the water taps installed on both sides. This way, there will be a "U" shape aisle in order to follow an order of the handwashing.





CONSTRUCTION PROCESS

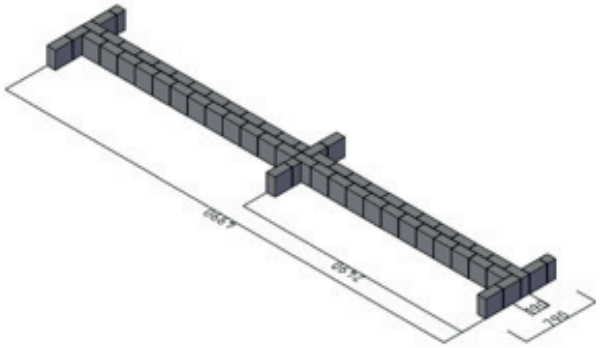
Setting out

The first step is to locate the framework in the available space having concern of the movement circulation in line with the layout.

Secondly, the base of the framework will be drawn so we will be able to know the exact position of it and we will gather the amount of bricks needed.

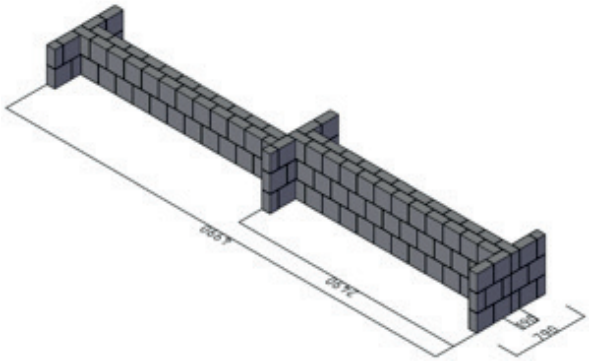
1st row of bricks

The template which has been drawn previously will be used as a guide when placing the first row of bricks. An amount of 61 interposed bricks will be placed to strengthen the framework, however plumb level should be controlled, that is to say, vertical and horizontal alignment of the structure.



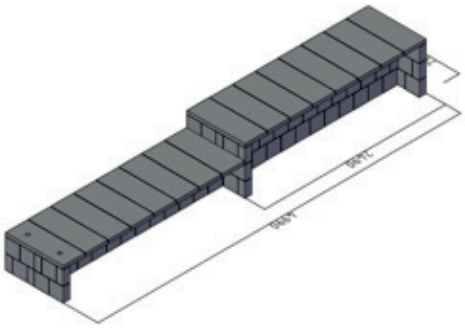
2nd and 3rd row of bricks

Two more rows of bricks will be laid interposed with the previous one. The last row, the third, will only use half of the structure, so we can obtain two levels for the washbasin. The second row will have a total of 62 bricks whereas the third will have 32. This concludes the structure or support.



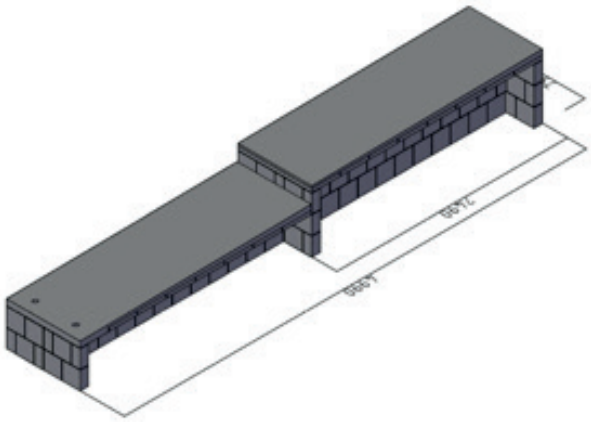
Big format brick colocation

16 bricks of this size 800x300x40cm will be placed in order to make the basis of the counter. With the help of a drill two holes will be done at the end of the lower part of the structure, which will be the drain pipes. An important part of this process would be controlling the horizontal level.



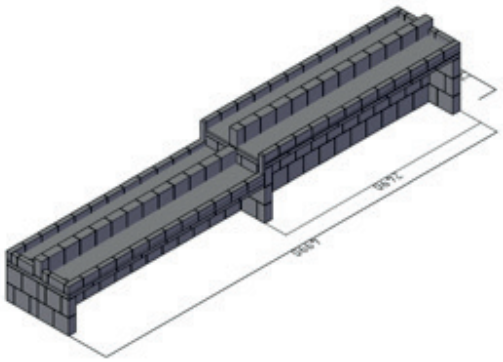
Discharging concrete

First of all is to put a wire net as well as the metallic reinforcement in cross direction, so the resulting structure will be more consistent and strong. After that, two 50mm tubes will be placed in the holes which will subsequently be the drainpipes.

