SANITATION FOR MILLIONS

WASH Repair & Maintenance Training Manual for Kampala and Apac Cluster

Development of a WASH Repair and Maintenance Training Manual for the Initial Training of Hausmeisters/Caretakers at Schools, Health Centers and Religious Centers for cluster communities Kampala and Apac Cluster

Version 2.0

APRIL, 2022

Acknowledgements

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About This Manual

The objective of this training manual is to provide a practical guide for facilitators to impart basic WASH repair and maintenance skills to their trainees. While a range of knowledge is provided in this manual, facilitators must encourage their trainees' self-initiative to acquire additional skills on areas that may not be covered in full depth in this manual.

This manual is guided by the tenets of both instructor-led learning and self-guided discovery. This ensures its usefulness and relevance. The outlined sessions point to a range of other resources, guidelines and methodologies that will equip the facilitator to effectively transfer knowledge in a practical and helpful way to their trainees.

Using This Manual

This training manual is designed to be a handbook for facilitators of trainings. It provides a framework for various modules that can be delivered to trainees. It offers a variety of participatory, learner-centered facilitation methods for each training session.

Facilitators should use the manual as a guiding document and read ahead before the lesson. The should ensure that the content delivery process is smooth and all required materials are available for optimal learning.

Some modules may be more detailed than others due to the complexity of the activity/activities. However, the facilitator can decide, how deep specific details will be provided during the training, based on the context and the needs of the trainees. A consistent session format is provided for each module: Module Number, Module Title/Name, Objectives, Materials Required, Session Topics, Facilitator Notes, and Assessment Questions.

At the end of each session, the facilitator is expected to take note of trainees' questions and session insights. In addition, the facilitator is expected to use the assessment questions to evaluate the trainees' comprehension and to be informed for the reinforcement of the learnings. A reference section is provided at the end of the training manual, which can be used to access more information and guidance on the training topic.

Table of Contents

MODULE 1: Safety, Health & Hygiene

Module No.: One

Module Name: Safety, Health & Hygiene

Objectives:

1. Definition of Safety, Health & Hygiene
2. Advantages of Good Safety, Health & Hygiene Practices
3. Disadvantages of Not Practicing Good Safety, Health & Hygiene
4. Demonstrate awareness

Total Time: 2 hours

Materials Required: First Aid Box, Basic Tools, Cleaning Equipment, and Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 1.1: Definition of Safety, Health & Hygiene

- Safety: Protection from danger, risk or injury.
- Health: A state of complete physical, mental and social well-being.
- Hygiene: Conditions or practices conducive to maintaining health and preventing disease, especially through cleanliness.

BASIC RULES FOR WORKPLACE SAFETY, HEALTH & HYGIENE

- Always report unsafe working conditions.
- Fully stocked first aid kit available for emergencies.
- Observe basic hygiene (e.g. bathing, proper hand washing and keeping a clean workstation).
- Always wear appropriate protective equipment when working.
- Take work breaks. Working when tired or hungry increases the chances of a workplace accident.
- Do not skip steps, follow the procedure.
- Stay up to date with new procedures or protocols.
- Maintain proper posture.
- Offer guidance to new employees.

SESSION 1.2: Advantages of Good Safety, Health & Hygiene Practices

- Reduces costs i.e., absenteeism from work due to illness.
- Reduces risks and accidents.
- Good practices prevent access to hazards through trying less risk options, issuing protective equipment and providing welfare facilities such as first-aid and washing facilities.
- Reduces threats e.g., lessen legal actions, customer care etc.

SESSION 1.3: Disadvantages of Not Practicing Good Safety, Health & Hygiene

- Absenteeism from work due to work related illnesses and injury
- Occupational diseases and risks
- Decrease in productivity
- Increase the risk for work injuries.

SESSION 1.4: Awareness

- Instruct all employees/caretakers about workplace safety
- Follow health and safety rules for the workplace
- Prevent work injuries by taking care whilst using tools and equipment and taking care of falling objects while working.
- Wear protective clothing and whole body protection e.g. goggles for protecting the eyes, workman's gloves to protect hands, etc.

MODULE 1: Facilitator Notes

MODULE 1: Assessment Questions

1. Why is this topic important?
2. What steps can you take in administering first aid to a work place cut?
3. What steps can you take in administering first aid to a work place broken bone?
4. How can you prevent injuries at your workplace?
5. What constitutes a safe working environment?
6. How do you protect yourself from HIV/AIDS?
7. How do you protect yourself from COVID-19?

MODULE 2: Useful Tools & Equipment

Module No.: Two

Module Name: Useful Tools & Equipment

Objectives:

1. Classification of Tools
2. Use of Different Tools
3. Care/Maintenance of Tools

Total Time: 2.5 hours

Materials Required: Basic Hand Tools, Basic Power Tools, Cleaning Equipment, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 2.1: Classification of Tools

HAND TOOLS

These are tools operated using hands rather than motor or electricity e.g., hacksaws, pipe wrenches, pliers, trowels etc.

Proper use and precision are more important than speed of work while using hand tools. Based on the type of work that needs to be done, a craftsman must choose the right kind of tools. He/She must be aware of the right tool for the job. Otherwise, the quality and efficiency of work will suffer.

Hand Tools are classified in different groups:

- Laying-out (measuring tools)
- Striking tools (hammers and sledges)
- Metal cutting tools (files, drills, reamers, etc.)
- Holding tools (pliers and clamps)
- Sharpening and grinding tools

Examples of Hand tools

Hack Saw (Specifically, for cutting through materials such as plastic, steel, and other metals)

Pipe Wrench

Pliers

Trowel

Plunger

Hammers

Screw driver (used to tighten screws, nuts and bolts)

Clamps (used to hold objects together in a tight manner to prevent separation)

Spanner (used to grip and turn objects especially during plumbing works)

Measuring Tape (for measurement)

Files and Rasps (used to create smooth edges)

Allen Keys (used to drive bolts and screws with hexagonal sockets in their heads)

ELECTRIC-POWERED TOOLS

These are tools operated with batteries and electricity. These include tools such as portable hand drills, electric threading machine, welding equipment etc.

They are categorized as follows;

- Drills
- Saws
- Sanders
- Grinders
- Oscillating and rotary tools
- Woodworking power tools (lathes, planers)
- Concrete power tools
- Compressors and accessories

Examples of Electric Powered Tools

Welding Machine

Power Drill

Side Grinder

Hack Saw

Table Saw

Miter Saw

SESSION 2.2: Uses of Different Tools

USES OF DIFFERENT TYPES OF HAND TOOLS

- Laying Out Tools: Measuring and marking tools
- Impact or Striking Tools: Marking or cutting away material (wood, stone, PVC etc.). Examples include: hammers, mallets and sledges
- Wrenches and Screwdrivers: Twisting or fastening of nails, screws, bolts, and other specialty hardware
- Wood Saws, Planes, Wood Chisels: Cutting wood
- Drills, Files, Punches, Reamers, Taps: Metal cutting
- Clamps, Pliers and Vices: Hold different components together
- Goggles, Gloves and Overalls: protective wear for safety equipment
- Grinders: Grinding, sharpening as well as finishing abrasives on surfaces
- Tool storage & accessory container: Stores tools and various tool accessories.

USES OF DIFFERENT TYPES OF ELECTRIC-POWERED TOOLS

- Drills: Making round holes or driving fasteners in woodworking, metalworking, construction, machine tool fabrication and construction.
- Saws: Cutting solid materials to prescribed lengths or shapes.
- Sanders: Smoothing, polishing, or cleaning a surface, as of wood, plastic, or metal. They are also used to roughen surfaces in preparation for finishing.
- Grinders: Grinding Surfaces, cutting material, smoothing & polishing, cleaning Surfaces, drilling and Sharpening Tools.
- Oscillating and Rotary Tools: Cutting, grinding, scraping, sanding and sawing especially in carpentry.
- Woodworking Power Tools (lathes, planers): Cutting, finishing, assembling, measuring and holding wooden parts while transforming raw materials into completed projects like making furniture.
- Concrete Power Tools: Chipping, drilling, grinding, cutting through concrete.
- Compressors and accessories: Power an array of tools by means of pressurized air for various applications.

