VILLAGE WATER SUPPLY

CARETAKERS MANUAL

INADES

INADES-Formation
P.O. Box 252 Bamenda

helvetas Cameroon

P.O. Box 114 – Bamenda

C.A.R.D

P.O. Box 688 Bamenda

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Maintenance of a Village Water Supply Scheme (VWSS) 10

MODULE ONE

THE CARETAKER

Global Objective: Caretakers know who they are.

Specific objectives:

- Describe the functions and qualities of a caretaker
- Establish the relationship between the caretaker, the WMC and the community.

LESSON ONE

THE JOB OF A CARETAKER

1.1 Introduction

A Caretaker (CT) is somebody who pays close attention to something or somebody. A CT is also somebody who looks after something. This something can be a house, a bridge, a school etc. In this manual we will be talking about a caretaker as a person who looks after a village water supply Scheme (VWSS)

A caretaker can be compared to a babysitter. Just as a babysitter takes care of a baby in a home, a caretaker takes care of the water supply scheme in a village. A VWSS is the baby of a caretaker, which needs close attention to function everyday. A caretaker can be a woman or a man and is recruited by the Water Management Committee (WMC).

1.2 Job of a caretaker

The job of a CT is at two levels:

A) Role in relation to technical work

- Regularly inspects the water supply network to identify areas that need maintenance/repairs.
- Identifies and carries out repairs which he is able to do.
- Identifies and handles the stock of spare parts needed for the smooth running of the scheme.
- Keeps a record of all repairs
- Keeps the tool box with all the tools
- Keeps a list of all tap points and their managers.
- Supervises activities in the catchment area on behalf of the WMC.
- Monitors the VWSS together with the WMC.

B) Responsibilities to water management committee (WMC)

The caretaker works for the community and is under the supervision of the WMC. He is thus expected to do the following:

- Takes instructions from the WMC.
- Participates in WMC meetings.
- Reports to WMC on his/her activities.
- Informs WMC when the community is required to participate in maintenance activities like cleaning of tanks or clearing of catchment

areas. This information should be given in time to permit the WMC to mobilize the community.
- Reports to the WMC of lost, stolen, damaged or worn out tools. It is left to the WMC to decide to replace the tool.
- Submits to a check of stock by the WMC at any time.

1.3 Relationship between CT and WMC, CT and Community

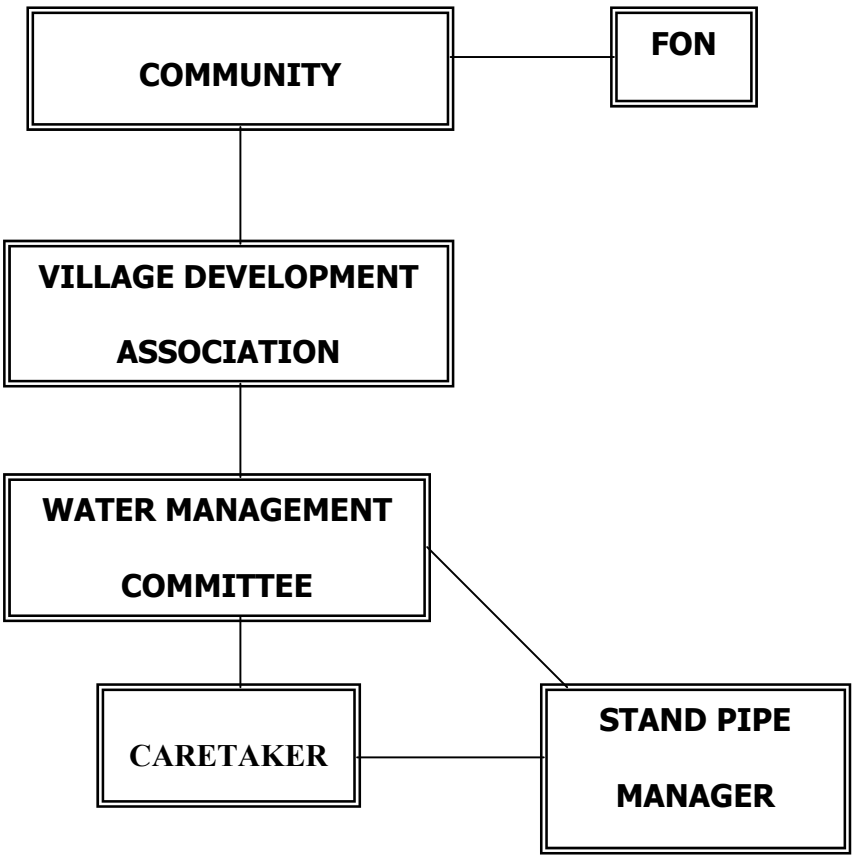
a) Caretaker and WMC

- A CT is employed by the community.
- A CT is paid by the WMC with money from the community, e.g. collected by the Village Development Association or the WMC directly.
- The WMC supervises the work of the CT.
- The WMC supplies the CT with working tools and materials.
- The CT makes a private connection only with a written instruction of the WMC (he also files the instructions).

b) Caretaker and community

- The CT guides the community during community work
- The community informs the caretaker of problems e.g. leakages noticed in the network

Organisation and management of a village water supply scheme



N.B.:

- The Fon instructs the community to fully participate financially and physically in the running of the water scheme
- Not all communities have a village development association. In this case, the community works directly with the WMC
- The standpipe manager is under the WMC not under the CT. The CT however advises the standpipe manager on how clean the standpipe.

1.4 Qualities of a Good caretaker

To be able to properly take care of a village water supply, the care taker must have these qualities:

1) Have technical knowledge in repairs/maintenance of water supply structures and fittings.
2) Know how to read and write
3) Be hardworking and smart
4) Be healthy and strong
5) Live in the village and be available
6) Be a good communicator
7) Know the importance of clean drinking water
8) Not too money minded
9) Be trustworthy.
10) Know how to plan and coordinate work.

1.5 The importance of a Caretaker

He is important for various reasons.

1) If water is life, then a caretaker contributes in enhancing life. He works hard to ensure a continuous flow of clean drinking water.
2) Without a caretaker, repairs become costly and will not be carried out quickly since a technician must come from outside the village.
3) Without a caretaker there will be nobody to technically guide and coordinate community work on the VWSS.

1.6 Summary

From this lesson it is clear that the success of a VWSS will depend much on a caretaker. His/her importance cannot be underestimated. It is the caretaker who does or reports so that all maintenance or repairs can be done on a VWSS. He/she is however under the direct supervision of the WMC.

1.7 Self check test

1) Tick the right answer(s)

   a) A caretaker takes instructions from WMC
   b) WMC reports to the caretaker
   c) Caretaker keeps records of his activities

2) A caretaker participates in WMC meetings in the capacity as an adviser _____(yes/no)

3) A caretaker can carry out private connections without the knowledge of the WMC if it is for an important man_____(yes/no)

4) Tick the right answer(s)

   a) A good caretaker should be money minded
   b) A good caretaker should not be a good communicator
   c) A good caretaker should know the importance of clean drinking water.

LESSON TWO

CONFLICT MANAGEMENT

2.1 Introduction

Conflict is part of daily life. Conflicts come from the fact that no two human beings are the same. Humans are different in the way they think and react to situations. Conflicts have positive and negative consequences or outcomes. The extent to which a conflict will have positive or negative outcomes depends on how it is handled or managed. If managed poorly, the conflict can have very destructive consequences but if handled well, the outcome will be positive leading to growth in relationships.

2.2 What is a conflict?

It is a disagreement, misunderstanding or quarrel between people. In a VWSS, there can be conflicts between the caretaker and the WMC or between the caretaker and the community.

2.3 What is conflict management?

It is the various ways/methods used in handling or resolving a disagreement or misunderstanding between people. Even though conflict is part of human life, efforts should be made to prevent conflict.

2.4 Possible areas of conflict between caretakers and WMC

1) Money

- WMC has not paid caretaker
- WMC has not bought materials needed by caretaker for repairs

2) Tools, materials, spare parts

- Caretaker cannot account to WMC concerning missing tools, materials or spare parts or shortage in materials
- Tools have not been returned after community work and the persons keeping them are not known.

3) Work

- WMC brings in external technician without knowledge of caretaker
- WMC accuses caretaker of laziness and incompetence
- WMC arranges community work without knowledge of caretaker
- Caretaker arranges community work without knowledge of WMC

- Caretaker reports to community without passing though WMC
- Caretaker does not inform WMC in time about community work.
- Caretaker carries out private connection without permission from the WMC

4) During meetings

- Caretaker is rude to WMC or vice-versa
- Caretaker is too technical to be understood by WMC
- Caretaker always comes late to meetings.

2.5 Reducing conflict between caretaker and WMC

1) Money

- WMC should make efforts to raise money to pay the CT regularly.
- Caretaker should exercise patience and understanding with difficulties faced by WMC in mobilizing resources.
- CT should work very hard in order to encourage the community to contribute.
- There should be transparent management of resources.

2) Tools, materials, spare parts

- Caretaker should keep good and up to date records of all tools, materials, spare parts, and all his/her activities.

3) Works

- Caretaker should obey instructions of WMC
- WMC should send caretaker to training workshops to improve on his skills
- Caretaker should be hardworking and committed to his work
- Caretaker should inform the WMC on work carried out.
- Caretaker should receive an authorisation from the WMC to make private connections.

4) Meeting

- There should be respect for each other
- Respect each others opinion and be tolerant
- Speak in simple and clear language
- Respect meeting time
- Apologize when you know you are wrong. The words "I am sorry" resolves many conflicts.

2.6 Managing (resolving) conflicts

In the situation where a conflict between the caretaker and the WMC cannot be solved by both parties the matter should be reported to the Council. The Council will call a meeting and look for ways to solve the problem.

2.7 Summary

People who love peace, unity and progress always try to reduce conflict situations or look for solutions when conflicts arise. The caretaker and the WMC are agents of development in the community. Development is however difficult when people live in permanent conflict.

2.8 Self check test

1) Conflicts have positive and negative results _____(yes/no)
2) When conflicts between caretaker and WMC are solved peacefully, it is good for the proper functioning of the VWSS_____(yes/no)
3) Name 3 conflicts which have occurred between you and the WMC or you and the community

a)_____

b)_____

c) _____

4) Explain how one of the conflicts was solved or managed.

