A MODULE ON JALABANDHU TRAINING

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Background

About Water For People India

Water For People is an international nonprofit based in Denver, Colorado. The goal of this organization is to bring water, sanitation, and hygiene services to everyone, and to make sure those solutions last forever.

Water For People India initiated its operations in West Bengal in 1996 in Nadia and North 24 Parganas districts. Consistent with the global vision and mission, we exist to promote the development of high-quality drinking water and sanitation services, accessible to all, and sustained by strong communities, businesses, and governments. Our organizational values are: accountability, courage, empowerment, partnership and transparency.

Water For People India programs have been implemented in 20 districts in the states of West Bengal, Bihar, Maharashtra, Tamil Nadu and Odisha. In all, nearly 1.2 million people have been reached through community drinking water and sanitation, WASH in public institutions and market led approaches to sanitation. By 2023, Water For People India programs aim to directly benefit 2.7 million people. We aim to build capacities at the district level which will contribute to organizational commitments, thereby indirectly benefitting 14.8 million people. Water For People India implements programs directly and through locally registered non-government organizations. Water For People India is an affiliate of Water For People USA.

It is working towards this ambitious goal by partnering with local community members, businesses, and governments, helping them bring sustainable water and sanitation systems to their communities. Then ensure they have the training and tools they need to maintain those systems for generations.

Vision: A world where every person has access to reliable and safe water and sanitation services.

Mission: Water For People exists to promote the development of high-quality drinking water and sanitation services, accessible to all, and sustained by strong communities, businesses, and governments.

About Sheohar

Sheohar is a rural district of Bihar state and in the northern part of the country. The district occupies an area of 443 km² and has a population of 656,246 (as of 2011). Water For People India works in all five of its blocks. Most people in these densely populated blocks are day laborers and farmers. The level of poverty is very high. Water For People India initiated its operations in Sheohar district in Bihar in 2011 with the support of local civil service organization (CSO) partners. The Project Sheohar consisted of both hardware and software activities. Hardware activities include construction of a school sanitary complex and installation and renovation of drinking water

sources in communities with the most need. Software activities include promoting awareness of safe WASH practices. The project's initiatives were also supported through social art, microfinance, livelihood interventions, and the establishment of sanitation enterprises known as Point of Purchases (POPs). This work improved the quality of life for 370509 people through reliable access to safe water and sanitation services for which the Jalbandhus are the backbone for installation and operation and maintenance of Water Points in the area.

Ground Water Scenario

Sheohar district lies in the North Ganga Plain, underlain by thick potential aquifer zones down to the depth of 300 m below ground. Both shallow as well as deep tube wells can be constructed to meet the irrigation and potable water supply.

The district of Sheohar is one of the prolific aquifer system in the Gangetic alluvium of north Bihar plains. Quaternary unconsolidated sediments of the area consists of sand, gravel, pebbles constituting potential aquifer. The aquifer is found to be extensive regionally and occurs in the form of layers down below. Rainfall is the main source of ground water recharge. The sandy layer at the top acts as a unconfined aquifer upto a depth of 100m whereas the deeper aquifers are confined aquifers. The aquifers from the area are of very high potential. The regional slope of the water table is towards south-east.

Jalabandhu

The lack of trained hand pump mechanics at sub-block level has been one of the reasons for considerably longer down time of hand pumps in rural areas. To ensure continued water services, in 2008, WFP-India initiated a program that invested in building a cadre of caretakers within the communities, to be responsible for regular operations and maintenance of drinking water systems. This initiative also serves as a business opportunity for the local youth who are engaged by the community as mechanics and caretakers for water systems. This cadre of trained youths under the WFP-India program are called JB or "friends of water".

Jalabandhus have today become an essential part of the community in many areas where they have already made their mark in keeping "the water flowing". It has been noted that lack of trained hand pump mechanics has been a problem since time immemorial, thus causing longer down time of hand pumps in rural areas. Delayed response to the minor repairing of hand pumps gradually leads to major break down and permanent defunctness after a period of time. The handful (varies from two or three) of hand pump mechanics available with the block government is unable to cater to the constant need of the community to repair the water points of the entire block. Moreover, the mechanics available, lack desired technical skills to repair advanced hand pumps like India Mark-II as their services are limited to repairing PHE-6 (suction pump) only.

India Mark –II hand pump is being promoted at a large scale since it is relatively efficient in keeping the water outflow above the normal in spite of ground water depletion in the dry season. Understanding the requirement for sustainability of the water sources, Water For People piloted a program of trained resource pool namely ***'Jalabandhu'*** or **'friends of water'** to meet the scarcity of hand pump mechanics in the end of year 2008 in the Patharpratima block of South 24 Parganas District in the state of West Bengal. The program aimed to eliminate the down time of hand pumps caused by the lack of mechanics and to promote private sector involvement for the sustainability of the water sources. Selected locally, *Jalabandhus* are the mobile hand pump mechanics trained in the operation of a variety of models and technology and equipped with a stock of basic spares. ***'Jalabandhus'*** are the pool of skilled manpower, available to be hired by any community or local government for repairing of any type of hand pump. *'Jalabandhus'* not only meet the repairing needs of all types of hand pumps but they also carry the spare parts that are not available in the local market.

Since 2013 the Jalabandhu Program also extended to Sheohar District in Bihar for reaching ''Forever''. Initially 106 Jalabandhu were trend. The process was to select the local mechanic- The Grampanchayat selects one or two local persons from each panchayat who have technical background on hand-pump repairing for the position of Jalabandhus and the Mukhiya had certified them. We (Water For People) have the selected the active jalabandhus and provide them the eight days training (in house and on site training) and one set basic tool kits to each Jalabandhu for their handholding support.

On an average each Jalabandhu is assigned 40 to 45 water points from his designated Gram Panchayat. He is encouraged to expand his business into the other areas too. *Jalabandhus* today are supporters as service providers, entrepreneurs and of course *"friends of water" who "keep the water flowing",* thus ensuring the quality of lives of the community.

"Jalabandhu"

is an effort to ***build a pool of skilled, local manpower,***

equipped to do ***minor repairing and preventive maintenance***

of ***all*** *installed community water sources"*

providing timely service *to rural communities*

on a ***pay and hire basis.***

serving the dual purpose of

1. Providing easy access to maintenance services to the community

2.Promoting sustainable livelihood option for local youth

and in the long run

check the steady drain of government resources

for repeated investments for creation of new water sources

Training 'Jalabandhus':

- The selected candidates have undergone a **5 Days Training Programme**
- The first two days have been theoretical sessions.
- Next three days were practical/ hands on training with all types of hand pumps viz. (India Mark II Hand Pump, PHE- 6, Tara Pump)
- On successful completion, the trainees have been allotted a kit of tools and a set of spares for basic repairs for the next 6 months

Agenda

Topic	Process/Methodology	Facilitated By	Time duration
Day 1			
Registration			
Inauguration			
Welcome address	Game		
Background of the Project & WFP			
Objective of the training and expectation	Discussion		
Water Cycle & Conservation	Presentation and		

	discussion		
Safe Water • Source of water • Reason for water pollution • How to stop the pollution • Water Quality as per IS 10500	Group work and short film		
What is WASH & 7 aspects of WASH	Discussion and presentation		
Day 2			
Recap			
Indicator of Safe Water and Sanitation, related diseases and how people are become below poverty – short note	Lecture mode		
The role of WUC, VWSC, SHG and WIMC	Discussion		
Assembly of India Mark -II and III and Sallow Pump (PHE-6)	Display the model of Hand Pump		
How the Handpump work and its maintenance Kind of tools required for repairing the Hand pump How to use the tools/tool kits & its function How to repair the Hand Pump Kind of attention required during repairing	Explain and discussion		
How to maintain the Hand Pump preventive majors of hand pump maintenance (CGT) Guideline for maintenance of the Hand pump	Group Work and Discussion		
During installation- kind of safety measure	During installation- kind of safety measure		
How to check the layer during installation/ Water Layer status as per soil profiling	How to check the layer during installation/ Layer status		
Day 3			
Recap			
Role and responsibilities of Jalabandhu Relation between Jalabandhu VWSC and WIMC How to build the relationship between Jalabandhu and WUC	Group Work and Discussion		
How to promote the Jalabandhu as business and livelihood			
Reason for breakdown/defunct of the Hand pump and how to solve the problem by Jalabandhu	Discussion and Presentation		
Data collection process of existing water points from responsible GP (Govt. WP and WFP WP) / How to maintain the log sheet and keep record			
Field Visit for practical demonstration	Travel to field and		

	practical demonstration		
Questions and Answer	Individual		
Evaluation and Rap-up	Involvement of participants through asking questions		

Registration

Every participant will be present 30 minutes before starting of the training session and sign in the registration sheet.