SESSION 2.3: How to Store Tools & Equipment

- Keep Hand tools in a dry place like shelves with low humidity.
- Power tools can be stored in a toolbox with some silica gel packs inside to keep the moisture levels down to prevent rusting.

SESSION 2.4: Care & Maintenance of Tools

- Clean tools after every use.
- Ensure right storage.
- Store power tools in original cases
- Use silica gel packs that help in reducing humidity and moisture to prevent rusting.
- Sharpen bits and blades especially for power to reduce on the ware of motors.
- Lubricate the moving parts for proper care of power tools.

MODULE 2: Facilitator Notes

MODULE 2: Assessment Questions

1. What are the differences between hand tools and electric powered tools? Give 5 examples of each.
2. State the use (or purposes) of the following tools:
   - Pipe wrench
   - Hacksaw
   - Threading machine
   - Drill
   - Pliers
   - Pipe Cutter
3. Describe the best way to care for your tools.

MODULE 3: Basic Masonry

Module No.: Three

Module Name: Basic Masonry

Objectives:

1. Definition of Masonry
2. Types of Bonding
3. Calculation for bricks and costs required for construction
4. Practical Demonstration

Total Time: 2 hours

Materials Required: Basic Hand Tools, Cleaning Equipment, Safety Gear

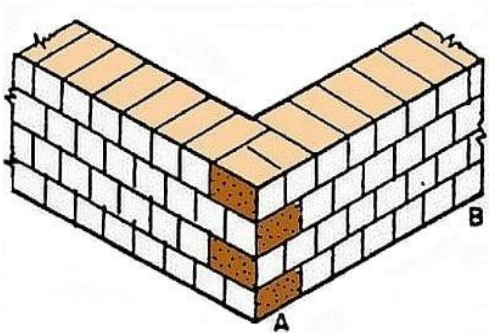
Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 3.1: Basic Classification of Bonds – 2 – No.

STRETCHER BOND AND HEADER BOND

Proper use and precision are more important than speed of work while working with masonry. Based on the type of work that needs to be done, a craftsman must identify the type of bonding and the amount of materials required. Additionally, he/she must be aware of the right tools for the job. Otherwise, the quality and efficiency of work will suffer. The following is a proposed procedure for works:

- Draw, sketch and interpret technical drawing used in Masonry
- Selection and calculation of materials required for a specific job.
- Identify tools and equipment according to the set parameter and procedures



Header Bond

Stretcher Bond

MODULE 3: Facilitator Notes

MODULE 3: Assessment Questions

1. Can you tell the difference between a stretcher and a header bond?
2. When is each type of bond most commonly used?
3. Which tools are required during construction of masonry?

MODULE 4: Basic Carpentry

Module No.: Four

Module Name: Basic Carpentry

Objectives:

1. Definition of Carpentry
2. Types of Wood Joints
3. Practical Demonstration

Total Time: 2 hours

Materials Required: Basic Hand Tools, Basic Electric Powered Tools, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 4.1: Basic Classification of Wood Joints – 3 – No.

BUTT JOINT, MITER JOINT AND HALF LAP JOINT

Proper use and precision are more important than speed of work while working with woodwork. Based on the type of work that needs to be done, a craftsman must identify the type of joints to be used and the amount of materials required. Additionally, he/she must be aware of the right tools for the job. Otherwise, the quality and efficiency of work will suffer. The following is a proposed procedure for works:

- Draw, sketch and interpret technical drawing used in woodwork
- Selection and calculation of materials required for a specific job.
- Identify tools and equipment according to the set parameter and procedures

MODULE 4: Facilitator Notes

MODULE 4: Assessment Questions

1. Can you tell the difference between the different types of wood joints?
2. When is each type of joint used?
3. Which tools are required during construction of woodwork?

MODULE 5: Basic Welding

Module No.: Five

Module Name: Basic Welding

Objectives:

1. Definition of Welding
2. Types of Welding
3. Practical Demonstration

Total Time: 2 hours

Materials Required: Basic Hand Tools, Cleaning Equipment, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 5.1: Basic Type of Welding

ARC WELDING

Proper use and precision are more important than speed of work while welding. Based on the type of work that needs to be done, a craftsman must identify right tools for the job. Otherwise, the quality and efficiency of work will suffer. The following is a proposed procedure for works:

- Determine the areas to be welded and have them cleaned up or smoothened
- Select the proper level of heat required depending on the material
- Identify tools and equipment according to the set parameter and procedures e.g. safety googles, gloves etc.

MODULE 5: Facilitator Notes

MODULE 5: Assessment Questions

1. What processes does one go through while preparing to do welding?
2. Which safety gears are important for welding?
3. Which tools are required during welding?

MODULE 6: Work Place Appliances

Module No.: Six

Module Name: Workplace Appliances

Objectives:

1. Definition of Sanitary Appliances
2. Classifications of Sanitary Appliances
3. Operation of Sanitary Appliances per Classification (Components)
4. Maintenance of Sanitary Appliances
5. Fixing Heights of Different Sanitary Appliances

Total Time: 4 hours

Materials Required: Basic Hand Tools, Basic Power Tools, Cleaning Equipment, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 6.1: Definition/Introduction of Sanitary Appliances

Sanitary Appliances are fittings used for collection and discharge of black and grey wastewater. They are divided into two main groups:

- Grey Water Appliances
- Black Water - User-Interface Appliances.

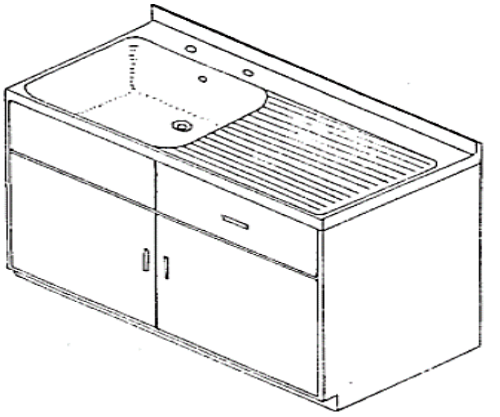
SESSION 6.2: Classifications of Sanitary Appliances

GREY WATER APPLIANCES

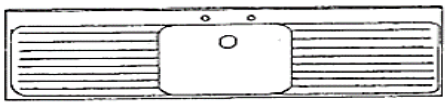
An appliance for the collection and discharge of water arising from ablutionary, culinary and other non-industrial purposes. These include:

1. Wash Basin: It is of one-piece construction having a combined overflow and preferably should have a soap holding recess or recesses that should properly drain into the bowl.

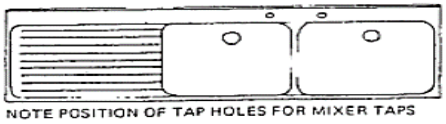
2. Sink: It is used in kitchen and laboratory for the purpose of cleaning utensils/ apparatus and also serve the purpose of providing water for general usage. The sink may be made with or without overflow arrangement.



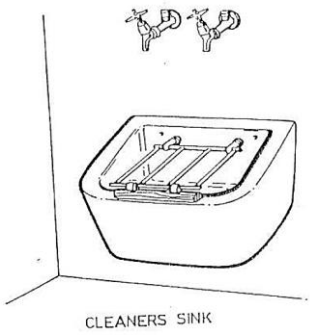
(a) Single drainer unit on cabinet.