_____

_____

_____

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_____

MODULE TWO

MAINTENANCE OF A VILLAGE WATER SUPPLY SCHEME

Global Objective

Caretakers acquire knowledge and skills necessary for the maintenance of village water supply schemes (VWSS)

Specific Objectives

- Caretakers know and understand the functioning of VWSS
- Caretakers know how to operate and maintain VWSS
- Caretakers know how to use tools and materials to operate and maintain VWSS

LESSON ONE

WATER SUPPLY STRUCTURES

1.1 Introduction

A VWSS has various structures. These structures can also be called the parts of a VWSS. These various parts are necessary and important for the proper functioning of the system. It is necessary for a caretaker to be able to recognize and know the functions/importance of these structures when he/she sees them.
It is also important to know that a VWSS usually has one of the following types of sources:

1) Spring source
2) Stream source

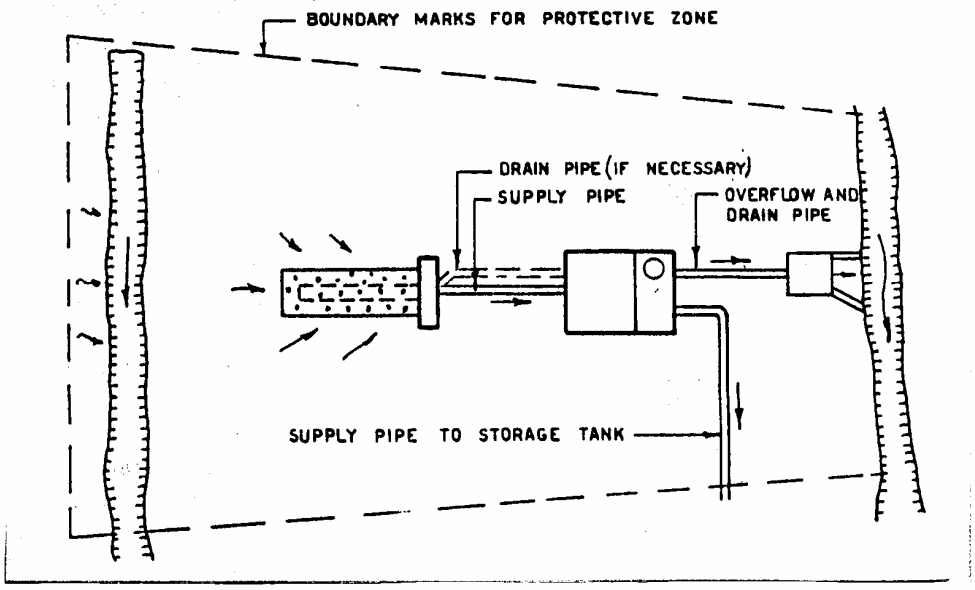
In any case, one village may have the two types.
The intake structure for a spring is different from that of a stream. We will therefore name and describe the parts of a VWSS.

1.2. Spring intake

This is the structure constructed to collect water coming out of the ground.

The intake is made up of:

- A channel or channels which collect water behind the dam and drains it into the spring inspection chamber
- A dam that guides water into the supply pipe.
- Collection chamber – chamber collects water from two or more spring intakes and feeds it into one pipeline for transportation into the storage tank.



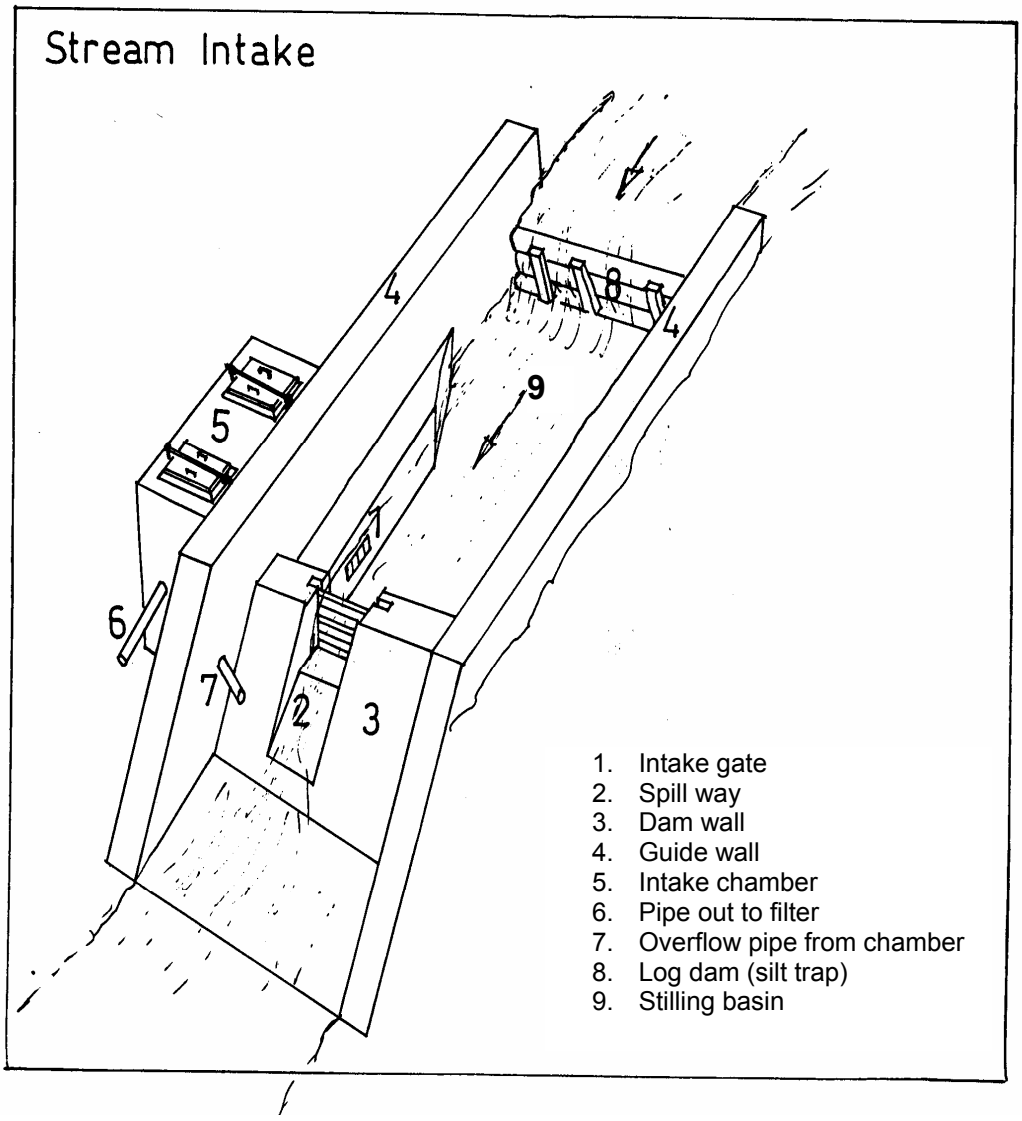
Spring intake

1.3 Spring inspection chamber

This structure enables the CT to inspect the water flow from the spring, it is constructed in a manner that water should not stand behind the dam.

1.4 Stream intake

The stream intake structure consists of a dam constructed across a stream with an intake chamber to take in the required amount of water needed for a VWSS. It is located above the village where the riverbed is not too wide and in many cases to reduce the possibilities of contamination.

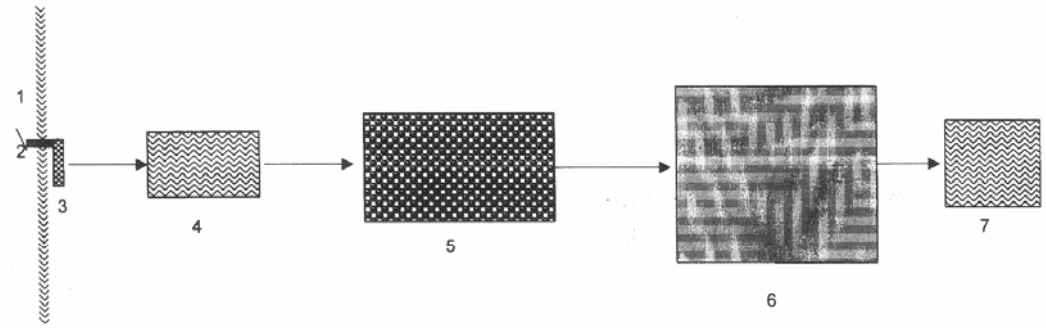


Stream intake

1.5 Treatment station

Stream water is not safe for human consumption without some form of treatment. Most VWSS treatment stations consist of the structures shown below.

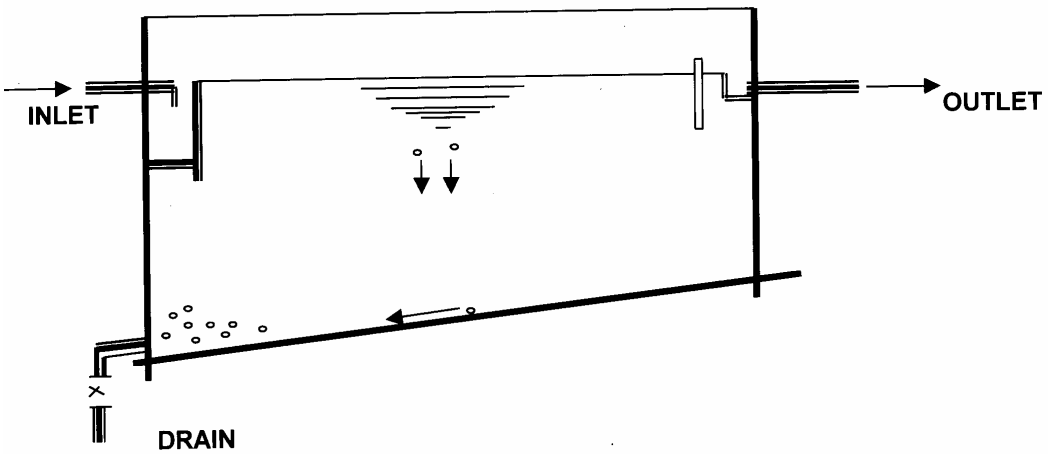
LAYOUT OF A WATER TREATMENT PLANT



1 STREAM
2 STREAM INTAKE
3 INTAKE CHAMBER
4 SEDIMENTATION TANK
5 UP-FLOW ROUGHING FILTERS
6 SLOW SAND FILTERS
7 STORAGE TANK

1.5.1 Sedimentation tank

This tank, receives water flowing from the intake chamber. The tank serves as a settlement structure. In the tank; heavy particles like soil and silt sink to the bottom, while floating objects e.g. leaves and sticks on the surface are taken out by the caretaker.