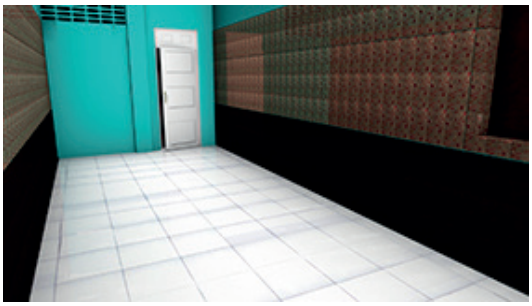
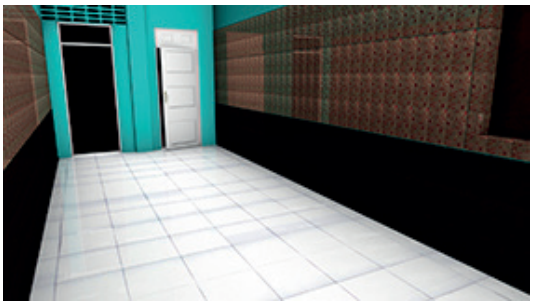
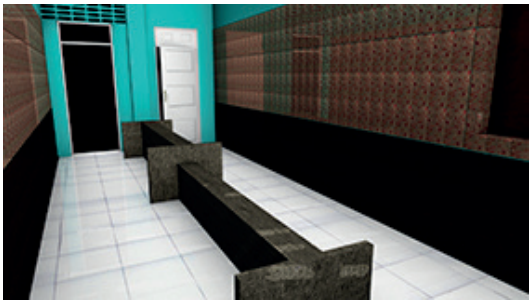
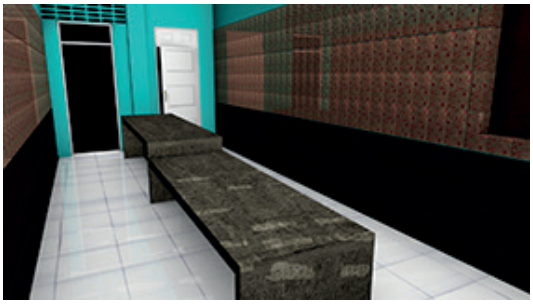
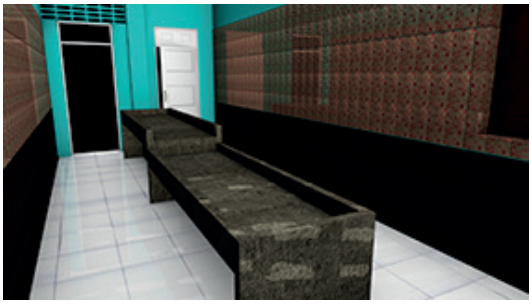
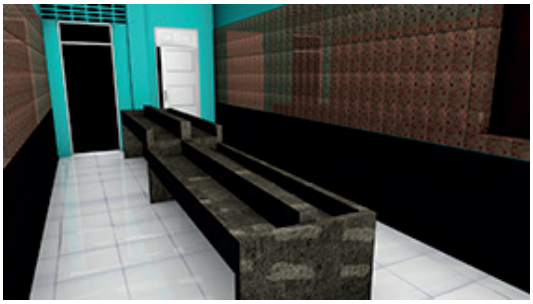
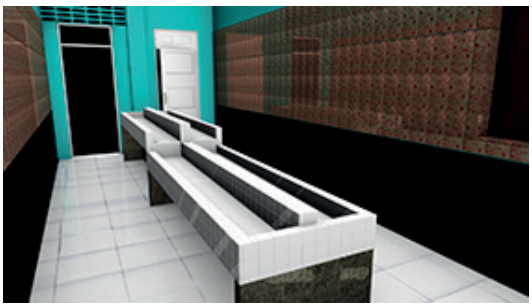
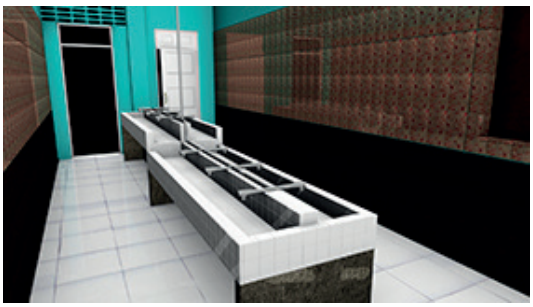


Middle wall and surroundings

By means of bricks, a surrounding wall and a middle one will be built. Straightening takes importance due to the discharging of the concrete is not horizontal and the middle wall will be the support for the taps. Once the structure is completely finished it will be tiled, which will allow the water to flow easily until the drainpipes.



SPACE IMAGES


Our finished proposal will include the application of informative vinyls which has a double objective:

- Remind the students the right way to use the water and the facilities in a funny manner.
- Make the space more appealing and confortable for the children.