Welcome

The session to be started with formal inauguration & warm welcome to all the participants and mentor. The formal introduction must be done around the participants. They will have divided into pairs and each partner will ask to introduce to other. Participant will share their name, organization/area where they have been working, experience and how long associate with this project.

After introduction handover, the session to mentor for continued the training.

Topic : Creating a conducive environment

Method: Number Game/any kind of fun game

Purpose :

- Breaking the hesitation of the participants and making a cordially environment
- Reducing the distance between mentor and participants
- Breaking the small group of familiar participants

Materials-

A small piece of paper

Pre-Preparation-

According to the total no of participants the mentor should write the number one by one on a small piece of paper and fold it. Take the same number of fold paper with a plain paper or register.

Method-

- The number which is written in a piece of paper equal to the number of participants in the middle of the group and clarify the following.
- All the participants will take a piece of paper and hide the number from another participant.
- This game should be played standing in a circle
- The people who will make this game stay in the middle.
- The middle man whenever call two numbers the both participants (those number has been called) will gesture and should change the location
- The middle man should try to take the place of one of those two
- The middle man after calling the number of two persons, kept moving around in the groups so that those whose number has been called could avoid them and point to the other partner.
- If the middle man cannot reach the place of another participant within three times, then they should be done penalty bonus (Like-Dance, Song, a Joke, a story etc.) given by the group.
- The instructor also played with the participants of this game
- If the method of practice is not clear to the participants at once,then explain the method twice.

Topic- Rules to be followed during training

- Informed to the participants about the training
- Speaking of sacrificial matters to be followed in the training hall
- Giving information about the rules of the institution, food and accommodation
- Let them know when the session will start
- Encourage them to ensure to participation in the training

Topic: Introduction

Method: Pair practice

Purpose:

- Getting to know each other
- Provide opportunities for everyone to speak
- Asses the participants understanding of Water and Sanitation

Materials:

Different painted cards cut into two parts related to different dimensions of hygiene /WASH (according to the number of participants)

Method:

- Place the pieces of the picture between the participants sitting in a circle
- Ask all the participants to take a piece
- Now ask them to find the half of your picture
- Those who have the cut part of the picture will get a pair
- After pairing ,ask the participants to get conversant with each other. The participants can also sit outside.
- Give 15 minutes to get the introduction
- Write some essential points for introduction in a chart paper, as..
  - Name and address
  - Education
  - Hobby
  - If you have previous interaction, the give information about three special things.
- Once the time is over ,ask the participants to sit back their pairs and ask each couple fist to put the massage which has been getting from their card in front of

Topic: The purpose of the training program and expectation of the participants through the program.

Method:

- Let ask to write to each participants on a chart paper,whay they have come to this training program and what is their expectation.
- Put all the chart paper in the room and discuss it above.

Part A (Programme)

Objective of the training:

The India Mark II handpump is different from other handpumps and be installed in a slightly different way. Through this training we explain in detail the basic features of the India Mark II handpump, elaborating on the procedures for installation and maintenance. Checklists on the tools needed for installation and maintenance. The manual establishes the need for community-based maintenance and

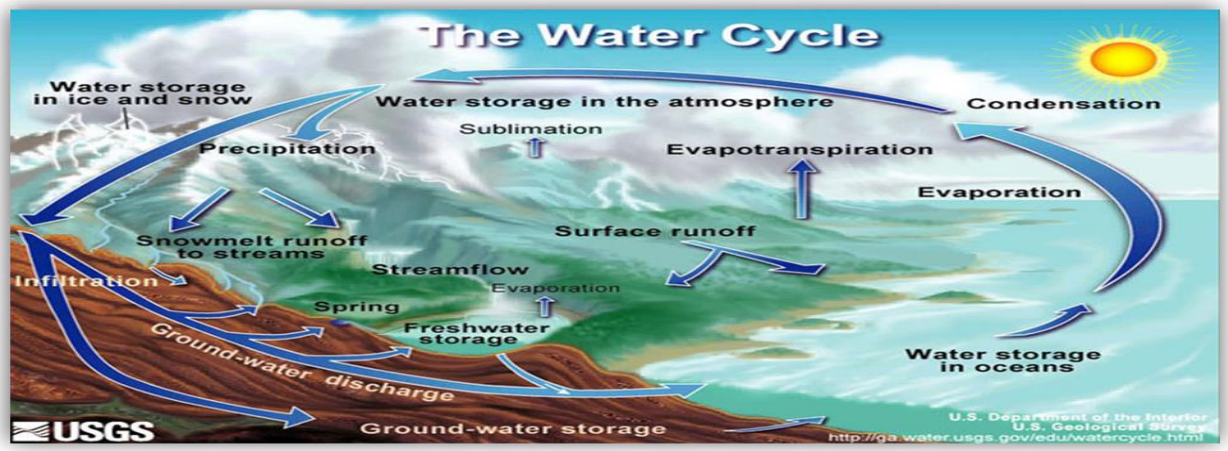
specifies the role of the Jalabandhus in preventive maintenance of the India Mark II handpumps installed.

Water Cycle:

Water circulates between the surface of the earth and the atmosphere and back to the earth's surface in what is called the hydrological cycle. Water evaporates from the ground, oceans, lakes arid streams, and transpires from plants into the atmosphere. There it is transported as clouds or humidity and precipitated again in the form of rain, snow hail or dew

A great deal of water contribution for beauty of the earth, because two-thirds of the earth is water and one-third is land. Out of two-third of water 97% is sea water ,2% is ice and only one percent is water that can be used by the people for drinking purpose.

About 2.5% of the Earth's water is freshwater. Of the fresh water, available on earth, only 31% is accessible for use. About 69% of the fresh water is in form of ice cap and glacier in places like the Antarctic and Greenland ice sheet, further reducing the quantity of the available drinking water. So, if only 31% of the fresh water is available for drinking, this means 31% of 2.5%=0.00775, which equates to less than 1%. Therefore, less than 1% of the earth's water is drinkable. In some areas, the glacier often melts in summer to provide additional drinking water. However, the amount of water from glacier melt is not sufficient to increase the available fresh water to above 1%

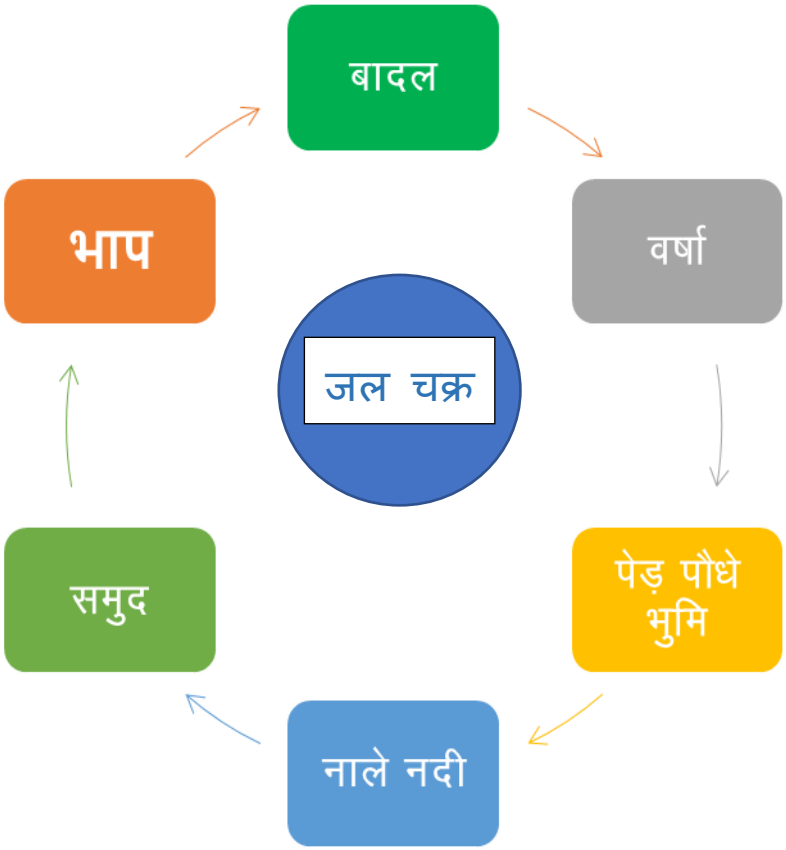


The water cycle is the path that all water follows as it moves around Earth in various forms. Liquid water is found in oceans, rivers, lakes—and even underground. Solid ice is found in glaciers, snow, and at the North and South Poles. Water vapor—a gas—is found in Earth's atmosphere

The water cycle begins with the evaporation of sea water. This water vapor is transferred by moving air. Under favorable condition, this vapor condenses and turns in to a cloud, which causes of rain. This is very much an exchange with the earth in the form of rain water or snow. Some part of the water that falls on the ground due to rain is temporarily absorbed or stopped. Some of this water goes back into the atmosphere and is cut off by the plant entering the atmosphere as vapor. Some part of this water

flows on the land through the surface of the soil in form of streams like River, Cannel and spring etc. A part of the water goes to the depth of the earth and becomes a part of the ground water. The surface water flows under gravitational force and the ground water grains flow towards the lower water and finally its immersion in the sea. A proven example of this the sweetening of well water in a seaside village.