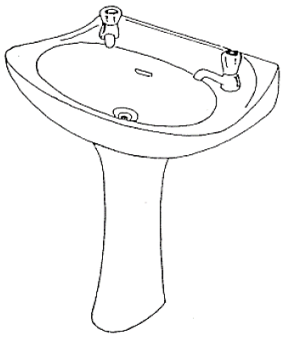


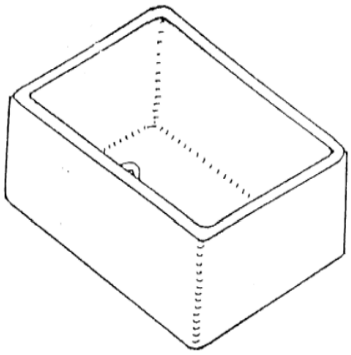
(b) Double drainer unit.



(c) Double sink single drainer unit.







3. Wash-trough: It is a linear trough for simultaneous use by number of persons.

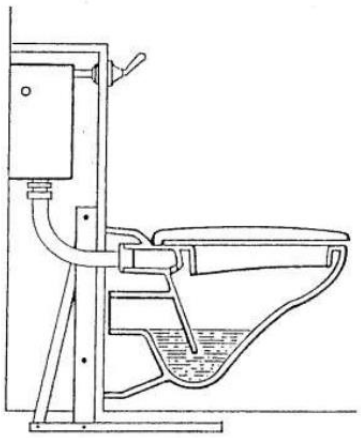
4. Bath Tub: It may be of enameled steel, cast iron, gel-coated, glass fiber reinforcement plastic or may be cast in-situ.

5. Drinking Fountain: It is a bowl fitted with a push button tap and a water bubbler or a tap with a swan neck outlet fitting. It is used for drinking water in schools, hospitals etc.

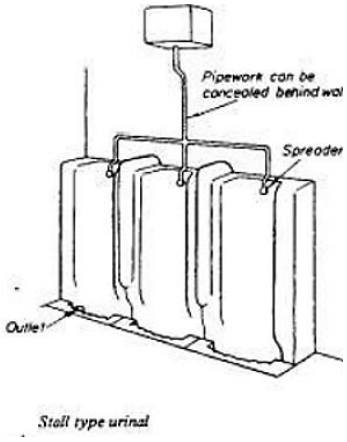
BLACK WATER/USER INTERFACE APPLIANCES

A sanitary appliance for the collection and discharge of excreted matter.

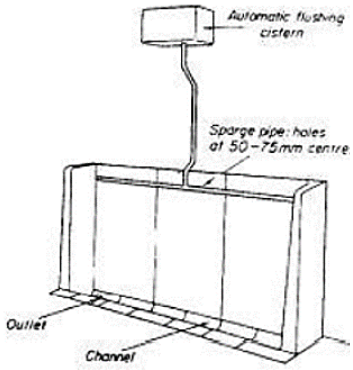
1. Water Closet/ Toilet: Bowl to receive excretory matter, trap and flushing apparatus.



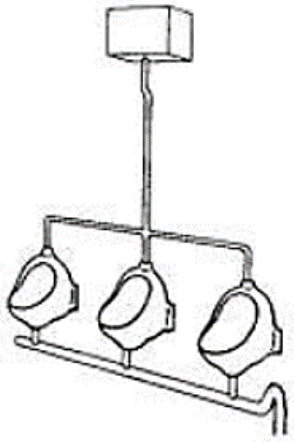
2. Urinal: For urination mostly used in men's rooms.



Stall type urinal

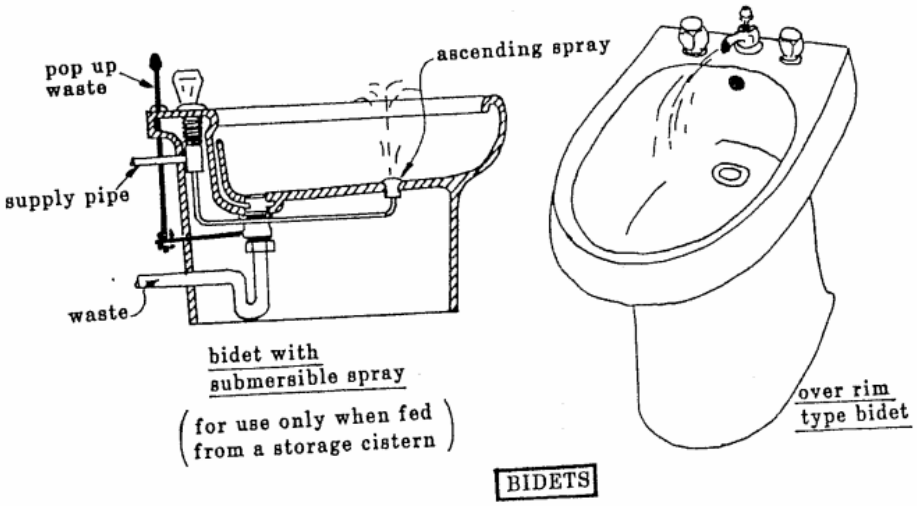


Slab type urinal



bowl type urinals

3. Bidet: An ablution appliance for cleaning excretory organs with water for personal hygiene.



4. Slop sink: Used in hospitals and is installed in the dirty utility room, sluice room for disposal of excreta, or other foul waste and for washing bed pans and urine bottles.

5. Bed Pan Sink: Part of medical equipment inventory which is used to clean manually or automatically, the hospital bed pans, urine bottles and other containers used to for collecting body fluids.

SESSION 6.3: Materials for Sanitary Appliances

The materials of sanitary appliances depend on the type of fitment and the use of the building where the appliance will be installed. In general terms the materials must be non-corroding, non-absorbent and easily cleaned. In factories and schools, materials must also be capable of withstanding rough treatment, but for domestic use this requirement can be discounted.

All sanitary appliances are made of non-absorbent, non-corroding, smooth and easily cleaned material and usually made from ceramic ware, vitreous enameled cast iron, vitreous enameled pressed steel, stainless steel or plastics (thermosetting and thermoplastic). The materials include:

- Metal: Baths, shower trays and flushing cisterns are commonly made out of cast iron, although this is being superseded to a large extent by the use of plastics. The interior surfaces of cast iron baths and shower trays are vitreous enameled to provide a smooth, hard-wearing surface that is corrosion resistant. Articles manufactured from cast iron are very heavy and brittle, and great care must be exercised when handling them.

- Ceramic: Ceramic or Pottery ware has always been a popular material for such appliances as WCs, wash hand basins, urinals, sinks and shower trays. The term ceramic means a substance made by firing clay and includes various forms of pottery such as fireclay, stoneware and vitreous China. Fitments manufactured from fireclay and stoneware would be porous, i.e. would absorb moisture, unless coated with vitreous enamel. Appliances made from fireclay and stonewash are strong and heavy and this makes them particularly useful in situations where hardwearing qualities are essential, i.e. factories and schools. Belfast sinks, urinal slabs and stalls, shower trays and WCs are all made from these two materials.

- Vitreous China: It is a special type of earthenware which, as a result of high firing temperature, is made impervious, i.e. will not absorb water. Its hard surface coating serves to aid cleaning and to improve its appearance. The strength of vitreous China allows fitments to be manufactured with a very thin section reducing their weight. Wash hand basin and WCs are the most common appliances made of vitreous China.

- Plastic: Acrylic plastic produces appliances that are very light in weight and cheap to manufacture. A gloss finish can be obtained, but this must be carefully cleaned to avoid scratching. The plastic becomes soft when heated, so the appliances must always be exposed to cold water before being subjected to hot water, or mixing taps should be used. Baths must be provided with supports, which usually consists of timbers on metal cradles. A variety of colours can be obtained.

- Glass-reinforced Polyester: These appliances are much stronger than those made from acrylic plastic, but they are more expensive. Baths and shower trays are often made from this material, and should have a good gel coat finish. Thin coats may be worn away by cleaning, which could expose the glass fibre.