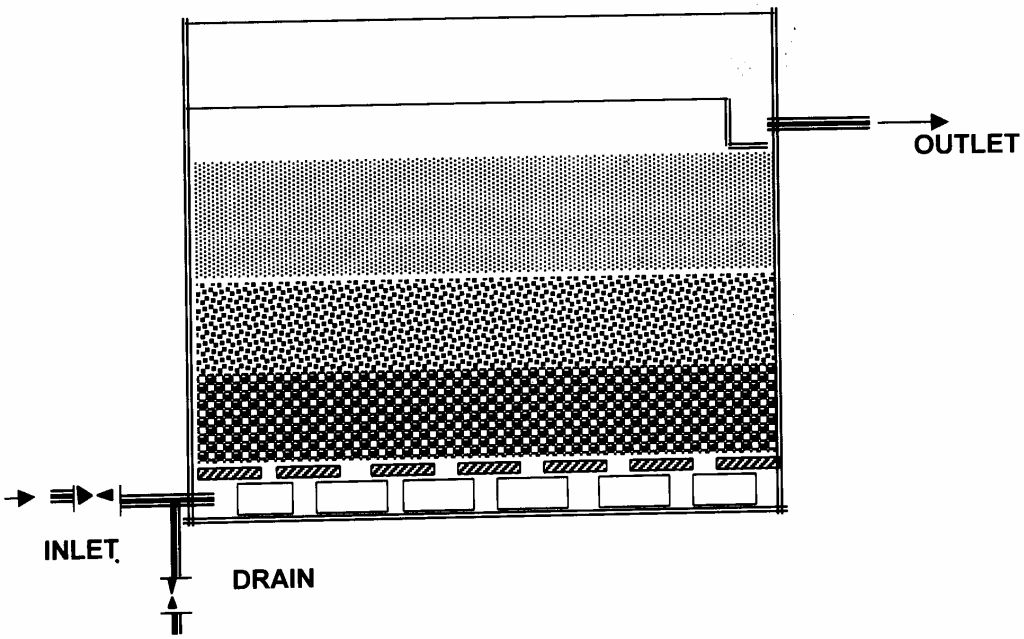
SEDIMENTATION TANK

1.5.2 Filters

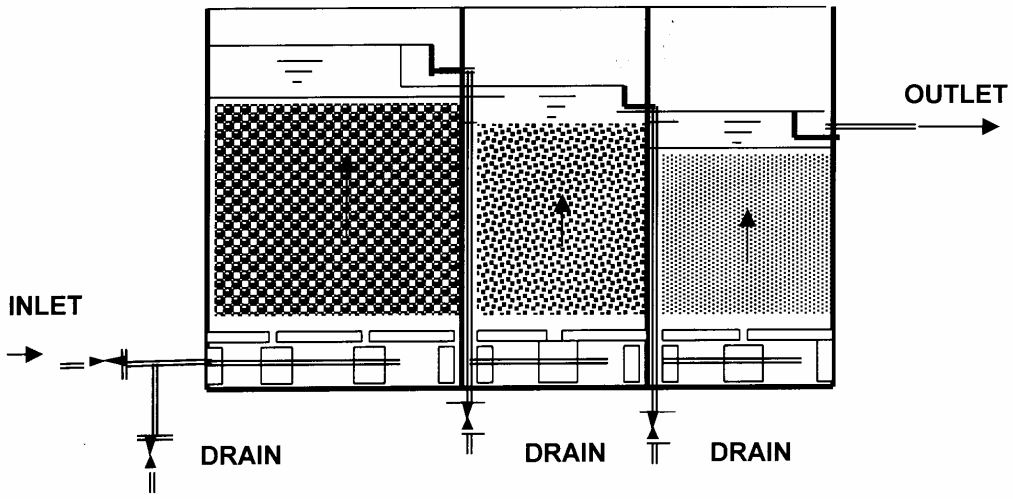
These are structures installed for the purification of water. There are many types of filters in use on VWSS.

i) Roughing filters (Vertical flow)

The vertical flow filter and precisely the up-flow roughing filter (URF) has been adopted for VWSS.



UP-FLOW ROUGHING FILTER IN LAYERS



UP FLOW ROUGHING FILTER IN SERIES

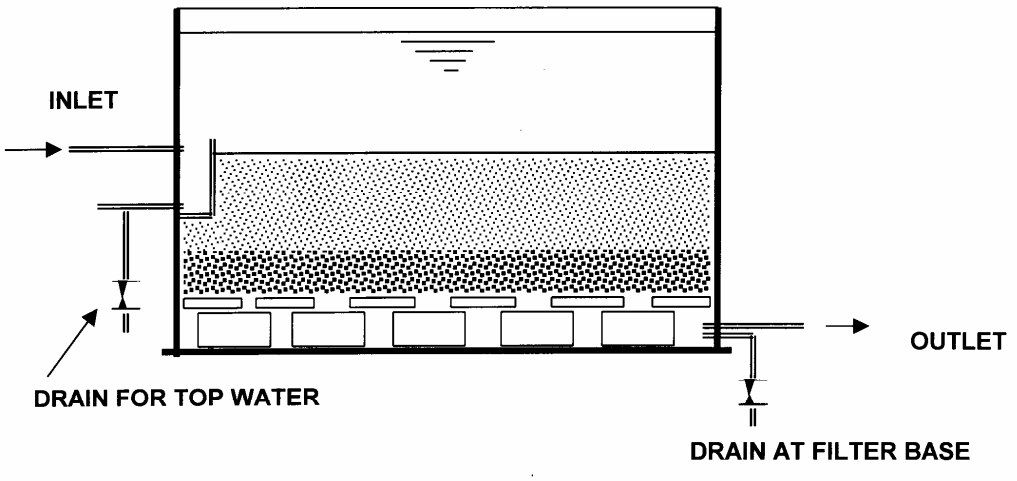
These are pre-treatment units for water. They precede the final treatment involving slow sand filtration. The main purpose of the gavel filter is to remove the bulk of the silt and suspended materials thus reducing the amount of silt reaching the sand filter.

The filter material for up-flow roughing filters is arranged with very coarse filter medium at the bottom and coarse material at the top. Water flows through the filter medium at O.5 to 1 m/h.

ii) Slow sand filter

This one is constructed to carry of sand and gravel for use in filtering water. Sand and gravel have a depth from 1.3 m to 1.5 m. When filtration starts, a biological layer is formed on top of the sand. This biological layer together with the sub-layers work to kill bacteria and filter the water.

When this layer becomes too thick, the flow rate of water through the filter reduces and soon the filter block thus needing cleaning.



SLOW SAND FILTER

1.6 Break pressure tanks (interruption chamber)

These are found along pipelines to break or reduce the water pressure. They are placed where the water pressure exceeds a vertical height difference (or altitude) of 70 to 100 meters depending on the pressure rating of the pipe. The structures are similar to storage tanks.

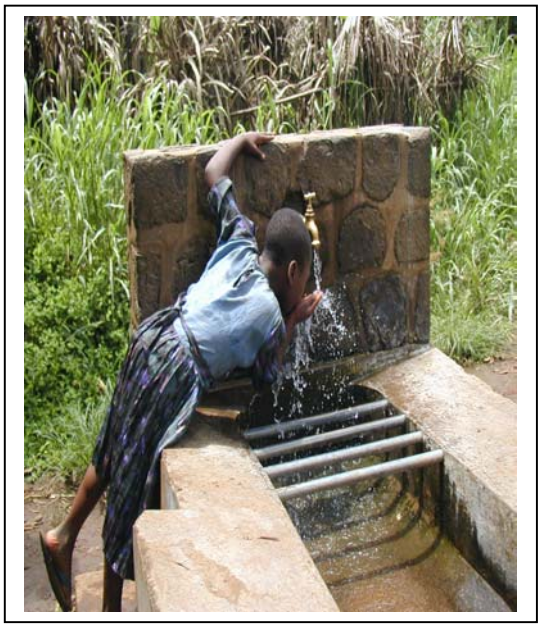
1.7 Storage tank

Storage tanks help to store water when it is not needed and releases it when it is needed. Storage tanks guarantee a continuous flow of water at all the collection points (i.e. standpipes, wash places etc).

1.8 Water collection points

These are standpipes, fountains and wash places

Stand pipe



wash place

1.9 Valve chambers

These are chambers built along pipelines to protect them. They provide easy access for control of flow within the system.

- Control valve chambers.
- Washout valve chambers.
- Air release valve chambers etc.

1.10 Summary

This lesson covered the various types of VWSS structures and their functions.

1.11 Self check test

1) Name 5 structures in your VWSS

   a) _____

   b) _____

   c) _____

   d) _____

   e) _____

2) The spring control chamber enables water flow from the spring without water standing behind the dam _____(yes/no)

3) Dams are built across spring intakes_____(yes/no)

4) Which of the filters below kills bacteria in water (tick right answers)

   - Up flow roughing filter
   - Treatment station
   - Slow sand filter

5) Some stream intakes have no treatment station _____(yes/no)

6) Name 3 water collection points

   a) _____

   b) _____

   c) _____

LESSON TWO

MAINTENANCE OF VWSS STRUCTURES

2.1 Introduction

A village water supply, once constructed, serves its purpose only when there is regular operation and maintenance. When a VWSS is poorly operated and maintained it could become a big waste to the community in this case the water will not flow regularly and the community will be forced to return to the old sources for drinking water.
A caretaker's work is to take care of the VWSS. Taking care of a VWSS means ensuring that the structures are in good condition and function as expected. When the structures function as expected, there will be a continuous and uninterrupted flow of clean drinking water.
This lesson is on how a caretaker with the assistance of the water management committee (WMC) and the community can maintain the various structures and installations of VWSS.

2.2 Types of maintenance

There are three types of maintenance.

1) Preventive maintenance: this is done to avoid or prevent water structures and fittings from getting bad.
2) Corrective maintenance: This is done when there is something not working well on the network. It is done to prevent the damage from getting worse.
3) Emergency maintenance: This is done to rescue the VWSS from total collapse. This is mostly as a result of failure in preventive and corrective maintenance, and acts of nature, e.g. a flood breaking a stream crossing.

Examples of types of maintenance:

Preventive maintenance	**Corrective maintenance**	**Emergency maintenance**
- Washing of the tank - Flushing of the URF - Fire tracing around the catchment - Creating contour bonds	- Filling soil round the foundation when it is being washed away - Filling holes with mortar in chamber - Replacing taps	- Reconstruction of low point chamber broken by floods

N.B.: An active and effective caretaker does more of preventive than corrective or emergency maintenance

2.3 Operation/ Maintenance of VWSS structures

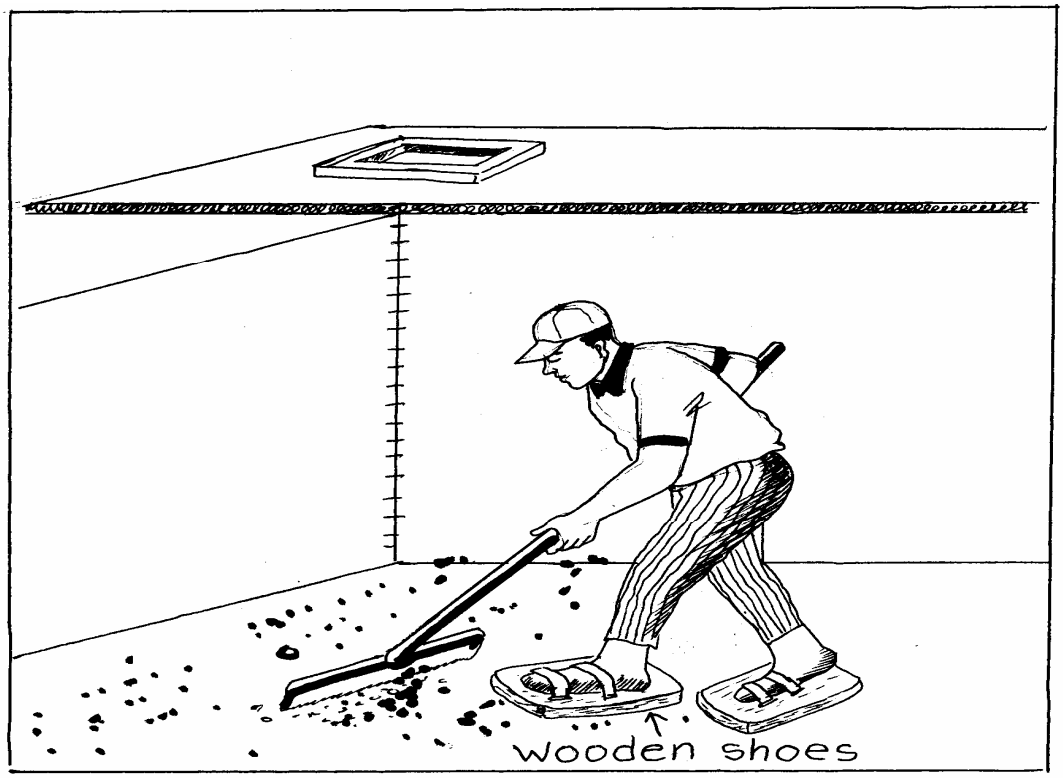
Structure	What should be done
Spring intake	- Dig and cut roots of trees growing toward masonry works. - Check for erosion around the structure and divert any run off away from the structure. - Check roots growing into channels and pipes. - Keep grass low around structure.
Spring inspection, collection, and interruption chambers	- Regularly open and check the chambers to remove sediments at the bottom, if necessary drain or clean - Inspect and clean inside and outside of the chambers - Clean and grease locks - Check roots in pipes - Wash internal walls, if necessary
Sedimentation tank, Storage tank and Break pressure tank	- Cut grass around the entrance and the road leading to the structure - In cases where leaks are found, report to WMC and make sure they are repaired as quickly as possible - All cracks should be reported to the WMC who shall call a qualified person to do the repairs - Enter these structures wearing wooden shoes, never enter bare footed. Each structure should have its own shoes which are left there - Cleaning the tank: see below
Valve chambers Low points High points	- Regularly inspect the valves. Open and close them during each visit. - Check the walls for cracks. - When cleaning the storage tank: close the valve to the supply pipe, and open the cleaning pipe; after cleaning, close the cleaning pipe and open the supply valve; follow the supply pipe and check whether all the branch valves are working; open the washout valves until the water coming out is clean and close them again. - Keep grass low around the structure. - Check valves to see whether they are working
Standpipes, Wash places and Fountains.	- Check drainage and ask users to clear if blocked - Clear the grass around the standpipes, wash places and fountains - If the tap manager does not ensure clean tap surroundings after warnings, the tap should be locked