After saturating in the soil, a portion of the rain water accumulates in the soil between the rocks, holes and in the middle of the cracks. This state of the water cycle is called ground water. We cannot be seen from the surface. Sometime its presence can be seen as a water fall on the surface of the earth. A part of the water fall joins the surface water and starts its journey in the form of water vapor. The rest goes back to the sea in a superficial way.



Topic: Safe Clean water

- water Source
- Water polluation
- Reason for Polluation
- Prevention of Polluation
- Water Quality

Method: Discussion, Explanation and Group work.

Purpose: Increase knowledge about the source of safe drinking water ,How to polluted it & how to protect the source from pollution and water quality.

Rules: Through discussion , explanation and group work this lesson should be done,like as –

- Distribute to all the participants in to four groups
- Ask a group to write the name of the water source.
- Ask the other group to write the reason for pollution of water source.
- Ask the third group to write measures to prevent water pollution
- Ask to fourth group to write water quality
- Give a chance to all four groups to discussed on selected topic.
- Share a film on History of Water or any related film.

Clean Water is the symbol of a healthy life. It has been proved by observation that about 80% of the diseases in India are causes by drinking water from uncontaminated water or by the misuse of water and its continuous misuse. If you think at the world level, either every third person is an Indian who does not get pure water or even if he does not get it easily. The good health also depends on personal habits. A person should wear clean clothes daily after bathing. Similarly, he should eat clean and fresh food to stay healthy and should only drink safe water.

For this we all have the desire for clean water. If the water we use at home is not pure, then there is a risk for us to effect of illness. Diarrhea, typhoid, cholera, dysentery, itching, polio, malaria and reddening of eyes etc., germs of diseases are found in the water itself. These germs reach from one place to another place through water, so keep these diseases from spreading with water, for this reason It's called water borne diseases. If a man uses uncontaminated water for drinking, avoiding contaminated water for domestic use, then he and his family can avoid water borne disease.

There is no care for cleanliness in the river, drain ,pond even open wells where people use water from such unsafe source, then people get sick. Repeatedly these diseases are also deadly.In urban area as well as rural area where peoples are depend on pipeline tap,if there is a hole in the pipe the contaminated water goes into the pipe line which is unprotected. That the reason for disease by contaminated water.

The problem of drinking water is unfluctuating more complicated in the summer, even similarly in rainy season the disease do not leave these place, because the dirty of the city flows with the water and come to these places. In the past, a large part of our mass society depended on such unsafe water sources to fulfill the needs of their daily lives and more or less still does it. It has been known from the surveys that the use of unsafe and contaminated water is at the core of 80 percent of the diseases. In the assessment of this fact, the government has decided to provide clean and safe drinking water to the urban and rural population. Initially the scheme was limited to drilling and installation of hand pumps over it. But the hand pump keeps above the surface of the ground. That's why the ground water is pollution free. So it is safe for drinking and domestic use being disinfected.

The Characteristics of the water of Handpump:

- Due to being very deep inside the ground or earth, the water of hand pump is very safe and clean.
- The water of hand pump is clean because of no leakage of dirty or unclean water due to the platform being made around hand pump.
- The water of this hand pump can't be polluted by man and animals, due to which the water is clean.
- It is known that the water of this hand pump is not contaminated by the air or other means, due to which it is safe and clean.

PARAMETERS OF SAFE DRINKING WATER

Water is defined as safe if it is free from biological contamination (guinea worm, cholera, typhoid etc.) and within permissible limits of chemical contamination (excess fluoride, brackens, iron, arsenic, nitrates etc) as per IS 10500:2012

Sl.No.	Water Quality Parameter	Maximum acceptable limit	Maximum permissible limit in the absence of alternative source

1	Appearance	Colourless	May be extended up to 50 if toxic substances are suspected
2	Turbidity	10 NTU	May be relaxed up to 25 in the absence of alternate
3	Odour	Unobjectionable	None
4	Turbidity (In NTU Scale)	5 NTU	10 NTU
5	pH	6.5-8.5	May be relaxed up to 9.2 in the absence
6	Alkalinity	200 mg/l	600 mg/l
7	Hardness	300 mg/l	600 mg/l
8	Chloride	250 mg/l	1000 mg/l
9	Fluoride	0.6-1.2	If the limit is below 0.6 water should be rejected, Max. Limit is extended to 1.5
10	Iron	0.3 mg/l	No Relaxation as per IS 3025 (Part 53)
11	Residual chlorine	0.2 mg/l	Applicable only when water is chlorinated
12	Total dissolved solids	500 mg/l	2000 mg/l
13	Arsenic (as As) mg/lit,	0.01 mg/l	0.05 mg/l
14	Nitrate as NO3	45 mg/l	No relaxation

BACTERIOLOGICAL STANDARDS

Water entering the Distribution system :

- Coliform count in any sample of 100 ml should be Zero.

Water in the distribution system :

1. E.coli count in 100ml of any sample should be zero.
2. Coliform organisms not more than 10 per 100 ml in any sample.
3. Coliform organisms should not be present in 100 ml of any two consecutive samples or more than 5% of the samples collected for the year.

Topic: The concept of cleanliness and different component of cleanliness

Method:

- Brainstorming, discussion, Explanation, group work and film show

Purpose:

- Clarify the concept of cleanliness.
- Getting information about the WASH to the participants
- Giving information to the participants about the seven aspects of WASH

Rules:

- Introduce the seven aspect of WASH
- Discuss each component of WASH and write the important things under it on the chart paper
- Should ask question to the participants that they can do any work related to the components of WASH that have been discussed so fat in their workplace.
- For their better understanding/getting details information, show them a film “Behetar

Swachhata Ki our’’ or related film.

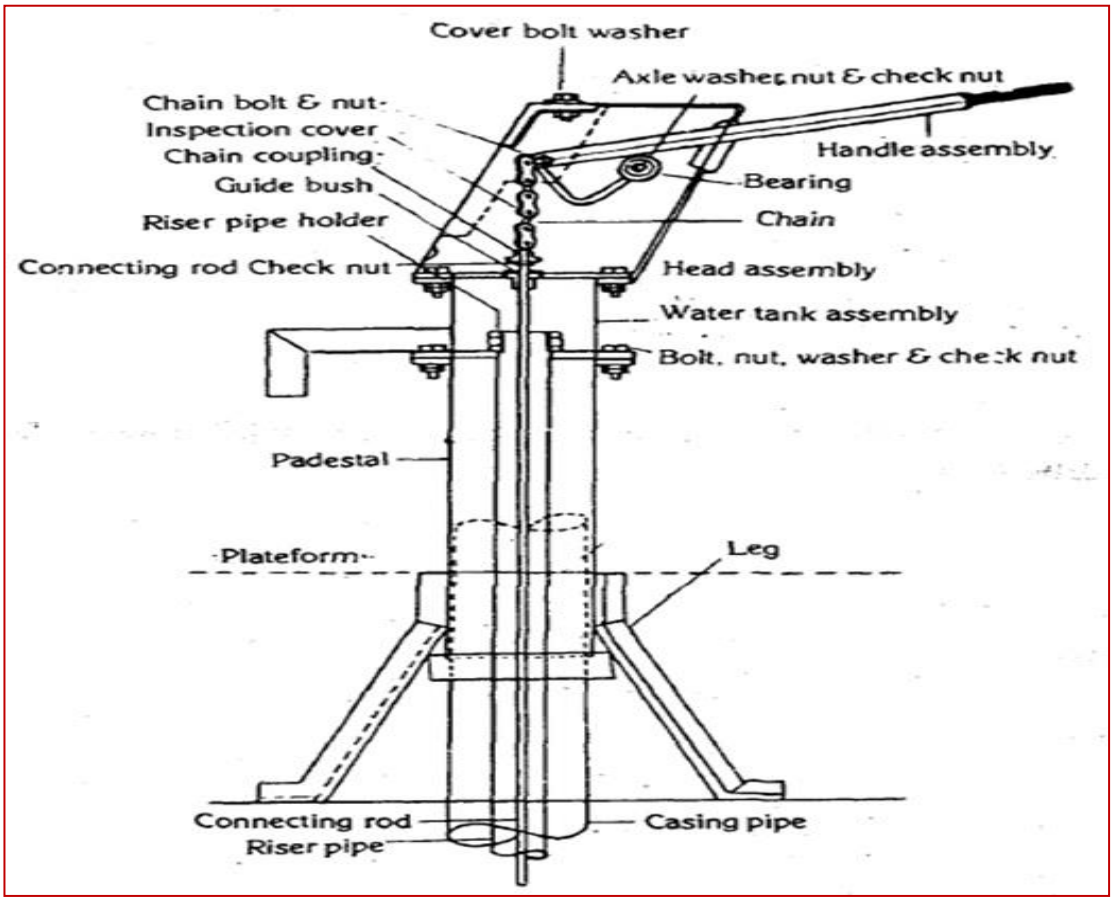
Part -B (Technical)