- Vitreous enameled pressed steel: It is also used for the manufacture of baths and sink units. It is cheaper material but does not have the long-lasting qualities of cast iron

- Stainless Steel: This is also extensively used for a wide range of sanitary appliances including WCs, sink units, urinal stalls and wash hand basins. Its popularity derives from its properties:
    i. It has a clean, pleasant appearance.
    ii. It is non-corrosive.
    iii. It is hard wearing.
    iv. It has no vitreous enameled surface to chip.
    v. It is easily cleaned.

SESSION 6.4: Factors for Design and Construction of Sanitary Appliances

- Durable (long lasting).
- Impervious to water (it must not absorb water).
- Resistant to corrosion (to make it long lasting and to be hygienic).
- Simple in outline (so that there will be no crannies to hold dirt).
- Smooth surfaced inside and out (for ease of cleaning and to be largely self-cleansing internally as flushed in use).
- With the inside so designed that the water will drain naturally to the outlet.

SESSION 6.5: Operation of Sanitary Appliances per Classification

- For grey water appliances: e.g., wash basins, sinks etc.
- For black waster appliances: e.g., water closets, urinals etc.

SESSION 6.6: Maintenance of Sanitary Appliances

Appliances made of:

- Ceramic:
    i. Put the cleaner on the rim and leave it for fifteen minutes and let the cleaner kill all bacteria.
    ii. Using a brush, clean all the areas where germs are potentially hiding.
    iii. Once completed, rinse it thoroughly with clean water.
- Plastic:
    i. Use a non-abrasive, all-purpose cleaner.
    ii. Rinse with clean water and dry with a clean, soft cloth. Avoid using abrasive cleanser that may scratch the plastic. Use a tub/tile/sink cleaner; nonabrasive, all-purpose cleaner; or a paste of baking soda and water.

- Stainless Steel:
  i. Use the right cleaning tools: soft cloths, microfiber, sponges, or plastic scouring pads are best. Avoid using anything that might scratch the surface.
  ii. Clean with the polish lines: Stainless steel usually has a "grain" that you can see running in one direction or another. If you can see the lines, it's always best to scrub or wipe parallel to them, especially if you use something more abrasive than a cloth or wiper.
  iii. Use the right cleaning chemicals: The best cleaner for stainless steel will contain alkaline, alkaline chlorinated, or non-chloride chemicals.
  iv. All the appliances should be properly used and tightly fixed to prevent leakages and blockages e.g., flush handles, bottle traps etc.

SESSION 6.5: Fixing Heights of Different Sanitary Appliances

Factors to consider:

- Type of users e.g., children, adults and people with special needs/disability.
- Type of facility.
- Independent heights regardless of users.

FIXED HEIGHTS OF SOME APPLIANCES

1. Vanity units: The height can be too high or too low depending on the user with the top surface at about 36 inches (90cm or 0.9m) from the ground is considered standard height.

2. Shower Head: Should be high enough to create gentle flow of water without touching your head, height of 183cm (1.83m) to 198cm (1.98m) is ideal but adjustable for shorter or taller persons.

3. Tap and Water Basin: The standard height is 3 feet (90cm or 0.9m) from the ground.

MODULE 6: Facilitator Notes

MODULE 6: Assessment Questions

1. What are sanitary appliances? Give 5 examples.
2. Define water appliances. Give 4 examples and uses for each.
3. Define soil appliances. Give 4 examples and uses for each.
4. You find an overflowing toilet; it is obviously blocked. How do you resolve this problem? Describe the solution and remember to mention what tools you are using.
5. A tap is still dripping even after the water has been shut off. How do you resolve this? Describe the solution and remember to mention what tools you will be using.

MODULE 7: Handwashing Technologies (WASHaLOTs, Millions of Clean Hands & Tap Stands)

Module No.: Seven

Module Name: Handwashing Technologies: WASHaLOTs, Millions of Clean Hands & Tap Stands

Objectives:

1. Definition of WASHaLOTs and MoCHs
2. Materials/Components of WASHaLOTs and MoCHs
3. Operation of WASHaLOTs and MoCH
4. Care, Maintenance & Precautions for Use of WASHaLOTs and MoCH

Total Time: 3 hours

Materials Required: Basic Hand Tools, Basic Power Tools, Cleaning Equipment, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 7.1: Definition/Introduction of these Technologies

Handwashing with soap is the single most effective way to prevent infectious diseases. Regular handwashing, specifically after using the toilet and before eating should be part of a daily routine in everyone's life. Schools, kindergartens, day care centers, hospitals, bus-stations, canteens are public places, where handwashing should be made possible for many people at the same time. In the context of COVID-19, adjustments and recommendations for the use of the WASHaLOT 3.0 group washing facility during a pandemic have been added.

SESSION 7.2: WASHaLOT 3.0

[Source: An Innovative Hand Washing Technology in Uganda Journal by Sanitation for Millions]

MATERIALS/COMPONENTS OF TECHNOLOGIES

- 1No. Main pipe system WASHaLOT 3.0
- 3No. GI pipe stands (standard legs)
- 2No. Spare water outlets

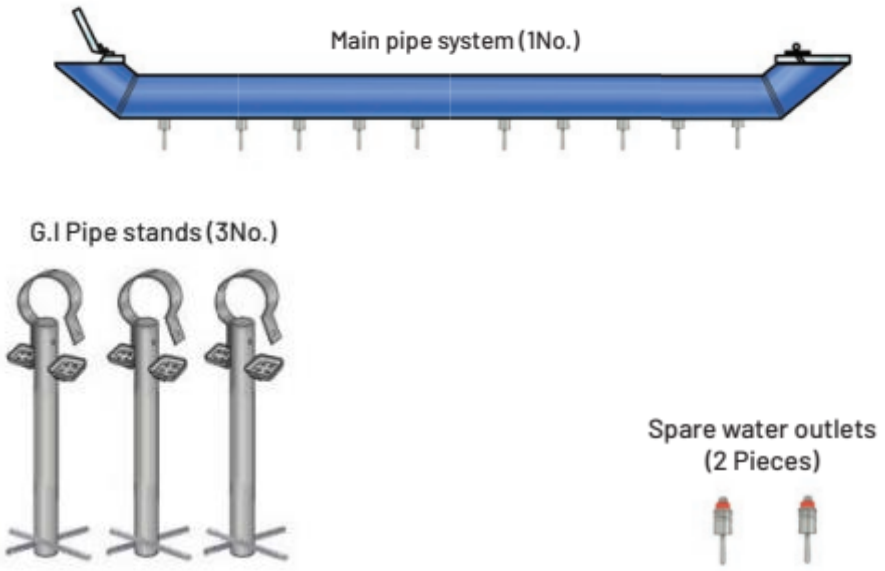


Figure 1: Package of the WASHaLOT 3.0 (illustrated by D. Egessa)

WASHaLOT 3.0 Component	Items	No. of pcs
Main pipe system	HDPE Blue pipe 110 mm, 8 mm thick.	1
	Stainless steel water outlet (with a strainer)	12*
(1 No.)	Polyethylene ½" pipe adopter (threaded male, no thread female)	1
	Polyethylene ½" plug	1
	HDPE plate 110 mm x 170 mm x 6 mm thick	2
	Rivets for the hinge	8
	Stainless screws (4.8 mm x 1/2")	6
	Stainless Hinge (50 mm x 30 mm)	2
GI pipe Stands – standard legs (3 No.)	Galvanized Iron (GI) pipe (1.2 m length, 4 mm thickness and 50 mm dia)	3
	Stainless steel clamps/pipe holders (100 mm dia, 50 mm wide and 1.2 mm thick)	3
	Bolts M12	3
	Stainless steel soap dishes (150 x 100 mm)	6
	Mild steel flat plates (150 mm length, 20 mm width and 4 mm thickness)	6
	Mild steel flat plates (350 mm length, 20 mm width and 4 mm thickness)	6
	T12 steel bars (anchors) – 12 mm diameter and 20 cm length.	6

** 10 pcs used on the WASHaLOT main pipe and 2 for spare pieces*

Figure 2: The details for the preassembled items for the WASHaLOTs

KEY FEATURES

- WASHaLOT 3.0 facility can accommodate many people (over 10) to wash hands at the same time.
- The water outlets are designed to release water only when manually touched and thereby reduce water consumption.
- A filled pipe of 3.0 m length carries 25 liters of water and can accommodate about 150 handwashing events.
- It is designed to be prefabricated locally, thus promoting local supply chains, creating incomes, ensuring quality and reducing the burden on user communities to build their own facilities.
- It can be connected to an existing piped water supply or can be refilled manually.
- WASHaLOT 3.0 pipe assembly is horizontally fixed onto galvanized iron stands installed at varying heights to accommodate people of different age groups.
- For ease of maintenance and or flexibility to ensure safety in times of no use, the water WASHaLOT main pipe is held in position by openable galvanized iron clamps.
- WASHaLOT 3.0 is easy to operate and maintain/clean due to wide openings of water inlet at both ends.