Structure	What should be done
Up flow roughing filters in layers	- Up roughing filters are cleaned by flushing. - Shut the incoming water. - Open the drain valve and watch the flow out of the filter. - If the water remains dirty when the tank is getting empty, the up flow roughing filter is filled again and the flushing process repeated. This flushing is done once a week in the rainy season and monthly in the dry season - Once a year, at the end of the rainy season the gravel in the filter is removed and thoroughly washed and put back. Remember: the very coarse gravel is put first, the coarse gravel second etc.
Slow sand filters	- Empty any water in the slow sand filter tank through the drainpipe at its bottom or through special overflow installed just above the maximum sand level. - Remove your shoes before entering the filter and wear the special shoes made of wood. - Remove the top layer of the sand carefully 5 to 10 cm, according to degree of clogging and keep it outside for washing later. Check depth of sand removed to know how much remains underneath, record it and the date - Level the sand carefully and fill the filter again with water through the inlet pipe. - When the sand layer height remaining in the filter is equal or less than 0.45 m after several sand removals at earlier intervals, all the sand is removed, washed and filled back into the tank to its original height of 1.3m to 1.5 m; and the filter filled with water again - The cleaning process should be finished between half and one day, otherwise, the silt in the lower layers might dry off and block water from passing. - For proper functioning, the filter should run for five days before water is sent to the community. - Once in every year the sand is removed completely, washed and put back, especially at the end of the rainy season (November/December).

2.4 Some general hints on VWSS maintenance

1) Water works need regular maintenance and repairs

2) Never use a kerosene lamp inside a tank. 1 litre of kerosene can contaminate up to 1 000 000 litres of water.
3) Control the colour of water after heavy rainfall to check whether there is infiltration of surface run off.
4) Caretakers should always inform the WMC of problems they cannot solve.
5) To check if all the dirt on sand has been washed out, take a handful of wet sand and rub it between your hands. If there is still any trace of dirt remaining, then the sand is not yet clean enough.
6) The owner of a private tap must also allow the caretaker to inspect the installations and commit himself to undertake the repairs. Report unauthorised connections to WMC for action.
7) Check regularly water cleanliness (colour, smell and taste) and water quantity.
8) Check regularly structural conditions: cracks, leaks, plastering, installations especially valves



Care taker cleaning the water tank

2.5 Summary

In this lesson, the caretaker now knows what to do, in order to maintain or repair the various structures of VWSS. It is only by conducting regular checks on these structures that the caretaker with the assistance of the WMC and discover faults and carry out repairs.

2.6 Self check test

1) Name the 3 types of maintenance and tick the best type
   a) _____
   b) _____
   c) _____
2) What do you do when there is a crack on one of the structures? Tick the right answer.
   1) Mix mortar and repair it
   2) Invite a builder to repair it
   3) Inform the WMC
3) Digging and cutting root trees growing towards masonry works is corrective maintenance _____ (Yes/no)
5) When cleaning the slow sand filter you can wear slippers, rain boats or enter the tank barefooted_____(yes/no)
6) For proper functioning, valves should be opened and closed during each visit _____(yes/no)
7) Tick the wrong answer
   a) private connections are part of the job of a caretaker
   b) private connections bring in money to the WMC
   c) the caretaker has the right to inspect private connections
   d) the caretaker can carry out private connections without informing the WMC.

LESSON THREE

PIPES AND FITTINGS

3.1 Introduction

Water transportation and distribution in the community is done through pipes. The distribution network is divided into 2 categories, namely:

Mainlines which carry the water through the network; it is from there that branches go off.

Branch lines branch off from the mainlines to collection points.

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This lesson describes the types of pipes used in a VWSS and how to lay them in the network. The lesson also gives some maintenance hints on pipes, taps and valves.

3.2 Pipes

There are several kinds of pipes but we will consider only those commonly used locally for water supplies. There are plastic (PVC and Polyethylene, PET) and galvanised iron pipes.(GI PIPES)

3.2.1 PVC pipes

PVC pipes are divided into two groups, pressure and non-pressure pipes.

Non-Pressure pipes

These are pipes used for draining water where the water does not flow under pressure. They are supplied in four metre lengths and should not be buried deeper than 20cm. The external diameters range from 32 mm to 110 mm.

Pressure Pipes.

Pressure pipes are available in standard lengths of six metres in several pressure ratings. The pressure is indicated in bars (1 bar = 1 kg/cm^2 or the pressure of a water column of 10m height on an area of 1cm^2)

Table1 Pressure ratings of pipes

Nominal pressure	Bars	Resistance to water pressure
4	4	40m high
6	6	60m high
10	10	100m high
16	16	160m high
25	25	250m high

Manufacturers depending on the raw materials produce pipes of different dimensions. So when you buy pipes, please refer to the markings on the pipes. The situation plan handed over to the community at the end of the project gives the pipe sizes and pressure as they have been laid. So always refer to this plan before embarking on repairs.
Plastic pipes should be labelled properly so as to identify the manufacturers, the pipe dimensions and the pressure. Avoid pipes that are not marked for this is probably a sign of low quality.

Table 2 Pipe sizes for PVC Pipes

Commercial description	Internal and external diameter	Pressure rating number (np)
Pipe 110	98.8x110	10
Pipe 90	80.6x90	10
Pipe 75	68.6x75	6
Pipe 75	63x75	10
Pipe 63	56.6x63	6
Pipe 63	53x63	10
Pipe 50	43.6x50	6
Pipe 50	42x50	10
Pipe 40	35x40	6
Pipe 40	33x40	10
Pipe 32	28x32	6
Pipe 32	26.8x32	10
Pipe 25	21x25	10

These figures are indicative; some manufacturers may have different dimensions. PET pipes are not widely used in Cameroon since they are eaten by rodents.

3.2.2 G.I. pipes

GI pipes also called galvanised iron pipes, come in nominal lengths of six metres. These are steel pipes that have been treated chemically (galvanised) to prevent rust from attacking them. They are generally described in inches e.g. three quarter inch, one inch etc. Galvanised pipes are used in marshy areas and sections of the pipeline where the pipes cannot be buried (over rocks and stream or valley crossings)

GI pipes are six meters long and have both ends diced. When transporting them fit sockets on the diced ends to prevent the threads from being damaged.
Dicing machines with proper and complete sets of teeth are few in the field and they are very expensive to buy. Therefore it is advisable to make a detailed list of GI pipes, with diameter and length, and then order them with the ends already diced. However you may also cut the pipes to the required lengths and take where there is a good dicing machine. When dicing a metal pipe, the pipe is weakened by cutting off part of its thickness. Therefore care has to be taken in making clean threads. Too much cutting not only causes leaks at the joints but also weakens them. Pipes should never be transported or moved after they have been joined together. The length of the diced part or thread varies according to the diameter of the pipe.

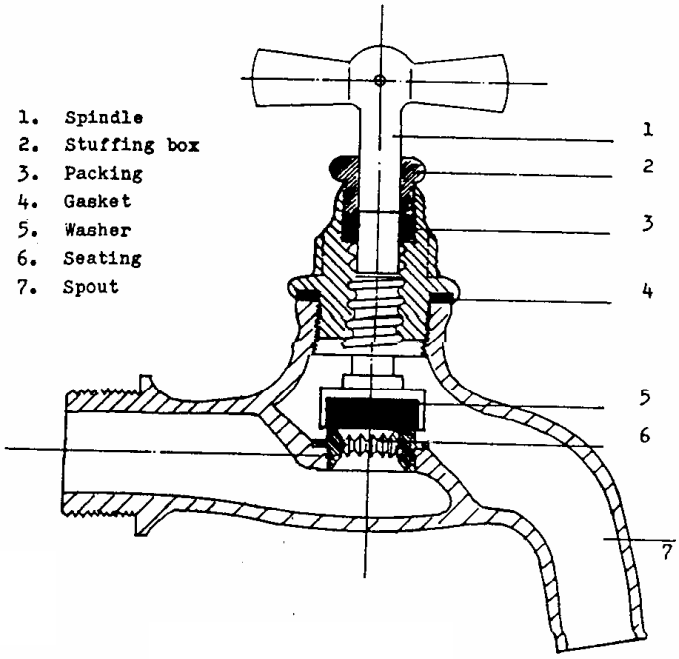
Table 3 Measurements of thread length

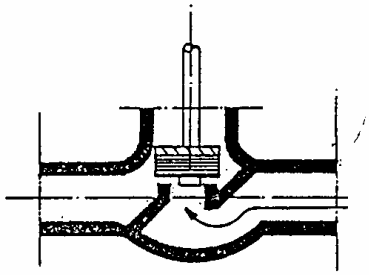
Pipe	Length (mm)
3/8”	10
½	13
¾	15
1	17
1 ¼	19
1 ½	19
2	24
2 ½	27
3	30
4	40

3.3 Taps

Standpipe taps are the most used in any VWSS and therefore require more attention.