WORKING PRINCIPLE OF INDIA MARK-II HAND PUMP AND THEIR PARTS

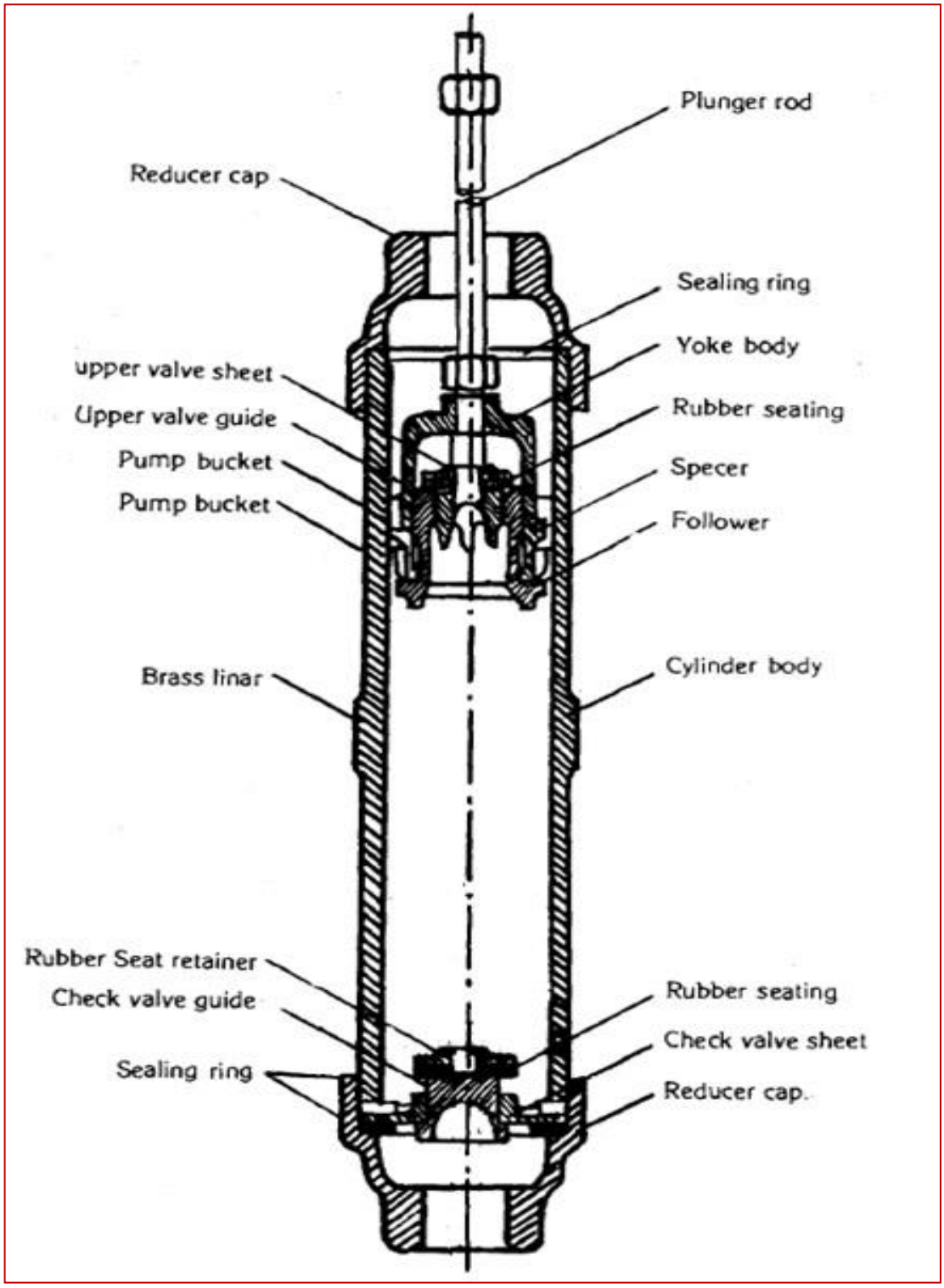
India Mark - II Hand Pump simply works on the principle of reciprocating pump. Its operation can be briefed as under: When the plunger is raised (upward stroke), the space in the cylinder below the plunger fills with air from the suction pipe. On the downward stroke the entrapped air is compressed between plunger and the bottom of the cylinder. Then air lifts the plunger valve and escape through the priming water. On the next up stroke, more air will be drawn out of the pipe and the water will rise higher. On the next downward stroke the plunger and valve pass through the water. When the plunger reaches the bottom of the cylinder and stops, the plunger valve closes, thus trapping the water above the plunger. The plunger will have lifted out from the pump.

The India Mark-II Pump can be divided by function into three main parts

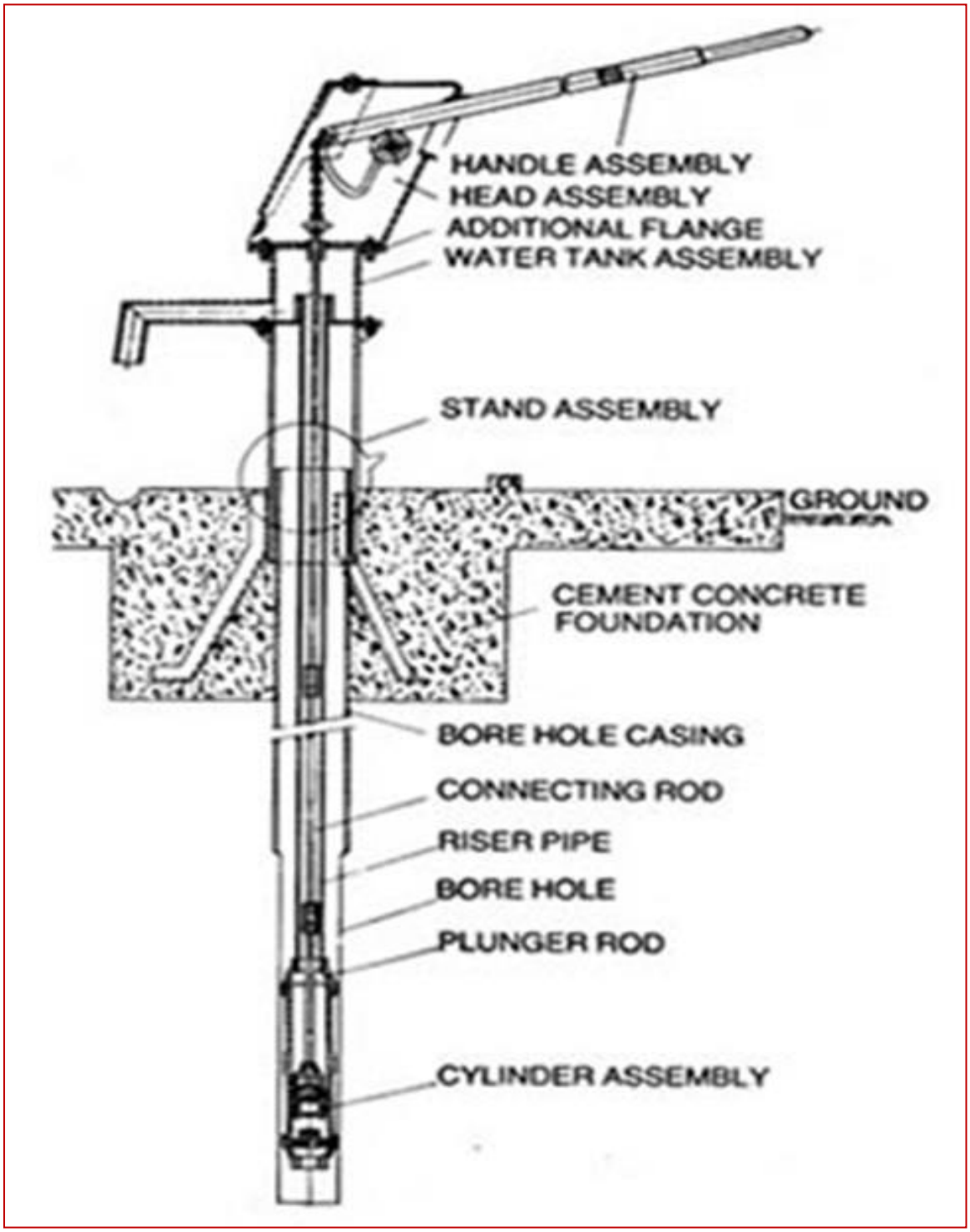
1. The Head Assembly at top of the bore-well (Pump head assembly)



2. The Pump Cylinder Assembly should be in contact with water, it should be below the water level as per the requirement (cylinder assembly)



3. The connecting assembly; which the pump stand and cylinder is connected with the help of riser main pipes and connecting pump rods (raiser rod).