FACILITY COSTS

Item	Unit	Quantity	Amount (UGX)
WASHaLOT Main pipe and accessories	Pcs	1	660,000
GI pipe Stands	Pcs	3	415,000
Material and Labour for Installation, Drainage platform and soak pit	LS	1	568,000
GRAND TOTAL			**1,643,000**

Figure 3: Facility Cost

Note:

- The costs are based on material costs in the market as of 3rd May 2020
- Estimate is based on direct materials and labour costs within Kampala, hence can vary depending on procurement method used and number of units under consideration.
- Installation costs may increase due to factors such as transport cost, material sourcing variances, and distance to water supply connection, among others

VULNERABLE SYSTEM COMPONENTS

- Nozzles.
- Pipe inlet cover.

OPERATION OF WASHALOTS

- WASHaLOT pipe is regularly refilled with water.
- The 3.0m long pipe has capacity of 25 liters and can accommodate 150 handwashing events.
- Refilling can be done manually with a container, connection to water supply or extension of water from a source using a horse pipe.
- Soap is placed at holders and should be restocked all times.

Figure 4: A WASHaLOT Illustrated by Dervin Egessa

CARE, MAINTENANCE & PRECAUTIONS FOR USE OF WASHALOTS

Proper and regular maintenance of the WASHaLOT 3.0 is needed to ensure its functionality and maximize its service life. Flush out remaining water prior to the weekend to avoid stagnant water which usually causes algal accumulation. Regular cleaning at least once every month is recommended. Schedule the cleaning of the WASHaLOT 3.0 in your school before weekends or long breaks.

1.

- Unbolt the stainless-steel holders and remove the main WASHaLOT pipe from the stands
- Open the inlet cover at both ends of the main pipe
- Empty the water in the pipe to about less than a quarter

2. 

- Tie a piece of sponge or a brush on a flexible rod (or 20mm pipe) into the pipe which is at least 3 m long

3. 

- Insert a brush or sponge in to the main pipe from either inlet

4. 

- Scrub the dirt interior surfaces of the main pipe from both ends

5. 

- Empty the dirty water and rinse the pipe with clean water until it is clean

6. 

Fix the cleaned pipe onto the stands and fasten the holders with bolts. Then clean the exterior pipe surfaces and the stands using a kitchen sponge scrubber

REPLACEMENT OF BROKEN SYSTEM COMPONENTS

Challenge	Explanation	Repairs/ Potential Solution
Water leakage from water outlets *(not between outlet and pipe).*	Dirt and silts might have entered into the water outlet and clogged it. Small dirts can affect the leak-free mechanism and cause the water to drip.	Push the lever five (5) times upwards then at the fifth time, move the lever in a circular motion also five (5) times to drain the clog.
Stones, dirt, rubbish in WASHaLOT pipe thrown in through the water inlets.	Covers are easy to open, giving opportunity to users to throw in unwanted solids.	- Continued sensitization of users. - Use of locks should be considered.
Loss, vandalizing or damaging of the water outlets	Users can easily reach the outlets at both ends of the pipe through the open water inlet covers	- Always advise student not to play with the WASHaLOT - Remove the damaged outlet and replace it with a spare one Mind the teflon tape! - The dismantled ones can be reassembled.
Leakage from piped water supply	Increased pressure in the pipes causing leakages or bursts.	- Contact any locally available plumber to fix it.

SESSION 7.3: Millions of Clean Hands (MoCHs)

MATERIALS/COMPONENTS OF TECHNOLOGIES

- 1No. Reservoir on a stand
- 3No. faucets and sinks with soap dispensers
- A shed to ensure use in any weather

KEY FEATURES

- MoCH facility can accommodate three people (3No.) to wash hands at the same time.
- The water outlets are designed to release water only when manually turned on.
- It can be connected to an existing piped water supply or can be refilled manually.

VULNERABLE SYSTEM COMPONENTS

- Taps.
- Pipework.
- Soap dispensers.

MODULE 7: Facilitator Notes

MODULE 7: Assessment Questions

1. What is a WASHaLOT and what is MoCH facility?
2. Describe how to construct a WASHaLOT. Mention the tools and materials required.
3. How do you clean a WSHaLOT/MoCH. Mention the tools and materials required.
4. What are the vulnerable parts/components of a WASHaLOT and a MoCH?
5. One of the nozzles on the WASHaLOT is damaged/broken. How do you replace/repair it?
6. One of the taps on the MoCH is damaged/broken. How do you replace/repair it?

MODULE 8: Rainwater Harvesting Systems

Module No.: Eight

Module Name: Rainwater Harvesting Systems

Objectives:

1. Definition of Rain Water Harvest System
2. Components of Rain Water Harvest System
3. Operation of Rain Water Harvest System
4. Care or Maintenance of Rain Water Harvest System
5. Advantages of Rain Water Harvest System

Total Time: 1.5 hour

Materials Required: Basic Hand Tools, Basic Power Tools, Cleaning Equipment, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 8.1: Definition of Rain Water Harvest System

Figure 5: Rainwater Storage Vessels

Rain water harvesting is the collection, storage and use of rainwater. It refers to the act of collecting rain water together from catchment surfaces such as iron sheets (hard roofs), grass thatched roofs, polythene papers/ tarpaulins, trees, rocks and artificial paved surface.

Common storage facilities for rain water include: drums, jerrycans, pots, saucepans, basins, tanks, ground surface/ditches, troughs, and ponds.

[Source: Handbook on Rainwater Harvesting Storage Options]