. Cross section through a tap and some discharge valves





GLOBE VALVE
(Stop valve,
female) \

3.4 Types of valves

a) Air valves

These are fitted at the high points on of the network to release any air that might be accumulating.

b) Float valves

Fitted in storage tanks or break pressure tanks to stop water entering the tank when it is full

c) Washout valves

Fitted at low points on the network to remove mud and settlements from the pipes.

d) Service pipe valves or branch valves

Fitted on the service pipe to control flow of water to the standpipe.

e) Branch valves

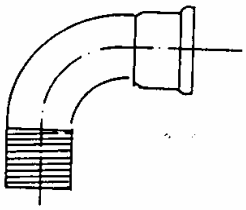
Branch valves are created where lines take off from the main line.

3.5 Fittings

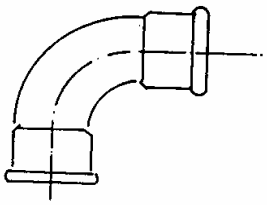
Fittings are described according to their types. Fittings described in numbers or metric units are generally of the plastic type. Those described in inches are of the galvanized type. Always remember to state whether the fitting is pressure or non-pressure.

Fittings for steelpipes

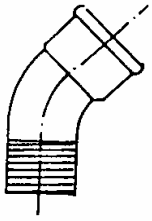
BEND 90o MALE/FEM.



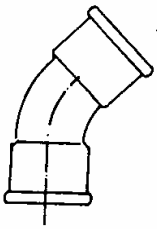
BEND 90o FEMALE



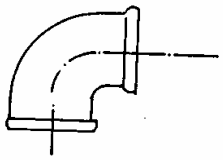
BEND 45o MALE/FEM.



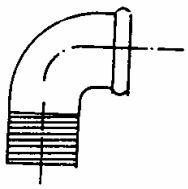
BEND 45o FEMALE



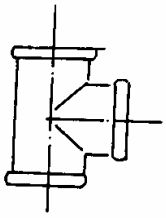
ELBOW 90o FEMALE



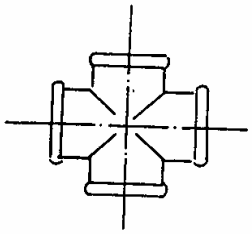
ELBOW 90o MALE/FEM.



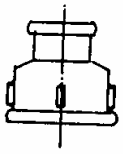
TEE EQUAL



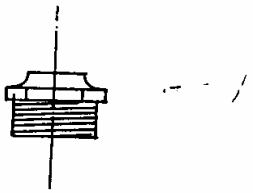
CROSS TEE



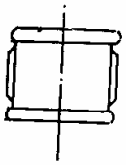
REDUCING SOCKET



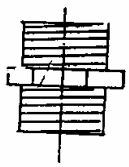
REDUCING BUSH



SOCKET

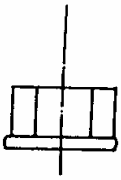


HEXAGON NIPPLE

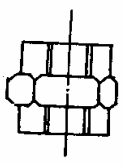


PLUG

CAP

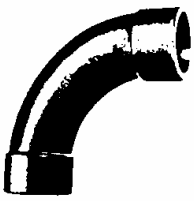


UNION

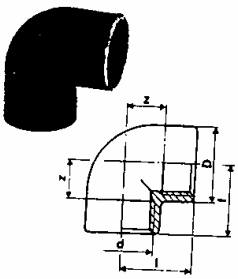


Fittings for plastic pipes

Elbows 90°

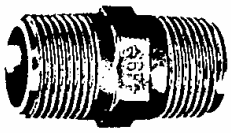


Bends 90°

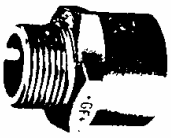


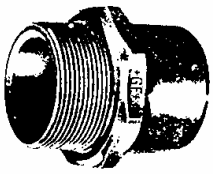
Sockets

Reducing Sockets

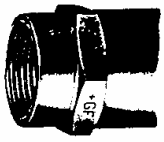


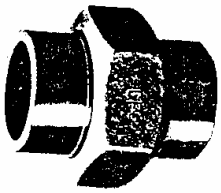
Adaptor Nipples



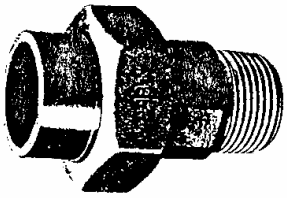


Adaptor Bushes, equal

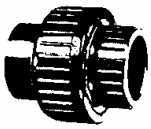




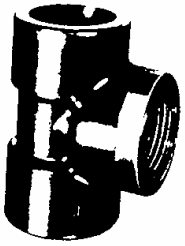
Unions



Adaptor Unions,

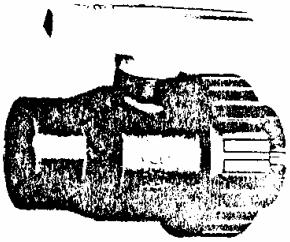


Tees 90°, reducing

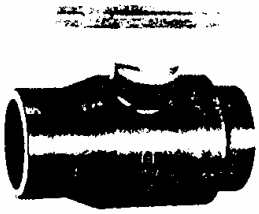


Tees 90°

Tees 45°



Compact Ball Valve



Ball Valve

3.6 Maintenance of pipes and fitting

Installation	Possible problem	What should be done
Pipes	Mending of broken PVC pipes	- Cut out the broken length of pipe Replace with a new section of pipe - Following reconnection, partially backfill the pipe leaving the joints exposed - Slowly open the control valve to check that there are no leaks at the joint - Backfill and compact the trench - Mark the position of the pipes with stones or pegs etc. - Record the repair (date, location, type of repair etc)
	Laying of PVC pipes	- Remove all dirt or ground from the pipe - Clean the inside of the socket end with a dry cloth - Carefully sandpaper the socket ends - Apply glue on the sand papered end - Put the chamfered end into the socket and hold steadily for five minutes - Lay the pipe but do not backfill - Allow water to pass through the pipes for 48 hours before backfilling if no leakage is discovered.
	Hints for making bends and elbows on PVC pipes	- Calculate the length of the bend by measuring the outside diameter of the pipe and multiply by 5. - Measure and mark the point of the bend - Fill the pipe with dry sand - Heat the pipe at the mark gently and regularly until it becomes soft and flexible - Put the pipe level in the trench and bend it to the desired angle - Cool the pipe with water and let the sand flow out.

Installation	Possible problem	What should be done
	Mending a broken GI pipe	- Turn off the water at the nearest control valve upstream of the leak - Excavate and expose the leaking section of pipe - Cut out the broken length of pipe - Take distance between the fittings and the threat lengths to get the total length to be used - Replace cut out pipe with a new piece of pipe - Follow steps on how to lay GI pipes below
	Laying of GI pipes	- Dice the pipe heads - Clean the thread with an iron brush - Hemp the thread in a clockwise direction on the diced head - Apply putty to make the joints water tight - Screw the sockets to the two ends of the pipe using a pipe wrench
	Water tight joints of GI pipes	- After dicing the pipe, take a good amount of hemp and put it around the pipe, following the screwing direction, or clockwise. Add putty on the hemp to facilitate the screwing and to make the joint fully water tight.
	If pipe route is not marked	- Mark pipeline routes with pipelines markers especially in areas where pipes cross farms - Plant grass along the pipeline route to stabilise soil - Check and repair pipe supports and anchor blocks at stream or gully crossings.
Taps	Tap handle turns but the tap does not flow or stop	- Fix handle or replace the tap
	Water dripping from around the spindle	- Tighten the gland or replace the packing

Installation	Possible problem	What should be done
	A corroded joint between pipe and tap	- Clean or re-cut the thread and replace the tap
	Water dripping from a closed tap or leaking from the gland around the spindle of a tap or valve	- Clean the tap - Replace the washer
	Water shortage at the collection point	- Locate the problem by measuring the spring flow at the source and in the tank and compare with previously measured figures. If low verify leakages by checking all the valves and pipelines - If problem persist, check on possible clogging or check whether there is air or vacuum in the pipes. These can be eliminated by opening and checking all taps and ventilation valves at low pressure
	Tap washer replacement	- Close the control stop cock or valve - Unscrew the tap - Remove the worn out washer and replace with a new one

Installation	Possible problem	What should be done
	Tap packing replacement	- Unscrew the gland nut - Remove the old material and clean around the spindle - Place new packing material - Screw back the gland nut and slowly tighten
	Fitting a new tap	- Remove the old tap carefully - Remove rust and old putty - Wrap the hemp of tape around the threat in clockwise direction - Screw the new tap tightly holding the pipe with a wrench.
Valves	- Water hammer which can damage pipes and fittings. - Damaged valve seat or thread	- Valves should be checked monthly - Valves should be opened and closed periodically - Valves should not be over tightened - A valve should not be shut quickly but slowly, until the flow is stopped.

Picture of poorly managed standpipe.

3.7 Describing fittings

To describe a fitting you must use the name, type and size,

Example:

1) Gate valve GI 2inch
2) Ball valve PVC 50mm

This order must be respected for somebody to recognize the exact fitting required.

3.8 Summary

This lesson is installations and fittings. You have learnt how to carry out minor repairs on pipes, taps and valves. Pipes and taps are very important components in the transportation and distribution of water in a VWSS network. A good caretaker has to ensure that leaks do not occur often on pipes taps and valves and even when it occurs, repairs should be immediate. Immediate repair of leakages, prevents waste of water and ensures continuous water supply.

3.9 Self check test

1) Name the two types of pipes used in village water supplies

   a) _____

   b) _____

2) State 2 things to do when making bends and elbows on PVC pipes.

   a) _____

   b) _____

3) PVC pipes are described in mm while GI pipes are described in inches_____(yes/no)

4) Where are G.I pipes used? Tick right answers

   a) In marshy areas

   b) Over rocks and streams

   c) At valley crossings

5) After mending a broken pipe, backfill immediately _____(yes/no)

6) When water is dripping from around the tap spindle you can_____or_____ to stop the water dripping (fill the spaces)

7) Which tool is used in holding the pipe when filling a new tap (tick right answer)

   a) Pliers

   b) Pincers

   c) Wrench

8) Valves should be shut quickly for them to last for long _____ (yes/no)