PRECAUTION TO BE TAKEN BEFORE USING THE INDIA MARK-II HAND PUMP
To increase the life and for better performance of the pump, following points should be

remembered before using the Hand Pump:

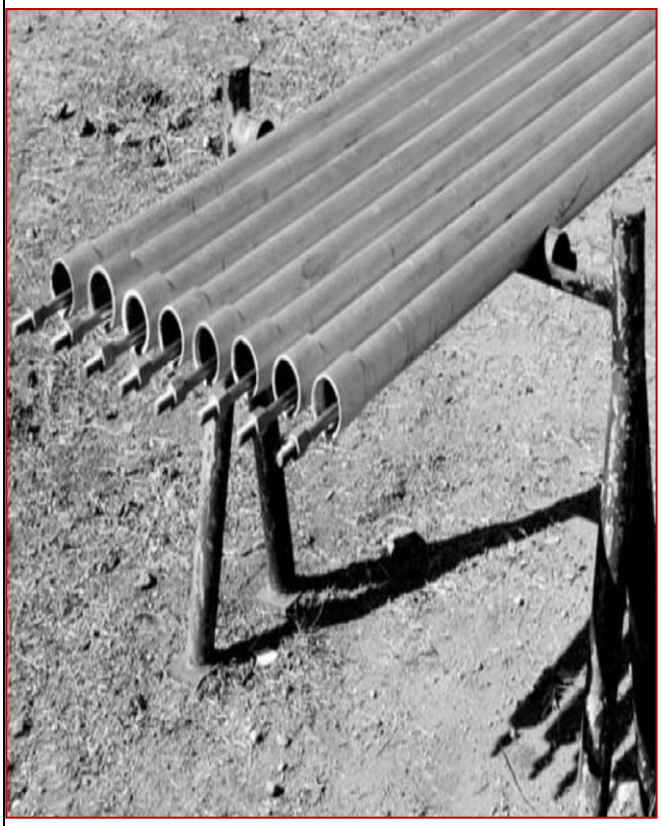
i. Do not use the Hand Pump roughly.
ii. Operate the pump handle with slow and long stroke.
iii. Try to keep the area around the platform dry and don't let water collect around the platform.
iv. Make proper arrangement for the disposal of waste water and if it is possible use the waste water for nearby gardening or by constructing soakage pit. It will avoid collection of waste water around the Hand Pump.

Soakage pit is easy to construct and can be made with locally available materials. It is a simple rectangular pit in which brick ballast of different size and soil is filled up in pit and waste water will fall in soakage pit through open channel: Waste water being absorbed in the soil of soakage pit. It does not allow to collect water nearby and also helps to make space clean.

Preparation Work Prior to Installation

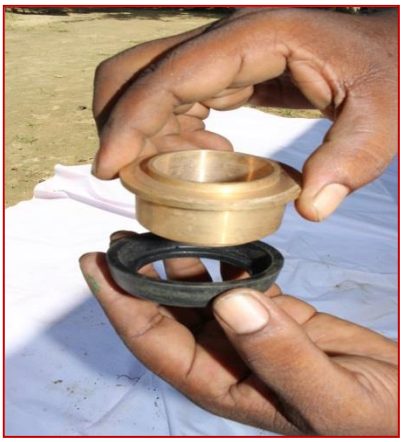
Riser pipes and Pump Rods

- **Step 1:** Check all pipe threads with socket for good engagement.
- **Step 2:** Check all pump rod threads with couplers for good engagement.
- **Step 3:** Apply hemp fiber with grease or sealing liquid to one threaded end of all pipes and attach one socket.
- **Step 4:** Place several logs or a pipe stand near the installation place.
- **Step 5:** Place all prepared pipes neatly on top of the logs or pipe stand (above the ground) so that all threads remain clean.
- **Step 6:** Introduce one pump rod to each of the riser pipes and make sure that the long hexagonal couplers are on the same side as the riser pipe sockets.



Pump Cylinder

Step 1: Assemble all components of the plunger

Place Rubber seating to the Upper valve	Attach a Cup seal to the lower part of the Spacer	Attach a Cup seal to the lower part of the Spacer
		
Figure-01	Figure-02	Figure-03

Attach another Cup seal at the top of the Spacer	Introduce the Follower into the Spacer	Place the Upper valve on top of the Assembly
		
Figure-04	Figure-05	Figure-06

Attach another Cup seal at the top of the Spacer	Introduce the Follower into the Spacer	Place the Upper valve on top of the Assembly

		
Figure-07	Figure-08	Figure-09

Step 2: Assemble all components of the check valve body.

Assemble Check valve with Check valve seat	Place Rubber seating	Secure with Seat retainer
		
Figure-10	Figure-11	Figure-12

Step 3: Assemble the Pump Cylinder

Prior to assembling check cleanliness of cylinder liner and clean all threads and prepare them

with sealing fluid or hemp fiber with grease (cylinder pipe and Reducer caps).

Place first Sealing ring into a Reducer cap	Introduce Check valve and place second Sealing	Attach the cylinder with liner to the Reducer cap
		
Figure-13	Figure-14	Figure-15

Introduce Plunger assembly into the Cylinder pipe	Place third Sealing ring and attach Reducer cap	Tighten both Reducer caps with pipe wrenches
		
Figure-15	Figure-16	Figure-17

Step 4: Leakage Test Proceed as follows-

• Immerse suction part of cylinder into a bucket with clean water • Operate the plunger by pulling and pushing the plunger rod • As soon as the cylinder is filled, place it in a vertical position and check for any leaks	 Figure-18

Preparation of "Above Ground Components"

Step 1: Assembling of Pump handle

Place first Ball bearing to Bearing mounting tool	Introduce Mounting tool into Bearing housing	Insert Spacer into Bearing housing
 Figure-01	 Figure-02	 Figure-03

Place second Ball bearing on Bearing mounting tool	Introduce Pressure plate on Bearing mounting tool	Add the hexagonal nut
		
Figure-04	Figure-05	Figure-06

Take two spanners (19 mm) and tighten the nut of the Bearing mounting tool, so that both ball bearings are pushed into their end position. If Ball bearings are mounted, remove bearing mounting tool.	 Figure-07

Step 2: Assembling of Pump head

Introduce the pre-assembled Pump handle into the Pump head assembly and place the Ball bearings near the Axle bushes at the sides of the Pump head.	 Figure-08

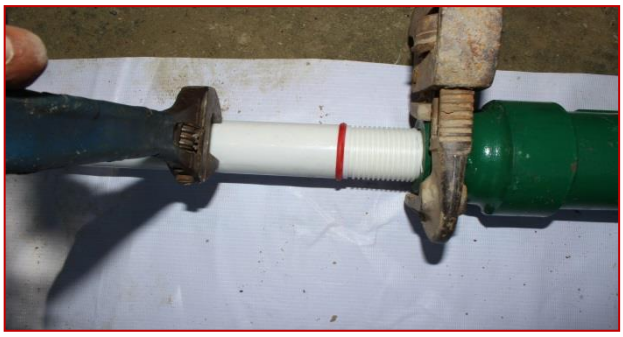
Knock the handle axle gently into the end position (use a plastic hammer if available).	 Figure-09

Introduce Axle washer and fasten one nut by hand	If the pump handle is moving smoothly (up- & down), take second nut as a check nut to secure the correct position.	
 Figure-10	 Figure-11	 Figure-12

Sequences of India Mark-II Hand Pump Installation

“Borewell Components”	
Step 1: Take the first riser pipe with pump rod from the logs. Place it horizontally on the pump platform and connect the pump rod to the plunger rod of the cylinder.	 Figure-01

Step 2: If the pump rod is tight, apply hemp fibers with grease, sealing liquid or Teflon tape to the pipe thread and screw the riser pipe into the reducer cap of the cylinder.	 Figure-02