USES OF RAIN WATER

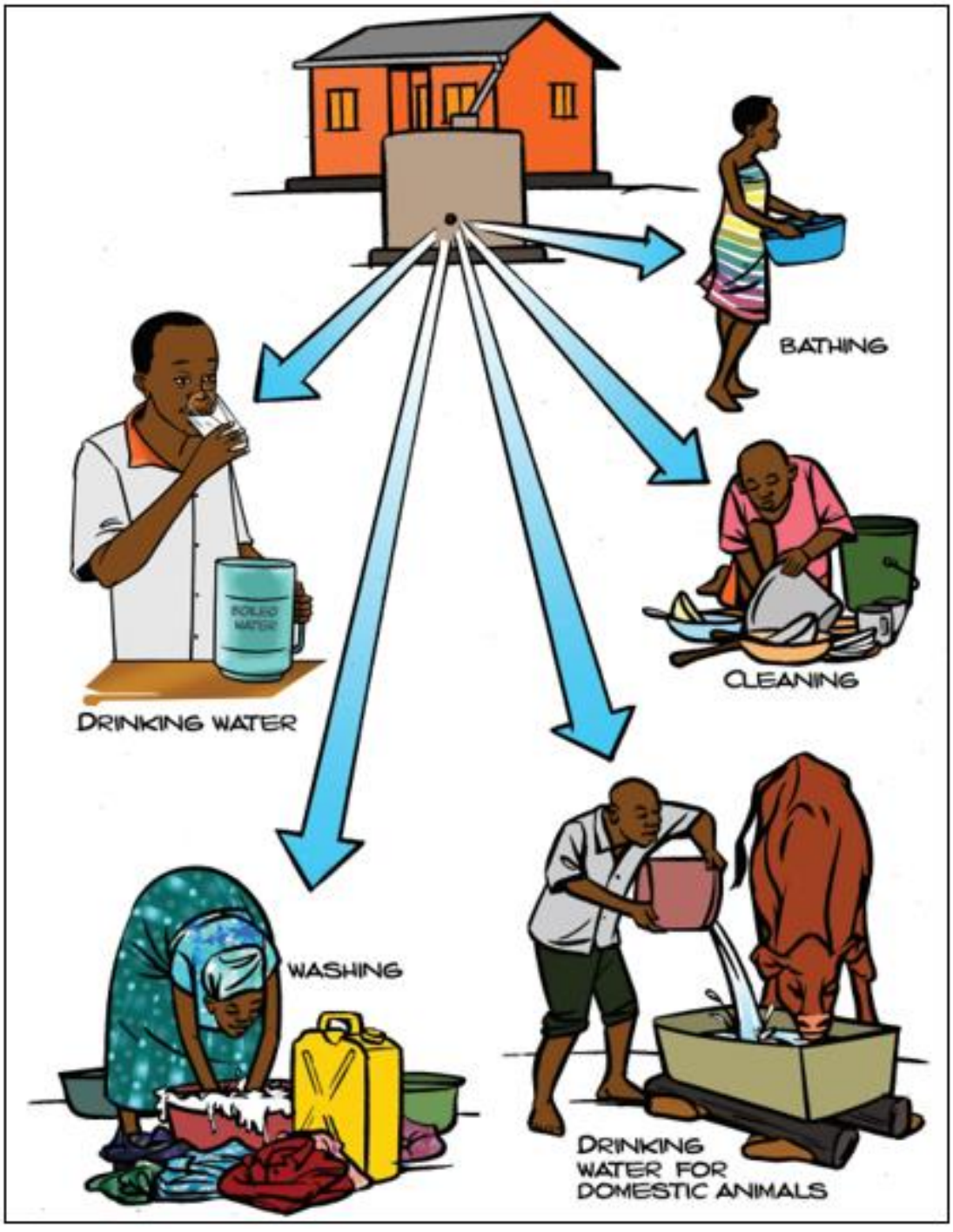


Figure 6: Uses of Rain water

[Source: Handbook on Rainwater Harvesting Storage Options]

SESSION 8.2: Components of Rain Water Harvest System

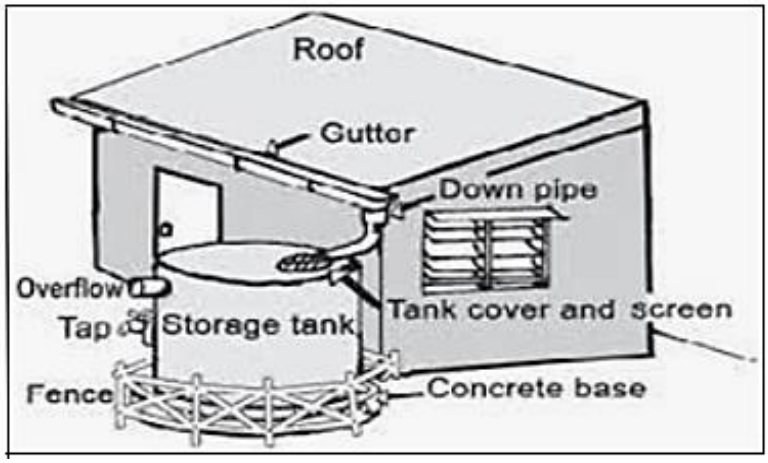
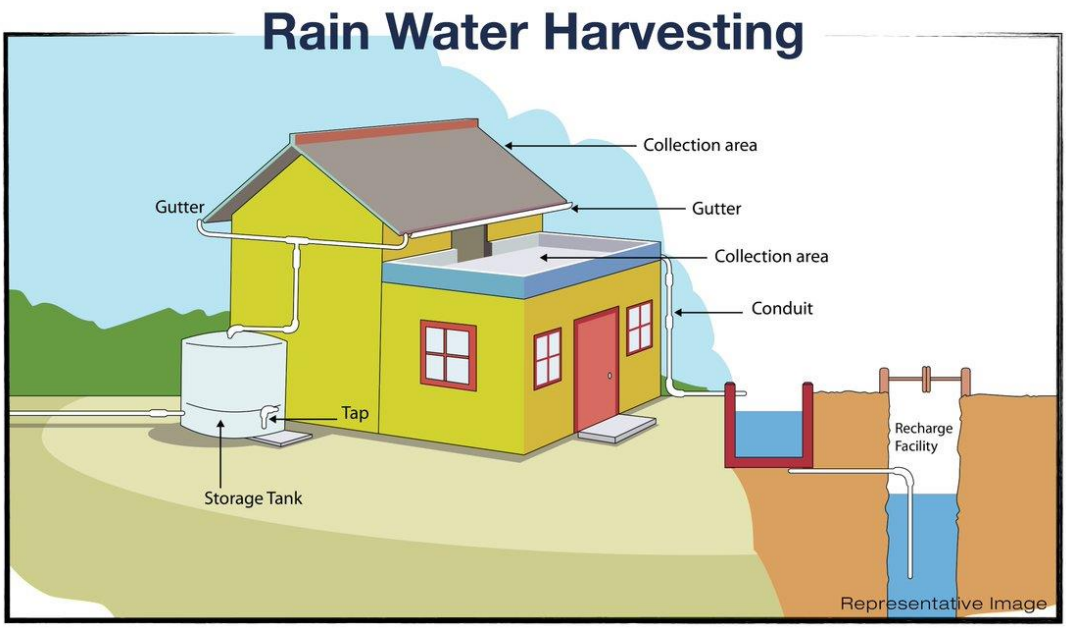


Figure 7: Common Rain Water System (above and below)



TYPICAL COMPONENTS

- Collection Area: Roof surfaces provide an opportunity for rain water capture.
- Conveyance System: Used to transfer water to the storage system. It is comprised of gutters or flat roof drainage holes and downspouts and pipping.
- Water Storage: May be above or below ground and can be comprised of a single container or multiple containers.
- Filtration: To keep debris out of the system.

- Delivery system: Piping system that convey the stored rain water till the point of end-use.

COMMON MISTAKES MADE IN CONNECTING THE SYSTEM COMPONENTS

- The storage vessel under sized for the amount of water collected at the roof.
- The storage vessel not having an over flow.

WARNING SIGNS OF FAILING COMPONENTS

- Sagging gutters and downpipes.
- Leaking Taps
- Broken or cracked tanks
- The tank does not fill up even in heavy storms
- Dirty water being drawn from the tank.

CAUSES OF RAINWATER HARVESTING SYSTEM FAILURE

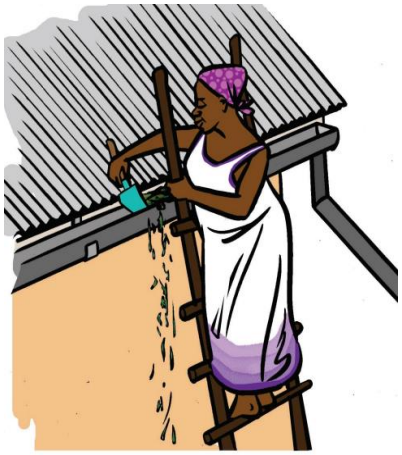
- Limited roof cover.
- Changes in rainfall patterns.
- Clogging of gutters.
- Accumulated dust in the storage tank.