LESSON FOUR

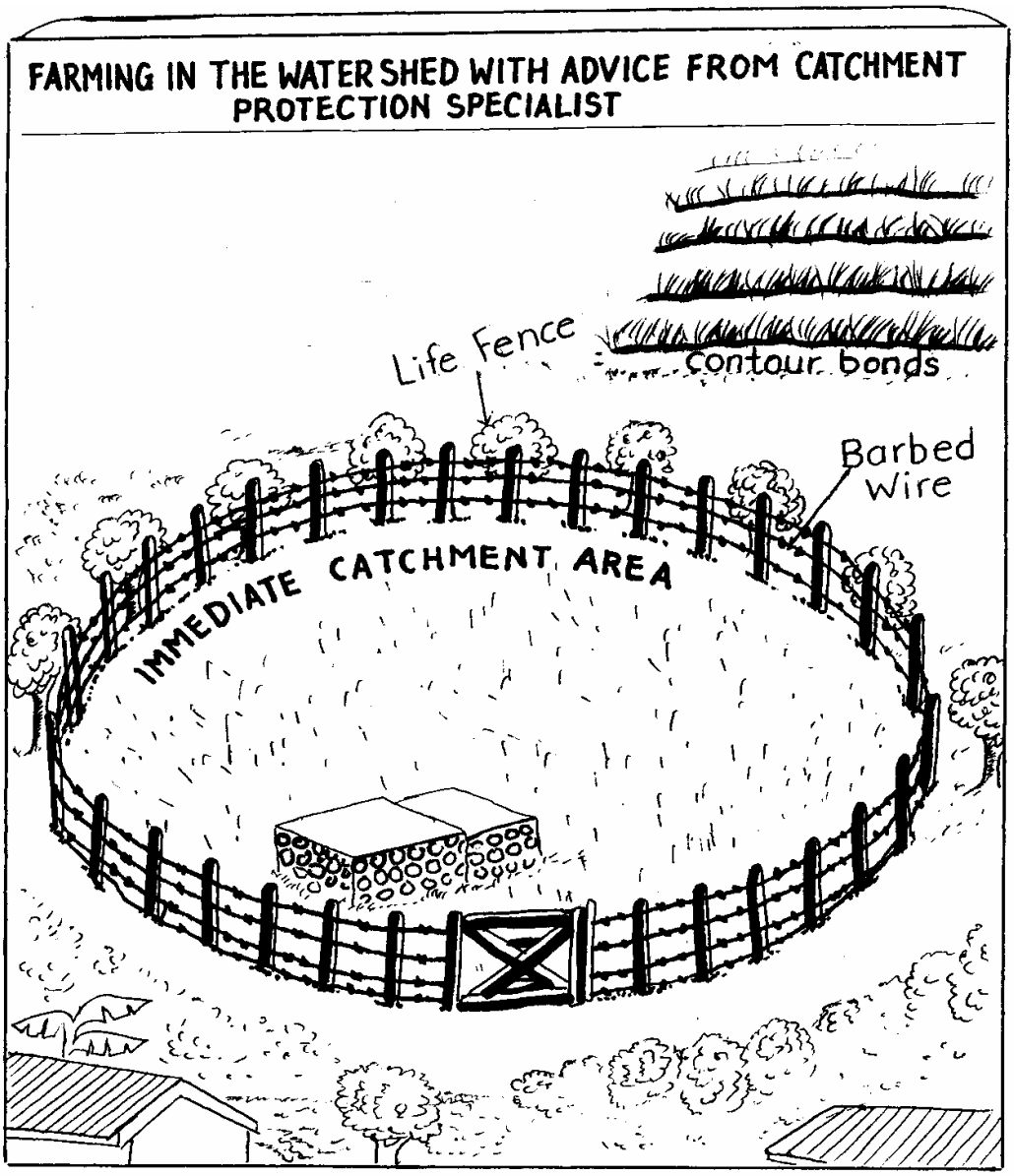
CATCHMENT PROTECTION

4.1. Introduction

Most village water supply schemes (VWSS) have either spring or stream sources of water. These sources have catchment areas. There is need to protect these catchments areas in order to ensure a continuous supply of clean water.

4.2. The spring catchment area

The spring catchment area is divided into immediate catchment area and the enlarged catchment area. The immediate catchment area is where human activity is not allowed. It is defined by a water shed specialist and should be fenced off immediately. The enlarged catchment area extends further beyond the immediate catchment area. Here some form of human activity maybe allowed with the advice of a watershed specialist.



SPRING CATCHMENT AREA

4.3 The catchment area of a stream

It is also divided into an immediate and an enlarged area. These areas are marked out by a water shed specialist.

4.4 Protecting the catchment areas

The community needs to be sensitised to participate in the protection of the catchment area. In order to get the participation of the community in catchment area protection, they should be involved in the planning and decision making stages of the VWSS. The community through the WMC should work with the Rural Council to get the Administration concerned with land matters to expropriate the catchment area to keep it protected.

Immediate catchment area

What should be done	What should not be done
- Build fence with barbed wire followed by a natural fence - Dig and cut roots of trees growing toward the masonry works - Plant grass which has a dense root system to prevent erosion e.g. vetiver - Dig trenches to divert runoff out of the catchment - Cut grass to avoid fire	- No farming - No grazing - No hunting - No burning - No excreting

Enlarged catchment area

What should be done	What should not be done
- Plant trees and shrubs which do not absorb water	Do not plant trees like Eucalyptus which absorb much water
- Farm but only plant the type of crop advised by catchment protection specialist	Do not use fertilizers, chemicals, insecticides and pesticides

N.B.: The catchment protection specialist will advise on the type of trees and grass to plant in the catchment areas.

4.5 Summary

It is important for the community, especially people living near the water source, to know what to do and what not to do in the catchment areas of a VWSS. It is necessary that during monitoring, the caretaker is vigilant to notice whether the community is respecting catchment protection rules or not.

4.6 Self check test

1) Farming can be done in the immediate and enlarged catchment area _____(yes/no)
2) Catchment landowners need to be sensitized to participate in the protection of the catchment _____(true/false)
3) Name 5 things which should not be done in the immediate catchment area
    a) _____
    b) _____
    c) _____
    d) _____
    e) _____
4) Whom should the community contact for advice on the type of farming to carry out in the catchment area?

    _____

LESSON FIVE

WATER LIFTING DEVICES

5.1 Introduction

When water is found at a lower level than where the water is needed, a water lifting device is required to get the water to the higher level. There are several kinds of water lifting devices among which all, water wheels, rope and bucket, pumps, rams etc. We shall discuss only pumps and rams.

5.2 Pumps and hydraulic rams

a) Hand-pumps

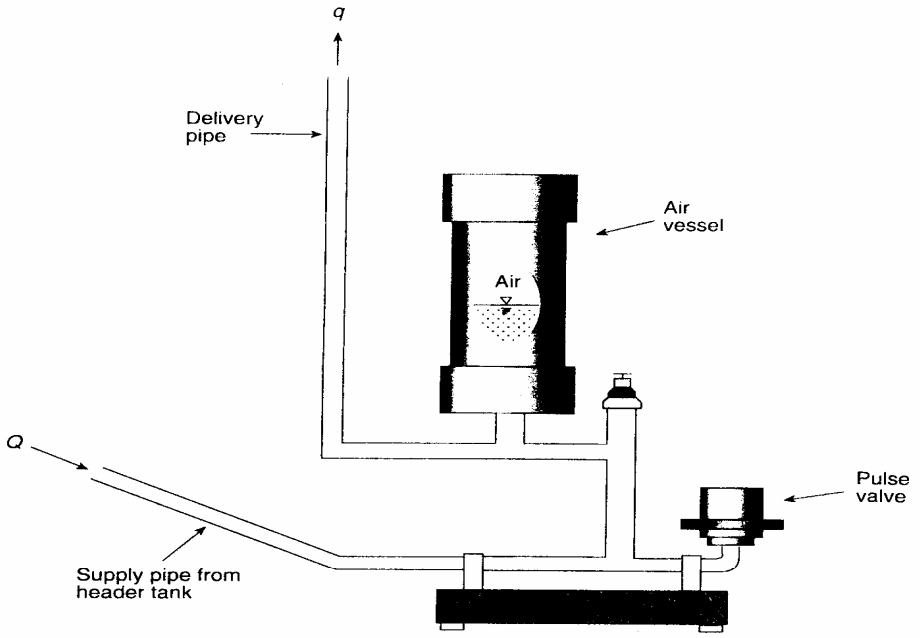
As the name implies, water is lifted up manually with the use of the hand. There are various types of hand-pumps.

b) Mechanical pumps

There are many different types of mechanical water pumps. Some use diesel, some kerosene, some petrol, some water and some electricity. The cheapest mechanical pump used in VWSS is the hydraulic ram

c) Hydraulic rams

These are mechanical pumps, which pump water-using devices powered by water under pressure coming from a dam at a higher level. With a special valve mechanism, part of the water (approximately 10 to 20 %) is separated and diverted into a supply pipe leading to an elevated tank meanwhile the rest is flowing off. Pumping is done by a process of continuous strokes, the pressured water being the energy.



The principal components of a ram pump are the pulse valve and the air vessel. The sudden closure of the valve causes a large waterhammer pressure which forces the flow (q) up the delivery pipe. The air vessel prevents damage to the pipework and smooths the flow

5.3 Maintenance of pumps

1) Regular check on weekly basis has to be made to make sure that the strainer, pump sumps and regulating valves are clean.
2) When pump parts are dirty, do the following

- Change oil
- Clean fuel tank
- Clean or change oil filters, washers and seals
- Clean and grease engine

3) Always maintain the battery
4) Check the main electrical cables and contacts
5) In case of repeated breakdowns, call a mechanic or engineer to examine the pump.

5.4 Summary

Pumps are good for lifting water from lower to higher points in a water supply network. Pumps require a clean source of water such as a stream or spring. The simplicity of pumps makes them reliable and if well maintained, they can operate for a long time.

5.5 Self check test

1) Not all VWSS need water lifting devices _____ (true/false)
2) Name the most common mechanical pumps used in VWSS_____
3) When pump parts are dirty, the following can be done (tick the right answers)
    a) Change oil
    b) Change battery
    c) Clean fuel tank
    d) Check main electrical cables.