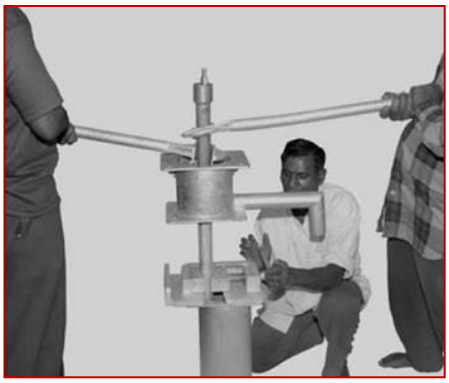
Step 3: Tighten riser pipe with reducer cap of the cylinder with two pipe wrenches.	 Figure-03

Step 4: Lower the first riser pipe with cylinder into the pump stand (by hand) until the riser pipe protrudes the top face of the pump stand by approximately 50 cm.	**Step 5:** Introduce the pipe vice and fasten the riser pipe in this position (ideal working height).	**Step 6** Take the second riser pipe with pump rod from the logs, connect the pump rods first and then the riser pipe after hemp fibers with grease, sealing liquid or Teflon tape has been applied.
 Figure-04	 Figure-05	 Figure-06

Step 7: With the help of the two lifting spanners, the rising main can be lowered after the pipe vice has been opened and removed	**Step 8:** Proceed in the same manner until the last pump rod and riser pipe is connected.	**Step 9:** At the end of the last riser pipe located in the pipe vice, the water tank will be attached. Therefore, take off the last socket of the last riser pipe and re-apply hemp fibers with grease or sealing liquid to the pipe thread.
 Figure-07	 Figure-08	 Figure-09

Please Note: As soon as the rising main is too heavy for being handled with the lifting spanners (5 to 10 pipe lengths), attach the pipe clamp and connect it with the hook of the chain block. Lower the rising main with the help of the chain block on the tripod until the height required (50 cm) for the next connection is reached!

Step 10: Then the water tank is screwed onto the last pipe end and tighten by hand.	 Figure-10

Step 11 (A): (For shallow installations, when rising main is not heavy). With the help of a short piece of riser pipe attached to the socket in the water tank, the entire rising main can be held in place with the help of 2 or 3 lifting spanners. As soon as the pipe vice has been removed, the riser pipe assembly with water tank can be lowered slowly to the pump stand flange.	 Figure-11
Step 11 (B): (For deep installations with heavy rising main assemblies). With a short piece of rope attached to the hook of the chain block, the water tank can be held securely in position, so that the pipe vice can be removed from the pump stand. Then the water tank with rising	 Figure-12
Step 12: Turn the water tank so that the spout is pointing into the required direction and tighten it properly to the pump stand with 4 x M12 bolts and nuts. Now the installation of the "above ground components" can start.	 Figure13

Installation of Components "Above the Ground"

Step 1: The protruding last pump rod needs to be cut to the exact length, so that the plunger connected is not knocking the check valve or the cylinder cap during pump operation.	**Step 2:** Use a hacksaw for marking the exact length of the last pump rod (at the top face of the water tank flange)	**Step 3:** Lift marked pump rod for easy cutting and fasten with connecting rod vice on the top flange of the water tank. Take a clean piece of cloth and wrap it around the marked rod, to prevent metal shavings or oil from falling into the well (contamination).
		
Figure-01	Figure-02	Figure-03

Step 4: Cut last pump rod at the mark	**Step 5:** Remove sharp edges and make a nice chamfer prior to threading	**Step 6:** Use little oil for cutting the M12 tread (40 mm long). As soon as thread is finished, remove cloth carefully and clean pump rod, vice and pump stand from remaining oil and shavings. Prevent shavings from falling into well
		
Figure-04	Figure-05	Figure-06

Step 7: Insert middle.	**Step 8:** Allow middle flanges to rest on top of connecting rod vice and fix the check nut on the newly threaded top rod.	**Step 9:** Screw the chain coupler on the connecting rod threads by hand.
 Figure-07	 Figure-08	 Figure-09

Step 10: Tighten check nut of connecting rod with the chain coupler.	**Step 11:** Insert chain coupler supporting tool below the chain coupler. Hold middle flange and remove connecting rod vice	**Step 12:** Carefully lower the middle flange to the top of water tank and ensure that all four corners coincide
 Figure-10	 Figure-11	 Figure-12

Step 13: Hold head assembly in position and insert chain through the hole in the bottom/ flange. Lower head on top of middle flange ensuring all four corners to coincide.	**Step 14:** Tighten head, middle flange and water tank with bolts and nuts.	**Step 15:** Lift handle up and attach free end of the chain with high tensile bolt, washer and "Nyloc" nut.
		
Figure-13	Figure-14	Figure-15

Step 16: Tighten "Nyloc" nut.	**Step 17: Make sure-**
 Figure-16	• That the connecting rod moves up and down freely. If it does not, the rod has been bent. Check the rod, • That the chain coupler is fully engaged on the connecting rod and that the lock nut is tight, • That the axle nut and lock nut on the handle are tight, • That the handle axle is firm in place, • That the "Nyloc" nut has been tightened securely with the chain anchor bolt, • That all 8 flange bolts and nuts are tight, • That nothing has been left inside the pump head (tools, cloth etc.).

Step 18: Lift handle up and apply grease on the chain.	**Step 19:** Fit inspection cover.	**Step 20:** Tighten the cover bolt.
 Figure-17	 Figure-18	 Figure-19

Step 22: Now the hand pump must be operated for first filling of the rising main pipe. Depending on the depth of the cylinder setting, the pump handle should have to be operated for many strokes (as an example: a 40.00 m. cylinder setting requires approx. 100 full handle strokes for filling the entire rising main)	

Step 23: As soon as the water is flowing from the spout; operate the pump for another 100 full strokes. Checks whether the water is clean (no oil or dirt). If the water is not clean, the pump operation needs to be continued until the water quality is acceptable (visually).
Step 24: If the water quality is acceptable (optically), the leakage test and the discharge test must be made.
Step 25: If the India Mark II Pump is working as expected, the users must be instructed in **"Operation and Maintenance" (O&M)** of their pump.
Step 26: Don't forget to fill the **"Installation Card"**.

TOOLS REQUIRED FOR DISMANTELLING / INSTALLATION OF INDIA MARK-II HAND PUMP

Pump dismantling may be required for rectification of any of the previously mentioned troubles. So, far as repair and dismantling of pump is concerned, it is necessary that one should arrange some special tools as detailed below:

Self-Locking Clamp/Locking Clamp: It will help at the time of pulling and lowering of riser pipe. If self-locking clamp (Figure-A) is not available, then arrange/fabricate two pieces of such type of clamp (Figure-B).