SESSION 8.3: Operation of Rain Water Harvest System

- Type of taps suitable for RWH tanks
- How to identify problems with the RWH system

SESSION 8.4: Care or Maintenance of Rain Water Harvest System

- Regular cleaning of components of the Rain Water Systems e.g., tanks, roofs etc.
- Replacement of broken system components.
- Local ways of fixing breaking components.
- Technical ways of fixing broken systems.
- Tree branches hanging over the roof should be trimmed to reduce dry leaves, birds' droppings falling onto the roof.
- Cleaning the tank from inside at least twice a year or every start of the rainy season.



Gutter Cleaning

Cleaning Storage Jar

Figure 8: Care of the Rain Water System

[Source: Handbook on Rainwater Harvesting Storage Options]

SESSION 8.5: Advantages of Rain Water Harvest System

- Good substitute during dry season.
- Reduces on water bills.
- This technology is relatively simple, easy to install and operate.
- Promotes water and energy conservation.
- Saves time from collection of water from other conventional sources (springs, boreholes, shallow wells). This is a key benefit for women and children especially the girl-child who bear the burden of collecting water for the family.

MODULE 8: Facilitator Notes

MODULE 8: Assessment Questions

1. What is a Rain Water Harvesting System?
2. Name the parts/components of a Rain Water Harvesting System and state the function of each part.
3. How does a Rain Water Harvesting System work?
4. What maintenance is carried out to ensure a well-functioning Rain Water System?
5. What are the advantages of having a Rain Water System?

MODULE 9: Water Borne/Emptiable Latrines

Module No.: Nine

Module Name: Water Borne/Emptiable Latrines

Objectives:

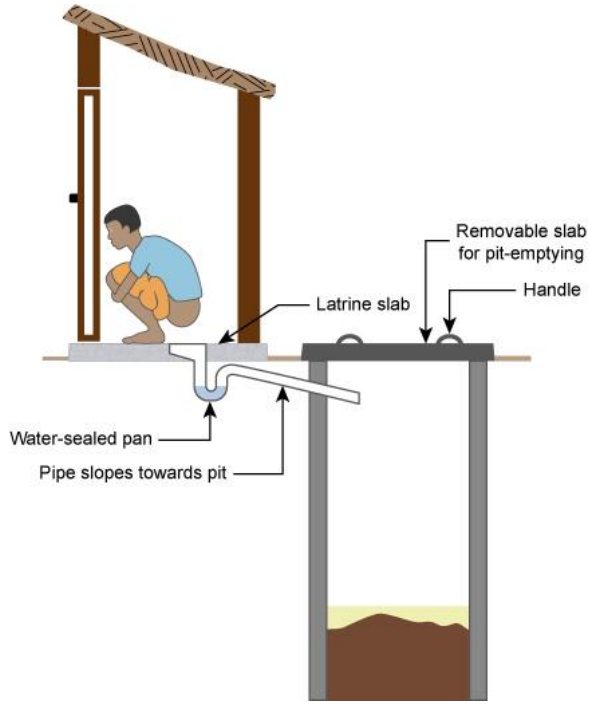
1. Definition of Water borne / Emptiable latrines
2. Components of a Water Borne System
3. Operation of the System
4. Care or Maintenance of the System

Total Time: 2 hours

Materials Required: Basic Hand Tools, Cleaning Equipment, Safety Gear

Methodology of Session: Instruction, Demonstration, Power Point Presentation, Question & Answer Session.

SESSION 9.1: Definition of Water borne/Emptiable Latrine



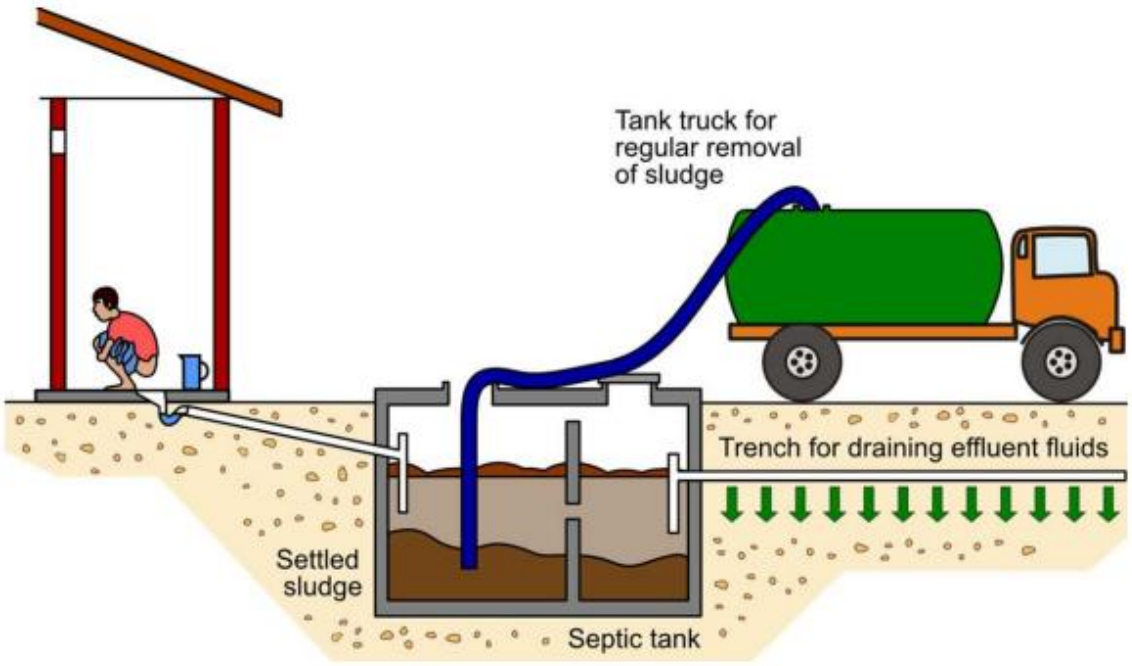
Water-flushed toilets, also known as water-borne toilets, **can be connected to a pit, septic tank or sewer.**

A septic tank is an underground, watertight tank in which sewage is collected.

Faecal solids accumulate in the tank and partially treated liquid is discharged into the ground.

The waste is channeled to a soak pit.

SESSION 9.2: Components of an Emptiable Latrine



TYPICAL COMPONENTS

- The toilet structure
- Drain pipes
- Septic tank.

COMMON MISTAKES MADE IN THE SYSTEM COMPONENTS

- The septic tank is sometimes under sized.
- If the ground conditions are not suitable, it can flood and overflow.

WARNING SIGNS OF FAILING COMPONENTS

- Leaking drain pipes
- Broken or cracked septic tanks
- Flooding around the septic tank.

CAUSES OF SYSTEM FAILURE

- Undersized facilities.
- Clogging of drain pipes.

MODULE 9: Facilitator Notes

MODULE 9: Assessment Questions

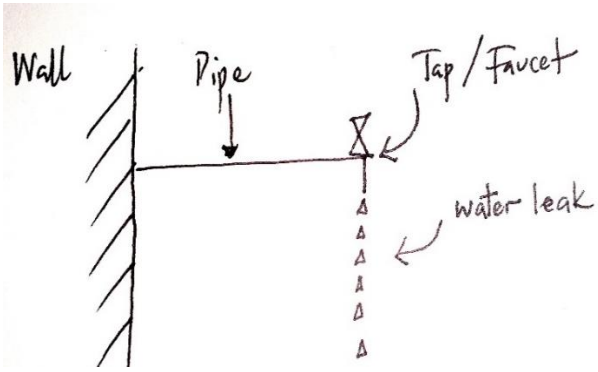
1. What precautions have to be taken while emptying a latrine?
2. What tools and equipment are required for emptying a latrine?