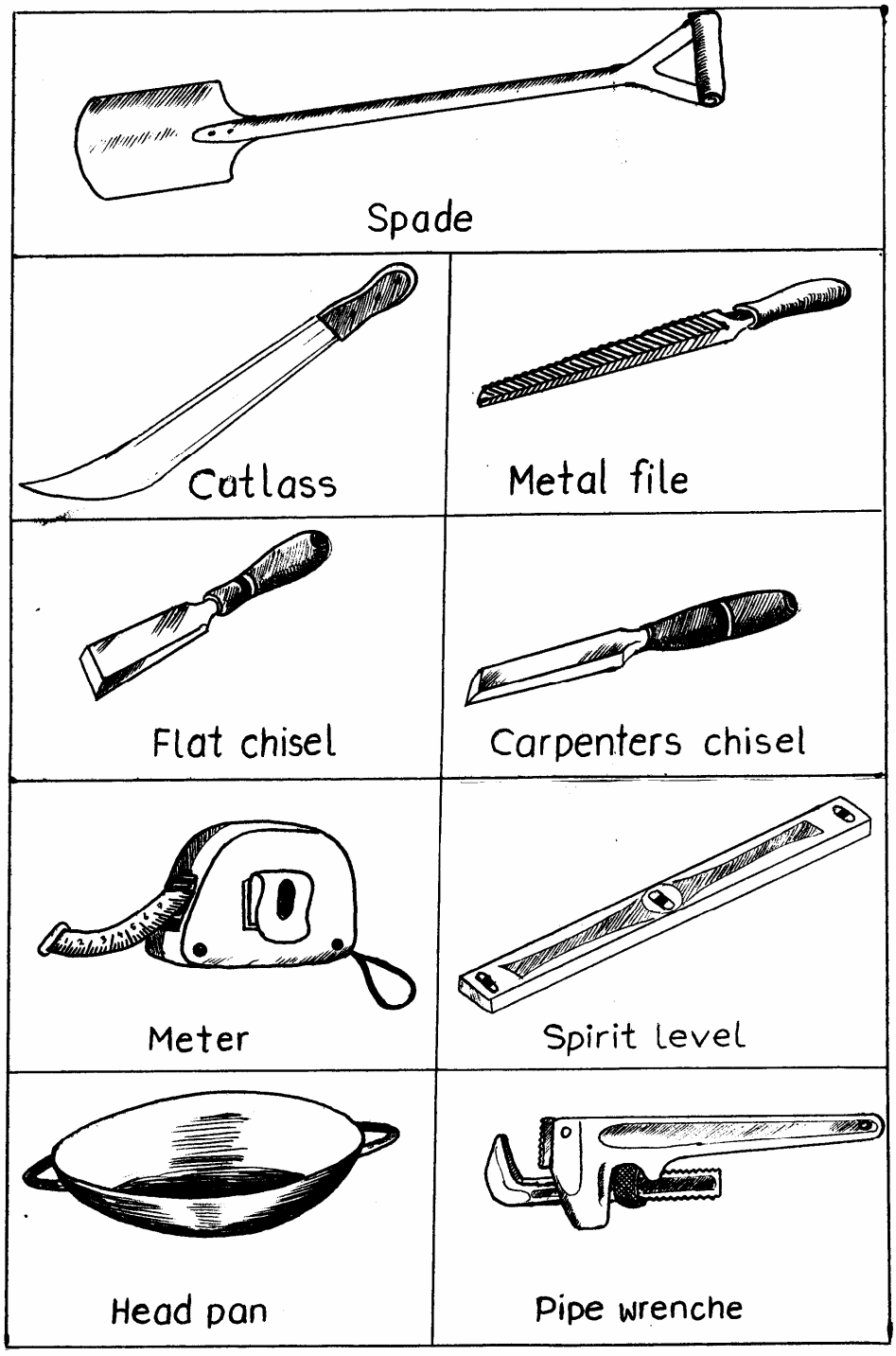
LESSON SIX

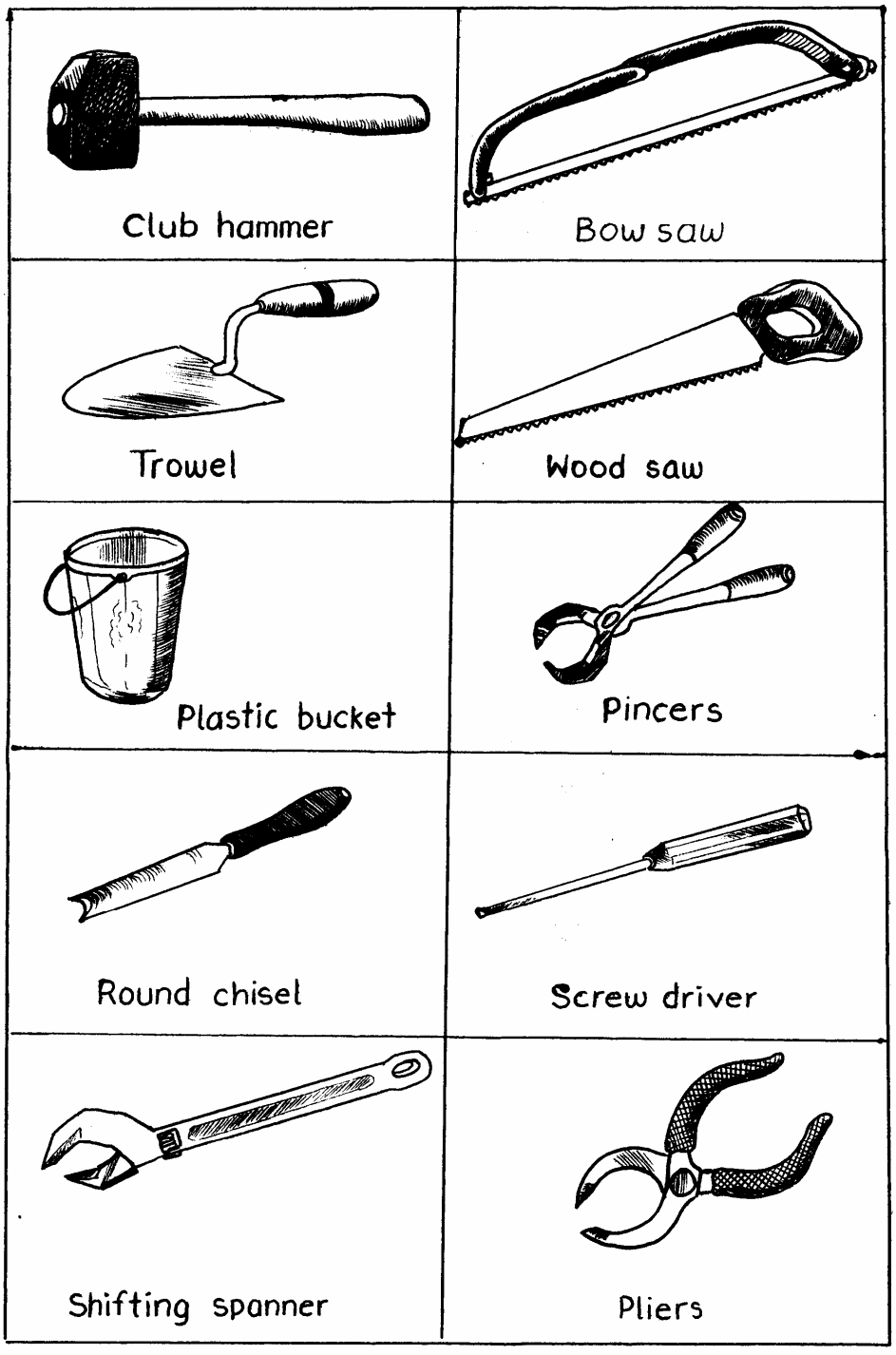
MAINTENANCE AND REPAIR TOOLS

6.1 Introduction

At completion of a VWSS, the WMC receives tools for use by the caretakers. The caretakers receive many types of tools, which are used depending on the type of maintenance or repair work to be carried out. It is the responsibility of the caretaker to use these tools judiciously or supervise the judicious use of the tools by others during community work.

6.2 Common tools for caretakers




Club hammer
Bow saw
Trowel
Wood saw
Plastic bucket
Pincers
Round chisel
Screw driver
Shifting spanner
Pliers

6.3 Tools and their uses

N°	Tools	Uses
1)	Spade	For digging and carrying top soil, mortar etc
2)	Cutlass	For cutting grass, wood etc.
3)	Metal file	For smoothing or sharpening metals (cutlass, spades) to make them sharp
4)	Pliers	For gripping, bending or cutting wire, can also be used for pulling nails
5)	Shifting spanner	For tightening or loosening nuts, bolts, etc.
6)	Screw driver	For turning screws to put them in or get them out
7)	Round chisel	For cutting or carving wood
8)	Flat chisel	For cutting or carving wood
9)	Carpenter chisel	For cutting or carving wood
10)	Pincers	For gripping things tightly especially when pulling out nails or cutting barbed wire
11)	Wood saw	For cutting wood and pipes
12)	Hack saw	For cutting metals e.g. GI pipes
13)	Club hammer	For driving nails into wood and breaking hard substances
14)	Trowel	For spreading mortar (it's like a small shovel)
15)	Meter	For measuring lengths of pipes
16)	Pipe wrench	For holding pipes
17)	Spirit level	For determining flatness and inclination of a surface when laying pipes
18)	Head pan	For carrying soil, mortar, gravel etc.
19)	Plastic bucket	For carrying water or measuring water yield
20)	Dicing machine	For dicing ends of GI pipes
21)	Table Vice	For holding pipes especially during dicing
22)	Iron brush	For washing of stones so that they can hold the cement, for cleaning rust on pipes
23)	Rasp file	For filing or smoothening plastic and wood
24)	Oil can	For cooling and smoothening dicing machine when dicing pipes
25)	Rubber brush	For washing tank
26)	Blow lamp	For warming pipes so that they can be bent

How to use the dicing machine

1) Choose the correct teeth, or socket head according to the diameter of the pipe
2) Fix the guiding teeth of the machine
3) While pushing the machine frontally against the pipe, keep turning the handle of the machine clockwise and anticlockwise to form the thread

4) Keep oiling the threads on the pipe to facilitate the cutting and to have properly formed threads
5) Measure and check the length of the thread,

6.4 Summary

With this lesson it is now easy to see and recognize the various tools used by a caretaker during maintenance and repairing structures and fittings of a VWSS. These tools have also been described in the lesson.

6.5 Self check test

1) A caretaker without tools is like a farmer without a hoe_____(true/false)
2) Which tool is used for cutting GI pipes _____
3) The dicing machine needs constant oiling when in use _____(yes/no)
4) A dicing machine is used for dicing PVC pipes _____(true/false)
5) Which tool is used for smoothening or filing plastic pipes (tick)
    a) Oil can
    b) Table vice
    c) Rasp file
    d) Chisel

MODULE THREE

PLANNING, IMPLEMENTATION, MONITORING AND EVALUATION

Global Objective: Caretakers are able to plan, implement, monitor and evaluate their actions and activities.

Specific Objectives:

- Caretakers know how to plan and implement their work.
- Caretakers know how to monitor and evaluate a VWSS;

LESSON ONE

PLANNING AND IMPLEMENTATION

1.1 Introduction

To succeed in life you need to plan. Working without planning can be compared to a man stumbling and falling because it is too dark to see. In order for a caretaker to succeed in his responsibilities he needs to plan and also keep records of his activities. Keeping records of all what you do and have to do will help you in planning.
In a VWSS there are activities that have to be done by the community but with the advice and direction of the caretaker. Some of the work for which the community is needed are:

- Fire tracing of the catchment area
- Planting of grass and trees in the catchment area
- Clearing along the pipeline
- Washing of tanks.
- Excavation of the pipeline in case of a leakage.
- Fencing the catchment area.

These tasks need planning in order to be successfully carried out by the community.

1.2. Planning work with the community

In carrying out work with the community, the caretaker should proceed as follows:

1.2.1 Before the day of community work

- Identify work to be done e.g. fence repairing, back filling etc.
- Inform the water management committee early enough on the type of work to be done, the date and the number of persons required.
- Inform WMC on the type of tools to be brought along by men and women for the work e.g. spades or cutlasses or hoes.
- Prepare tools/materials that have to be supplied by the caretaker.

1.2.2 On the day of community work

- The caretaker should be at work site early with members of the WMC.
- The caretaker should explain to the WMC at the site the work that is to be done and how it will be done

- When population arrives the caretaker and WMC partition the work to be done
- The caretaker demonstrates what is to be done
- When work starts, the caretaker moves around giving advice politely and helping where necessary
- At the end of the work, he/she collects all tools
- He/she assesses the work done and with the WMC plans for the next set of activities.

1.2.3. Planning chart

The caretaker with the WMC can plan activities using this format.

Table 4 Planning chart

Do what (Activity)	With what (Tools/materials)	By whom	When (Date/day)
Fire tracing on catchment	Cutlasses and hoes	Community	Tuesday 20^{th} march 200_
Washing of storage tanks	Spades, brooms, and buckets	Community	Friday 30^{th} may 200_
Repairs on leaking tap at market square	Spindle Valve	Caretaker	Monday 31 May 200_

This planning chart helps the caretaker to know in advance what is to be done with what, when and by whom. Time of work should also be fixed in advance

1.3 Summary

Planning is good. It helps you to manage time and resources properly. Caretakers should always plan all their activities before carrying them out.