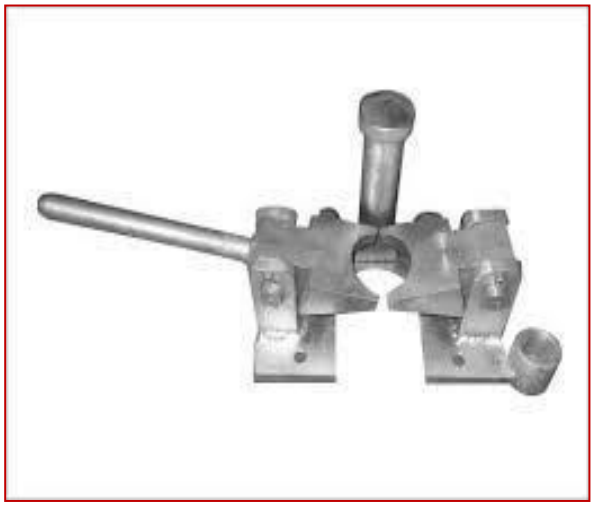


Figure-A

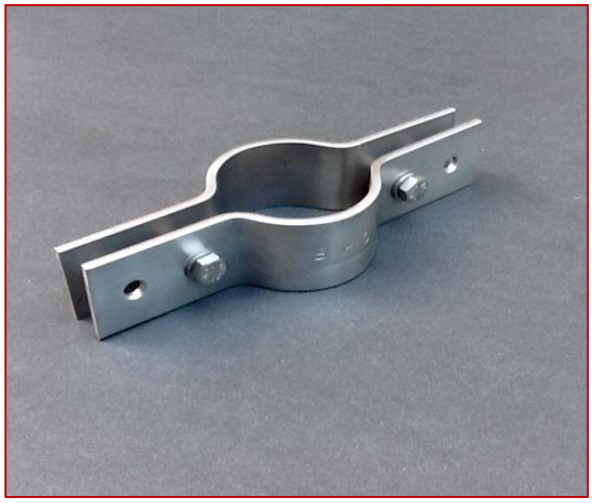


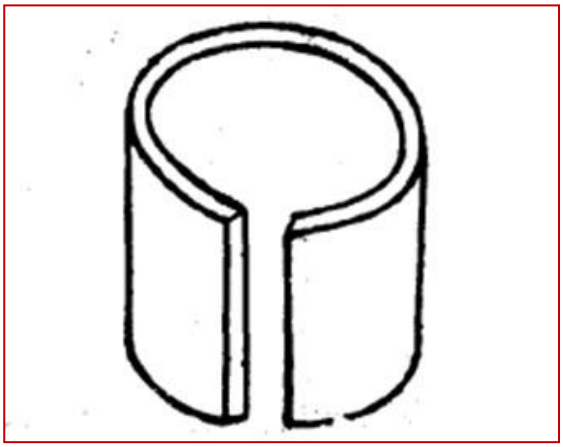
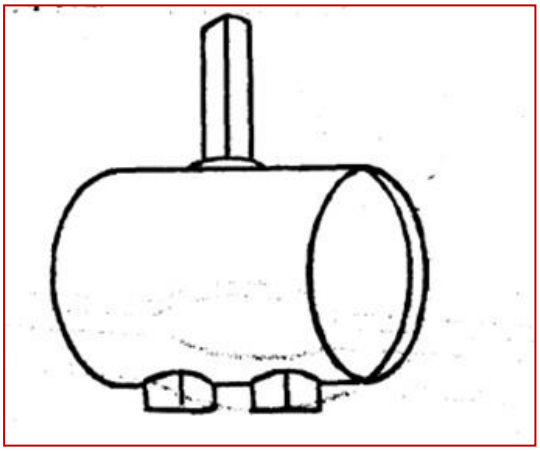
Figure-B

Pipe wrench, Slide Wrench and Spanners: Size as per requirement

Pipe Wrench

Slide Wrench

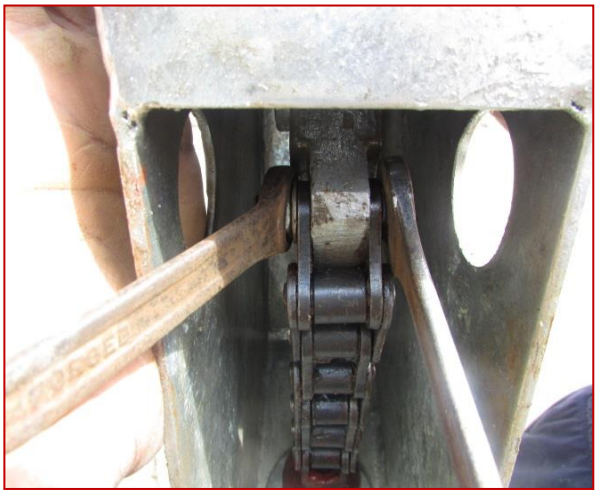
Spanners

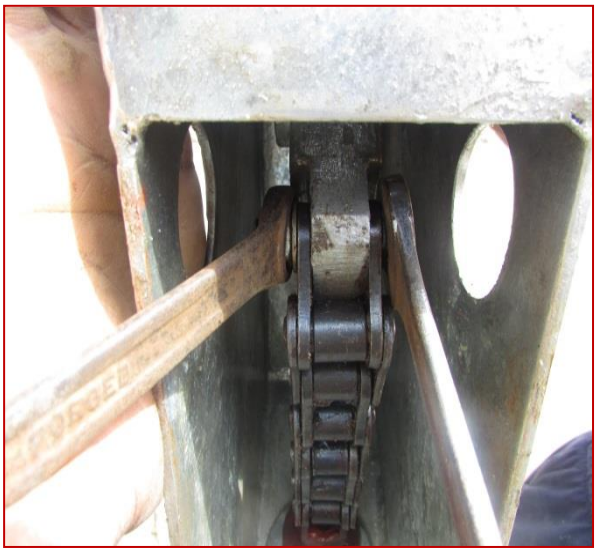
Tool for holding the Chain Coupler: It helps to attach the chain with handle and will be used between chain coupler and head assembly flange (Figure-C).	**Tool for lifting/lowering of the pump rod:** As per requirement, pump rod can be lift out with the help of lifting tool (Figure-D).
 **Figure-C**	 **Figure-D**

Pump rod vice: It is used for holding the pump rod at the time of repairing or thread cutting (Figure-E)	 **Figure-E**

Other general tools: Hammer, Screw Drivers, Punch and Pipe wrench etc.	
 **Hammer**	 **Screw Driver**

DISMANTLING OF PUMP

For dismantling of pump for repairing, at first remove the inspection cover from head assembly refer (Figure-F).	Fix the tool for holding the chain coupler inside the head assembly; refer (Figure-G).
 **Figure-F**	 **Figure-G**

Release the chain with handle after loosen up the nut and bolt in the upward position of the handle; refer (Figure-H).	Carefully release the handle axle by using the punch and hammer. Again, release the handle and flange bolts from head assembly. Insert the pipe spanners in both the side holes of the head assembly and lift the head assembly in upward direction, refer (Figure-I)
 **Figure-H**	 **Figure-I**

- Fix the pump rod vice in the flange of water tank after lifting of head assembly in upward direction and make assure the holding of pump rod with the vice
- Rotate the head after loosening the lock nut of head assembly. Remove the chain assembly and head assembly.
- Remove the pump rod vice after lifting the pump rod in upward direction with the help of lifter (pump rod clamp). Remove the lifter after lowering of pump rod in downward direction, refer (Figure-J)

Figure-J

- Again, hold the riser main pipe by self-locking clamp/locking clamp and remove the water tank after loosening of bolts of bottom flange of water tank

- Collect the riser main pipe and pump rod at a clean place after dismantling. Remove the self-locking clamp/locking clamp at the time of dismantling of last riser pipe and pump rod.

- Dismantle the last riser pipe and pump rod from cylinder by hand after pulling the last pipe connected with cylinder assembly and to the last pump rod.

- Check the all threads of the dismantled pump rod and riser pipe and remove the rust & dust with help of emery paper. If it is necessary, then make the new thread on the riser pipe/pump rod. If the pump rod has been damaged/bend, it is advisable to replace the old (damaged) pump rod by new.

REASSEMBLY OF THE PUMP

After repairing reassemble the pump properly-As per following Instructions:

- At first joint the plunger rod with pump rod (first pump rod) and pump cylinder with riser pipe (first pipe) and tighten property after applying the sealant on the threads. After tightening the pump rod and riser pipe if you feel there are excess sealant then remove it otherwise it will increase the impurities in the tube well.

- Then lower the cylinder, first pump rod & first riser pipe in the tube well through the pump stand assembly.

- Properly hold the riser pipe with the self-locking clamp/clamp. Again, joint the first pump rod with second pump rod and first riser pipe with second pipe and tighten it properly after applying the sealant on threads.

- Lower the pump rod and riser pipe slowly and slowly after loosening of locking clamp. Repeat the same process up to last pump rod and last riser pipe.

- Lock the last riser pipe with locking clamp

- Mount and tighten the water tank on the threads of last riser pipe

- Hold the riser pipe properly with the help of pipe wrench after tightening a small piece of pipe in the coupling of water tank. Release the locking clamp from stand (after loosening the riser pipe).

- Lower the water tank carefully in down ward direction and fix it on the flange of pump stand.

- Release the excess piece of pipe which is fitted in the coupling of water tank.

- Tighten the all four nut and bolts of the water tank & pump stand flange.

- Lowering the last pump rod carefully in down ward direction after fixing of lifter on the threads of last pump rod and hold it properly in pump rod vice.

- Release the lifter from pump rod after properly resting of pump rod vice on water tank.
- Lowering the pump head through pump rod in down ward direction up to pump rod vice and tighten the chain to pump rod (up to three or four threads only).

- Tighten the chain coupler by the revolving of pump rod.

- Put the chain coupler holding tool inside the pump rod.

- Allow the lowering of pump rod (after loosening of pump rod vice) up to resting of chain coupler on chain coupler holding tool.

- Release the pump rod vice after pulling the pump head in upward direction with the help of pipe spanners.

- Rest the properly pump head on water tank after carefully lowering of pump head in down ward direction.

- Put the handle assembly inside the pump head.

- Insert the handle axle inside the hole with the help of punch and hammer. Tighten the all nuts with the help of spanner.

- Connect the chain with handle and be sure that handle shall be in upward position at the time of connection.

- Tighten the nuts of chain & handle by spanner and make the proper lubrication on chain with grease.

- Make the handle in down ward direction and release the tool (tool for holding the chain coupler).

- Now, be assuring that all nuts & bolts are tighten properly and after assuring mount the inspection cover on head assembly and tighten it.

Finally, start the pumping but it is advisable not to use the water at the first delivery and after 10-15 buckets the water can be used.

As chlorination of tube well is necessary after repairing work therefore pour the chlorine solution into tube well. Remember that hand pump must not be used at least for six hours after chlorination.