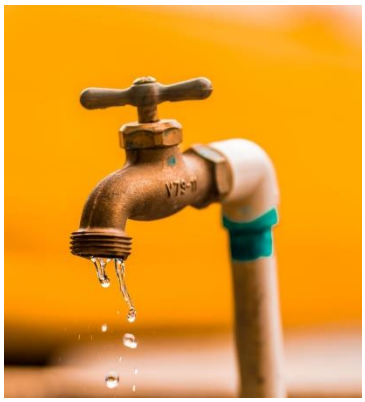
MODULE 10: Most Common Faults

Repairing Malfunctioning Infrastructure

A. LEAKY TAP

A leaky tap of faucet is a situation where the tap or faucet fittings have become worn with time or have been over-tightened causing the rotating knob to move beyond its guided grooves. This causes slippage and improper closing of knobs, leading to water leaks.





Causes: Worn out Seating or worn-out rubber washer

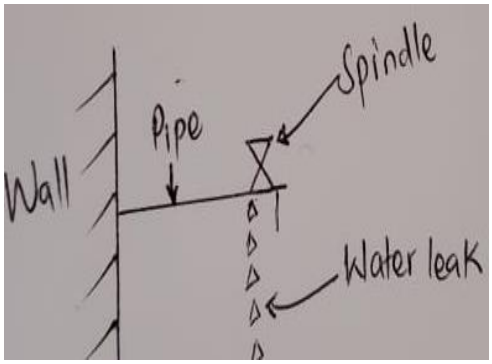
Tools & Materials Required: Wrench, New Tap/Faucet, Plumber's Tape.

Solution/Method of Repair and/or Replacement:

i. Shut off the water from the main.
ii. For the outdoor tap, Use the wrench to slowly twist open the nut under the faucet knob by turning anti-clockwise.
iii. Remove spindle.
iv. Check and clean seatings and thread guides. Ensuring that the spindle threads are still intact. You might need to grease the threads on the valve stem to make sure the tap turns on and off easier.
v. Replace rubber washer.
vi. Mount tap or faucet onto the pipe and installing the stem and turning clockwise. Tightening the nut.
vii. Secure the tap threads with plumber's tape.
viii. Turn on the water from the main.
ix. Open and close the tap to ensure that there are no leakages. You may have to let the water run for a few minutes to clean out any debris that may have gotten in while replacing the tap.

B. SPINDLE LEAKAGE

A leaky spindle is a situation where the tap fittings have become worn with time.



Causes: Worn out threads of a spindle

Tools & Materials Required: Wrench, New Tap/Faucet, Plumber's Tape.

Solution/Method of Repair and/or Replacement:

i. Shut off the water from the main.
ii. For the outdoor tap, Use the wrench to slowly twist open the nut under the faucet knob by turning anti-clockwise.
iii. Remove spindle
iv. Secure the tap threads with plumber's tape.
v. Turn on the water from the main
vi. Open and close the tap to ensure that there are no leakages. You may have to let the water run for a few minutes to clean out any debris that may have gotten in while replacing the tap.

C. LEAKAGE AT TAP JOINT

A leaky tap joint is a situation where the tap fittings have become worn with time or have been over-tightened causing the rotating knob to move beyond its guided grooves. This causes slippage and improper closing of knobs, leading to water leaks.

Causes: Worn out thread joints

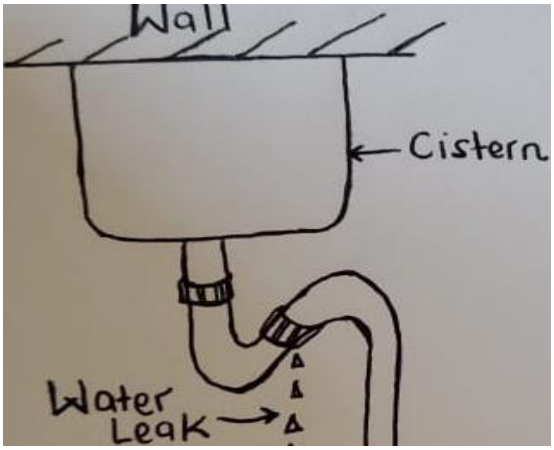
Tools & Materials Required: Wrench, New Tap/Faucet, Plumber's Tape.

Solution/Method of Repair and/or Replacement:

i. Shut off the water from the main.
ii. For the outdoor tap, Use the wrench to slowly twist open the nut under the faucet knob by turning anti-clockwise.
iii. Remove spindle
iv. Turn on the water from the main
v. Open and close the tap to ensure that there are no leakages. You may have to let the water run for a few minutes to clean out any debris that may have gotten in while replacing the tap.

D. LEAKING PLASTIC CISTRENS AND TANKS

For Flushing cisterns: Leakage at flush pipe connecting to the siphon. The joint between the flush pipe and siphon is caused by poor alignment of pipes looseness of at the joint.



Tools & Materials Required: Thread tape, Rubber washers.

Solution/Method of Repair and/or Replacement:

- Shut off the water from the main
- Empty the cistern
- Open the joint
- Align siphon connecting with the flush pipe
- Use thread tape and rubber washers to fasten the joint
- Tighten the siphon and the flush pipe well
- Turn on water supply
- Check/observe for any leakage

E. BROKEN FLUSH HANDLES

Tools & Materials Required: Wrench, Replacement handle.

Solution/Method of Repair and/or Replacement:

- Shut off the water from the main.
- Open the cistern cover to access the nut holding the handle.
- Unhook the lift chain that lifts the flush valve when you push the handle, making a note of which hole the chain is attached to so as to put it back in the same place after replacing the handle.
- Remove the handle by using a crescent wrench to turn the nut that holds the handle in place.
- Install the new handle.
- Reattach the chain on to the same hole as it was on with the previous handle, and test the toilet flush mechanism a few times.

F. BROKEN FLEXIBLE PIPES

Flexible tubes, leakage along joints or failure to deliver water to draw off points.

Caused by: failure of joints and installation of many bends

Tools & Materials Required: Thread taper, new pipe, Rubber ring.

Solution/Method of Repair and/or Replacement:

i. Shut off the water from the main using angle valve.
ii. Using pipe wrench, open and remove the flexible tubes
iii. In case of bursts, replace the flexible tube
iv. In case of joint leakage, use thread tape and rubber ring to tighten the joint.
v. Turn on the water from the main and observe for any leakages

G. BLOCKED SINKSAND TOILETS

SINK OR WASH HAND BASIN

Tools & Materials Required: Hand force pump, Flexible wire.

Solution/Method of Repair and/or Replacement:

i. Reduce dirty water level by scooping it out with a bowl of the sink or wash hand basin
ii. Using a hand force pump, Pump air into the basin – this way you will be pushing out all the blocked dirt.
iii. In case it does not clear, use hot water; pour it into the basin to melt the fats that could be clogging the system.
iv. If it persists, unblock through the access using a flexible wire to further unblock the system
v. Additionally, open the bottle trap, empty it and clean it up using a piece of cloth with soap and water
vi. Open tap to ensure that there are no more blockages. You may have to let the water run for a few minutes to clean out any debris that may have gotten in while unblocking.

TOILET

Tools & Materials Required: Hand force pump or Plunger, Rodding sticks.

Solution/Method of Repair and/or Replacement:

i. Using a hand force pump, Pump air into the toilet bowl – this way you will be pushing out all the blocked materials

ii. Go to the first manhole of the blocked toilet, open it and using a few flexible rodding sticks try to unblock whilst pointing the rods in the direction of the blocked toilet
iii. Repeat this in the manholes next to the first one to clear the blockage completely
iv. Test out the toilet by flushing it out.

H. FIXING A DOOR LOCK

Tools & Materials Required: Screw Driver, New door lock/knob.

Solution/Method of Repair and/or Replacement:

i. Remove the door handle
ii. Remove the spoiled lock from the door using a screw driver
iii. Unscrew the cover
iv. Replace the cover hand
v. Reinstall the mortise lock and door handle