With this it will be easier for the environment to be kept clean and in a good state.

DESIGN SOLUTION
METERING SYSTEM

A general counter will make possible the measure of the supplied water.

On the other side, our proposal includes two more counters:

- The first one will measure the used drinkable water
- The second one will measure the used non drinkable water.

This double counter of used water will allow us to accomplish a double objective:

- Getting the real data of the water usage
- Getting control of the current use of the system due to the supplied water must be equal than the used water, if not we would be able to notice if there has been any leaks.

TIMELINE

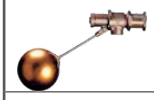
Note:

This timeline is designed to be developed by eight people symultaniously, fullfilling diffrent tasks. So the time required is not the total.

ITEM	DAY 1	DAY 2	DAY 3	TOTAL
MATERIAL RECEPTION AND TESTING BEFORE INSTALLATION	60 mins			
OPEN DOOR APERTURE AND DOOR SUB-FRAME COLOCATION	60 mins			
ON-SITE LAYOUT	30 mins			
MORTAR CEMENT MIX	15 mins			
HAMMERING THE CONCRETE DECK TO PLACE THE SANITATION PIPE	30 mins			
BRICKWORK (SUPPORT STRUCTURE)	150 mins			
BIG FORMAT BRICK COLOCATION	90 mins			
HOLES ON BIG FORMAT BRICK	10 mins			
FORMWORK	45 mins			
PLACE IRON MESH AND MARK OUT LEVEL OF CONCRETE	15 mins			
PLACE PVC PIPES ON SINK BEFORE POURING THE CONCRETE	10 mins			
MIX CONCRETE (WITH SMALL GRAVEL)	40 mins			
POUR AND LEVEL THE CONCRETE	40 mins			
REMOVING OF CURRENT INSTALLATION PLUMBING	240 mins			
ROOF WORK (TANK,WATER SUPPLY CONNECTION,COUNTER...)	240 mins			
REMOVE THE FORMWORK		30 mins		
MORTAR CEMENT MIX		15 mins		
BRICKWORK (SINK PERIMETER AND CENTRAL WALL)		120 mins		
MORTAR CEMENT MIX		15 mins		
SUPPORT STRUCTURE MORTAR CEMENT PLASTERING		60 mins		
TILE ON-SITE LAYOUT AND CUTTING		180 mins		
PLACE DOOR		45 mins		
PAINTING		120 mins		
PLACEMENT OF DRINKING TAPS AND DRAIN OF HANDWASH		100 mins		
INSIDE TANK, FILTER AND WATER SUPPPLY INSTALLATION		240 mins		
CUT AND SCREW IN HADWASH PIPES		120 mins		
PAINTING		120 mins		
HANDWASH WATER EXIT INTSTALLATION		60 mins		
TILING			300 mins	
GROUT			60 mins	
SET UP OF WATER SUPPLIED PIPES (ON THE STRUCTURE)			120 mins	
TOTAL	595 mins	640 mins	360 mins	1595 mins

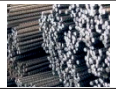
DESIGN SOLUTION
Tools and Equipment Required

	PIPES	QTY	COST/ UT	TOTAL	
				RUPIAH	EURO
	GI PIPE 1"["C" CLASS]: PRAKASH SURYA	70m 230ft	70,98	16325,4	223,65
	GI PIPE ½ ["C" CLASS]: PRAKASH SURYA	10m 33ft	35,49	1171,17	16,04
	PLUMBING ACCESORIES				
	GI ELBOW 1" [H]	50	58,8	2940	40,27
	GI ELBOW ½" [H]	10	29,4	294	4,02
	GI COUPLING 1"	30	30,46	913,8	12,51
	GI COUPLING ½"	20	15,23	304,6	4,17
	GI PLUG ½"	10	8,4	84	1,15
	GI PLUG ½"	10	4,2	42	0,57
	GI TEE 1"	25	53,68	1342	18,38
	GI TEE ½"	10	26,84	268,4	3,68
	GI CROSS 1"	15			
	GI CROSS 1/2"	10			
	GI UNION 1"	20	100,6	2012	27,56
	GI UNION ½"	15	50,3	754,5	10,34
	1" - 1/2" GALVANIZED REDUCING BUSH	25			
	1" - 1/2" GALVANIZED HEX NIPPLE	25			