1.4 Self check test

1) Tick the right statements
   a) Planning has no use
   b) Planning is a condition of success
   c) Implementation without planning is not good
   d) Implement before planning

2) On the day of community work the caretaker should come_____ members of the community (select and insert word (a) with (b) after(c) before (d) together.
3) A caretaker should be rude when showing people what to do during community work_____ (false/true)
4) Following the planning chart format in this lesson, plan your activities for the next 3 months.

LESSON TWO

MONITORING AND EVALUATION

2.1 Introduction

A caretaker has to monitor and evaluate a VWSS. This is to find out if the scheme is functioning well. Planning and record keeping helps in the monitoring process. You cannot monitor or evaluate if from the very beginning you did not plan and keep records.

2.2 What is monitoring?

Monitoring means keeping a close and careful check on planned actions and activities. It means following up constantly to make sure that everything is going on well as expected or planned.

2.3 Monitoring activities in a VWSS

What to monitor	How to monitor
- Monthly work plan	- Compare work plan done at beginning of month with realisations at end of month
- Spring flow speed of various inlets.	- Compare current speed with speed when VWSS was handed over.
- Project tools, materials and spare parts	- Count and crosscheck tools with tools record especially after community work - Verify materials and spare parts used with quantity in stock
- All records	- Go through each record to ensure that they are up to date.
- Standpipes	- How many are functioning - Are the surroundings clean
- Water quality. Is the water clean	- Find out about N° of water borne diseases from village clinic
- Frequency and duration of breakdowns	- Compare interval between repairs and damage

2.4 Evaluation

Evaluation means identifying and analysing the successes and difficulties registered during the period of carrying out planned or unplanned activities in a project. The caretaker can conduct minor evaluations during the year when he/she is monitoring. A major evaluation should however be conducted at the end of the year.

2.4.1 Evaluation questions

When carrying out an evaluation, you have to ask and answer the following questions:

1) What did I plan to do? Your monthly or yearly planning chart should contain activities, which you planned to carry out within the month or year.
2) What did I do well? Why? Here you are identifying your successes and things that contributed to your successes;
3) What did I not do well? Why? Here you identify your failures and things that contributed to your failures.
4) What do I need to improve next time? When you identify what caused your failures, it will be easy to know what to do in order not to have the same failure next time.

2.4.2 What to evaluate?

1) Evaluate objectives/yearly plan of work
2) Evaluate caretaker's relationship with WMC and community
3) Evaluate record keeping
4) Evaluate repairs carried out on network
5) Evaluate the functioning of the network
6) Evaluate the quality and quantity of water.

2.4.3 Who evaluates?

1) The caretaker should carry out self evaluation that is he/she should evaluate his/her activities in order to improve
2) The WMC can evaluate the caretaker in order to make recommendations for improvement.

2.5 Summary

The objective of this lesson has been for the caretaker to understand the terms monitoring and evaluation. It has equally come out with what the caretaker has to monitor and evaluate in order to attain the goal of being a good VWSS caretaker.

2.6 Self check test

1) Record keeping is necessary for monitoring and evaluation_____(true/false)
2) Tick the correct statements
    a) Monitoring is evaluation
    b) Monitoring means following up to ensure that things are going on as planned.
    c) Without planning, monitoring is difficult.
    d) Monitoring is for educated caretakers
3) Name three things which a caretaker has to monitor and evaluate.
    a) _____
    b) _____
    c) _____
4) Who has to carry out evaluation
    a) _____
    b) _____

LESSON THREE

MONITORING OF A VILLAGE WATER SUPPLY SCHEME

3.1 Introduction

One of the most important jobs of the WMC together with the CT is regular monitoring of the VWSS. It involves visiting every part of the scheme.

3.2 How and what to monitor

1) Before the monitoring exercise review your notes so that you are familiar with how the parts of the VWSS should be. This will enable you to quickly spot problems with any part.
2) The monitoring starts from the catchment area and intake and follows the pipeline by visiting all the structures on the way.
3) All problems seen in the catchment areas, intakes or pipelines are recorded and the points noted. Notes are taken as follows: e.g. catchment area 1: fence broken, needs fire tracing, farming in the area; spring intake: drainage channels blocked by grass, needs cleaning around and inside.
4) Structures along the pipeline are visited and any problems noted.
5) Private connections are checked.
6) At each stand tap the records of the stand tap manager are verified
7) At the end of the exercise the WMC holds a meeting and a report is made by those who carried out the monitoring.
8) The meeting shall end with a plan of actions on how to correct all problems identified during the monitoring.
9) Do not carry out repairs during monitoring or propose solutions. Note the problems and the solutions shall be part of the plan of actions drawn up at the end of the meeting.

3.3 Monitoring periods

Monitoring is best carried out in January, April, June, and October.

3.4 Summary

Monitoring the VWSS should be taken seriously by the caretaker and the WMC in order to enable the VWSS to function well. It also allows small problems to be identified and corrected before they become big ones.

3.5 Self check test

1) At least how many times per year should a caretaker monitor the village water supply scheme (VWSS) (tick right answer)
   a) At least 2 times
   b) At least 4 times
   c) At least 8 times.

2) If the caretaker does not monitor the VWSS, the system will surely collapse _____(true/false)

3) Tick the correct statements
   a) Monitoring also involves the catchment area
   b) Monitoring a VWSS is done only by the WMC
   c) Monitoring should be done at the end of the rainy season
   d) Filling a monitoring form is not necessary
   e) Monitoring a VWSS is the most important job of the caretaker.

LESSON FOUR

RECORD KEEPING

4.1 Introduction

There are some essential records, which a caretaker has to keep and update continuously. These records are:

1) Pipe stock records
2) Fitting stock records
3) Tools record and logbook
4) Network repairs record
5) Spring flow record
6) Visitors book (record)

To avoid confusion, each record should have a clearly defined section in a ledger. The name of the village water supply scheme should be written on the front cover of the ledger.

4.2 Records of a Caretaker

Table 5 Pipes stock record
Pipe type: 98.8 x 110 NP 10

Date	Quantity in	Quantity out	Quantity balance	Signature	Remarks
28/04/0-	20	-	20		Pipes brought in by pa Paul
02/05/0-	-	5	15		5 pipes used to repair old leaking pipes
08/12/0-	5	-	20		5 pipes donated by Kun women's group.

NB
- All pipe types should have a separate page designed in this same way.
- With this format, the stock of each pipe type is followed up closely by the caretaker.

Table 6 fittings stock record
Fitting type: pressure plastic, elbow

Date	Stock descrip-tion	Quan. In stock	Quan. in	Quan. out	Bal.	Signa-ture	Remarks
2/5/0-	elbow 90 mm	0	10	-	10		Left over after completion of project
2/5/0-	elbow 60mm	10	10	-	20		Left over after completion of project
4/6/0-	elbow 60 mm	20	-	5	15		5 elbow 60mm used during repairs of 04/06 200
12/6/0-	elbow 90 mm	15	-	2	13		Used at Fon's Palace

Table 7 tools logbook

Item	Name and sign of receiver	Date received	Date to be returned	Signature on return	Remarks
Spade	Peter	04/04/200..	05/04200..		Returned on 6/6/200… broken
Cutlass	Paul	10/05/200..	10/05/200..		Returned on time
hoe	Mary	10/05/200..	10/05/200..		Returned on time

N.B.:

- Caretaker should report all cases of lost, stolen, damaged or worn out tools to the WMC who will take the necessary action.

Table 8 repairs logbook

Date of damage or date reported	Date of repairs	Materials and tools used	Remarks	Signature of WMC chairman
10/10/200-	11/10/200-	Glue and 2/6 piece of pipe	Pipeline leakage caused by bush fire at Kwang.	
14/11/200-	20/11/200-	Pipe wrench, glue and gland nut	Stand tap leakage caused by worn out gland nut at market square.	

NB: The record briefly states the fault that has to be repaired, the cause of the fault and where the repairs took place

This record is usually used by the WMC to evaluate the work of the caretaker. The logbook is filled after repairs have been carried out, then taken to WMC chairman for signature.

4.3 Source yield measurement and recording

This is used in recording spring flow i.e. the speed at which water is coming out of the spring source. Each time a caretaker visits the catchment he/she has to measure the flow of water from the spring.

Requirements for measuring spring flow

1) A watch
2) A calculator
3) A plastic bucket. Always use the same size of bucket, either 10, 15 or 20 litres bucket. Make sure you state the size of bucket used

Measuring procedure

1) Put the bucket under the inlet pipe
2) Observe your watch and record how many seconds it takes to fill the bucket
3) With your calculator, calculate the litres per seconds.

Example

Assume that:
1. The plastic bucket used is 10 litres
2. It takes 20 seconds for the bucket to get filled

In this case to get the spring flow speed, you divide 10 litres over 20 seconds.
That is, spring flow speed = $\frac{10 \text{ litres}}{20 \text{ seconds}}$ = 0.5 litre/second.
After measuring the spring flow, you record in the spring yield record designed as follows:

Table 9 Source yield record

Name of spring source:				
Date	**Container used (litres)**	**Time (seconds)**	**Speed (Lts/sec.)**	**Remarks**
20/10/200--	10	20	10/20 = 0.5	Normal flow
20/11/200..	10	25	10/25= 0.4.	Flow has reduced. Will check reason for reduction
25/11/200 ..	10	15	10/15 = 0.7.	

NB:-
- The same bucket size is used all the time.
- If more time is taken to fill the same container, then there is a

problem, the caretaker has to find out the reason for the reduction and correct the situation

- Every inlet should be measured separately.

Table 10 Visitor's book

Date	Name/Title of visitor	Purpose of visit	Remarks and signature
15/04/200	Jane Nfor. Trainer CARD Bamenda	Organise training workshop on spring catchment protection	Workshop participants participated very well during training
20/05/200	Peter Khan. Monitoring agent from Helvetas Cameroon.	To monitor the water supply scheme	System generally not maintained see monitoring report.

4.4 Summary

In this lesson the importance of record keeping has been discussed as being very necessary for the maintenance and follow up of a VWSS by the caretaker Recording designs have equally been presented. It is necessary for the caretakers to keep and update all the records discussed, in this manual.

4.5 Self check test

1) Name 3 essential records of a caretaker
   a) _____
   b) _____
   c) _____

2) It does not matter how records are entered in a ledger_____(true/false)

3) Complete the table below (?)

Date	**Quantity in stock**	**Quantity in**	**Quantity out**	**Balance**
5th May	20	0	0	20
10th June	20	0	?	15
12th June	?	0	5	10
20 Nov.	10	10	0	?
22nd Nov.	?	0	?	15
10th Dec.	15	5	0	?

Glossary

Filters: A medium through which water can pass but not solid materials.

Sediment: The material that settles at the bottom of water in a tank.

Pressure: The amount of force exerted by the flow of water.

Network: All pipes laid in a water supply scheme form a Network.

Engineer: Person who has learned how to design, construct or manage public works like a village water supply.

Galvanised steel pipes: Pipes covered with a thin layer of zinc to prevent it from rusting.

Masonry: Work constructed by a mason, especially the stonework of tanks, chambers and filters.

Stabilize: Hold soil together so that it is not carried away by rainwater.

Flush: Water coming out with force during cleaning of the URF.