THE STANDARD TOOLS REQUIRED BY A COMMUNITY HAND PUMP MECHANIC/JALBANDHU

Sl. No.	Tools	Quantity	Unit
1.	Button Die to Suit M12 x 1.75 Threads	1	No.
2.	Die Set for 32/40 mm. Pipe	1	No.
3.	450 mm. Pipe Wrench	2	Nos.
4.	M17 x M19 Double Ended/Single Ended Spanners (10 mm. x 12 mm.)	1	No.
5.	600 mm. Pipe Wrench	2	Nos.
6.	Screw Driver 300 mm. Long	2	Nos.
7.	10 lb. (ball Point Hammer)	1	No.
8.	Hack Saw Frame and Blade (300 mm.)	1	No.
9.	Injectable Oil Can (200 ml.)	1	No.
10.	Wire Brush	1	No.
11.	250 mm. Half Round File with Handle	1	No.
12.	250 mm. Flat File with Handle	1	No.
13.	Graphite and Lithium Grease	200	Ml.
14.	Slide Wrench	1	No.
15.	Nylon Rope (4 Strung)	75.00	M.

Safety during installation and repair works of Hand Pump

Safety should always be first on your mind. Much of the goal of training in water hand pump repair is learning how to accomplish a repair safely.

Following are a few things you must consider before you start any repair operation:

- Even with training, experience is always the best teacher. Even so, do not attempt to repair any pump with which you are not completely familiar.
- There are a few items to remember as a general approach to repairing hand pumps.
- Water hand pump repair should always begin with a plan. It would be a mistake to dive into a repair job without preparing properly to undertake the task.
- Safely getting the pump out and repaired requires teamwork and knowledge of water hand pump.
- As always, it is important to be sure to include the community in every aspect of a water project including repair of a broken water hand pump.
- There may be good reasons, unknown to those repairing the well that the well is not working.
- The community knows the history of the well and the pump, and is a vital source of information. The community needs to know that the pump is being worked on, what is being done to it, and why it is not in the well.
- Maybe there is nothing wrong with the pump. Maybe the well is dry or, if it is the dry season, maybe the water level has fallen below the intake of the water hand pump cylinder. Again, the people in the community can tell you if there are times of the year that water does come out of the well.
- If you are not familiar with the type of water hand pump you want to repair, there is a good chance that you should not even get into it. Don't try "experimenting" as a troubleshooting technique.
- Experience is the best teacher. The more experience you have as a water hand pump repair technician, the more likely it is that you will be able to handle the repair of an unfamiliar pump.
- Be sure to have the tools and parts on hand before you begin any repair job.

Worker's Safety

- Workers should all have hard hats on since there is a lot of steel overhead and things to bash you head on around the work site.
- Workers should also have gloves since they are handling steel that can have rough, sharp edges. Also, there are many opportunities to get your skin, finger, or hand pinched between pump parts.
- Parts and tools can be heavy, so wear boots to protect your feet.
- The other risk that is always present when pulling a pump from a well is the possibility of losing things back down the well. This can happen when disconnecting riser main sections. Riser mains should always be clamped so that they do not fall down the well.

- Also, pump rods need to always have a "T" handle attached to the top to keep it from falling into the well. Remember that the pump rod is connected to the pump cylinder.
- As you remove riser main sections from the well, set them on pieces of wood, off the surface of the ground, and in the order in which you took them out.
- Once you have removed all the riser main, pump rod, and pump cylinder, look down the well
- Be sure to emphasize that this pump belongs to the community and it is their responsibility to take care of it and get it repaired.

Preventive Maintenance of Hand Pump (IM-II)

Preventive maintenance of hand pumps having major role to sustain the operating systems of hand pumps. In General words we can say the preventive maintenance as **"CGT"** which defines the process of **Checking, Greasing and Tightening.**

Work with the community to help set up a program of preventive maintenance. Maintenance should be done on a pump and its surrounding area on a continual basis.

Preventive maintenance is a must. Preventive maintenance can ensure that serious breakage, malfunctions, and contamination do not occur and that they are detected and fixed before they force a shutdown of the water supply.

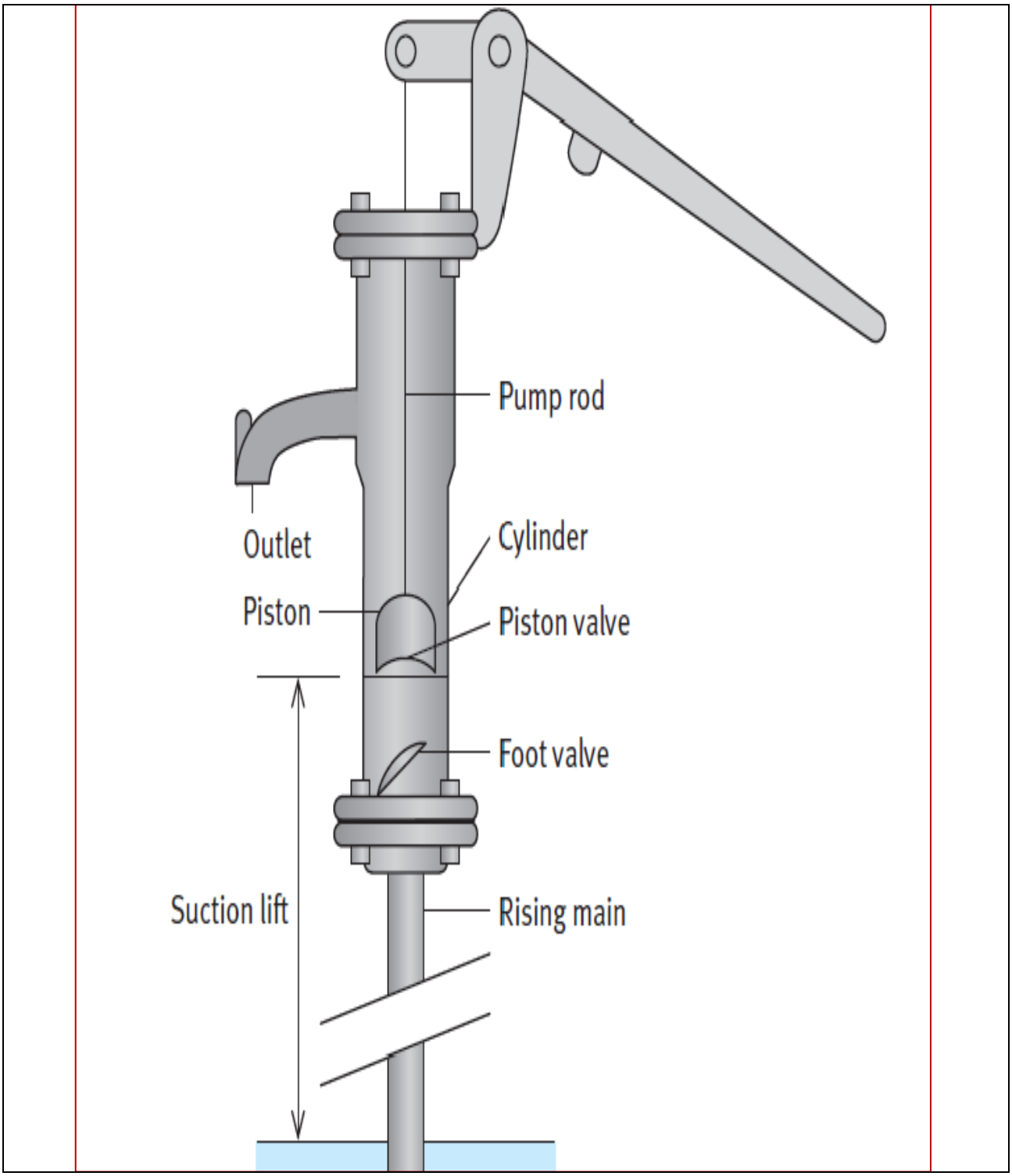
The capacity of a village to perform its own preventive maintenance can make the difference between a successful water project and loss of water altogether.

Some of the tasks that need to be addressed and scheduled at regular intervals include the following

Weekly	Monthly
Lubricate moving parts	Check pump flow rate and record results
Check and tighten nuts and bolts	Repair concrete base and apron as needed
Make sure the water hand pump is firmly set in the base	-----
Keep well pad and area around the well clean and neat	-----

Suction Hand Pump (PHE-6)

Working Principle:
On the up stoke of the piston the foot valve opens and suction brings water into the pump head. On the following down stroke of the piston the valve on the piston opens up and allows water to flow above the piston. On the successive up stroke of the piston water is pushed out of the outlet.


Pump rod
Outlet
Cylinder
Piston
Piston valve
Foot valve
Suction lift
Rising main