	1" - 1/2" Reducing Coupling Fitting	25			
	1" BSP GALVANIZED BARREL NIPPLE	30			
	1/2" BSP GALVANIZED BARREL NIPPLE	10			
	GI TANK NIPPLE 1"	10	94,5	945	12,95
	GI TANK NIPPLE ½"	5	47,25	236	85,01
	1" WALL MOUNT PIPE CLAMP	100			
	1/2" WALL MOUNT PIPE CLAMP	25			
	APROPIATED FIXING PLUG AND LAGS	MANY			
	VALVES & ACCESORIES				
	BALL VALVE 1"	12	500	6000	82,2
	BALL VALVE ½"		250		
	FLOAT VALVE 1"	4	500	2000	27,4
	WATER METER 1"	1			
	1" BRASS FILTER FOR WATER PIPE	1			
	1" NON RETUR VALVE	1			
	TEFLON TAPE (PTFE TAPE)	5			
	HEMP FOR PLUMBING				

	TAPS				
	FORGED TAP	6			
	SELF CLOSING TAP	16			
	WASTE FITTINGS				
	WASTE PIPE 11/4" [FLEXIBLE]	3	40	120	1,64
	PVC WASTE PIPE RIDGID 1 1/4"	20			
	WASTE COUPLING 11/4"	3	230	690	9,45
	BOTTLE TRAP	3	800	2400	32,88
	11/4 WHITE SOLVENT 90° TEE	5			
	11/4 WHITE SOLVENT 67° TEE	5			
	11/4 WHITE SOLVENT 45° TEE	5			
	11/4 WHITE SOLVENT SWEPT 90 BEND	5			
	11/4 WHITE SOLVENT SWEPT 67 BEND	5			
	11/4 WHITE SOLVENT SWEPT 45 BEND	5			
	11/4 WHITE SOLVENT 90 ELBOW	5			
	11/4 WHITE SOLVENT 67 ELBOW	5			
	11/4 WHITE SOLVENT 45 ELBOW	5			
	PVC SOLVENT GLUE & CLEANER	2			

	SLOW SAND FILTER AND WATER TANKS				
	WATER TANK SINTEX 5000	1	33850	33850	463,745
	WATER TANK SINTEX 2000	1	12874	12874,3	176,37
	WATER TANK SINTEX 500	1	3219	3218,57	44,09
	CLEAN SAND 0,72 m^3 (0,5m)	50			
	CLEAN GRAVEL 0,43 m^3 (0,3m)	25			
	TOOLS				
	PIPE THREADING SET 1" AND 1/2	2			
	CHAIN VICE	2			
	HACK SAW	4			
	STILSONS	4			
	SPANNER	4			
	BOLSTER	2			
	SCREWDRIVER SET	2			

	HAMMER	4	800	3,200	43,52
	CHISEL	4	177	708	9,62
	RUBBER BRICKLAYER HOD MORTAR PAN	4	350	1,400	19,04
	RUBBER PAIL	4	160	640	8,70
	LEVEL	4	525	2,100	28,56
	PLAIN TROWEL	4	150	600	8,16
	PLAIN PLASTERING TROWEL	3	125	375	5,10
	CARPENTER'S SQUARE	2	130	260	3,54
	GAUGE ROD	6	100	600	8,16
	FLEXOMETER	4	60	240	3,26
	CARPENTER'S PENCIL	4	10	40	0,54
	NYLON BRICKLAYER LINE	8	80	640	8,70
	42,5R CEMENT	79,5 Kg	6.60	524.70	7,14
	CONCRETE SAND	5,15 ft^3	45	231.75	3,15
	BRICK 190X190X90	300	4.50	1,350	18,36
	20 X 30 TILE	220 ft^2	15	300	4,08
	DOOR SUB-FRAME	1	18	3,960	53,86
	CONCRETE MIXER RENTAL 3 DAYS	1	1,102	1,102	14,99
	STEEL BAR 4MM	6 kgr	3,000	3,000	40,80
	IRON MESH	7 m^2.	30	21	2,86

	WOOD FOR FORMWORK	5 ft³	260	1,300	17.68
	TILE CUTTER	2	1,080	2,160	29,38
	DRILL	1	5,000	5,000	68
	CROWN FOR DRILL	1	800	800	10,88
	SMALL GRAVEL	1,5 ft³	40	60	0,82
	FORMWORK CLAMP	6	500	9,000	122,40
	TILE GROUT	3 kg	50	150	2,04
	PLAIN GROUTING TROWEL	2			
	TILE ADHESIVE	75 kg	25	1,875	25,50
	SHOVEL	2	1,100	2,200	29,92
	WHEEL BARROW	2	2,800	5,600	7,16
	TROWEL	4	150	600	8,16
	HAND SAW	2	350	700	9,52
	PVC PIPE 50 MM	0,3 m	40	12	0,16
	DOOR	1	3,000	3,000	40,80
	PAINT	10 ltr	2,400	2,400	32,64
	PAINT ROLLER	4	400	1,600	21,76
	TRIANGLE SPATULA	4	125	1,000	13,60
	CERAMIC EDGE TRIM INSIDE CORNER	50 m	146	7,300	99,28