INDIA MARK III (VLOM) DEEPWELL HANDPUMP

INSTALLATION AND MAINTENANCE MANUAL

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ABOUT THIS MANUAL

This manual has been developed for use during training programmes on installation and maintenance of the India Mark III(VLOM) handpump for engineers and staff of the maintenance team of the Public health and engineering departments, VLOM mechanics and other personnel involved in the installation and maintenance of India Mark III handpumps.

The India Mark III handpump is unlike other handpumps and has to be installed in a slightly different way. This manual explains in detail the basic features of the India Mark III (VLOM) handpump, elaborating on the procedures for installation and maintenance. Checklists on the tools needed for installation and maintenance as well as the spares requirement for normal two year maintenance are given. The manual establishes the need for community based handpump maintenance and specifies the roles of the village handpump caretaker, mechanic and the back-up team in maintenance of the handpumps installed.

The manual has been developed specifically as a reference tool to be used during installation and servicing/maintenance of the India Mark III handpump.

INTRODUCTION

IMPORTANCE OF SAFE WATER

All forms of life are dependent on water in one way or another for survival. For health benefits in terms of reduced morbidity and mortality due to diseases it is important to use a source of safe water supply. Water from surface sources like rivers, lakes, ponds etc. is prone to contamination by animals and human beings. This contaminated water may be the cause of many water borne diseases. It has been revealed through many studies that improvement in water availability and quality have resulted in a substantial impact on the reduction of diarrhoeal morbidity.

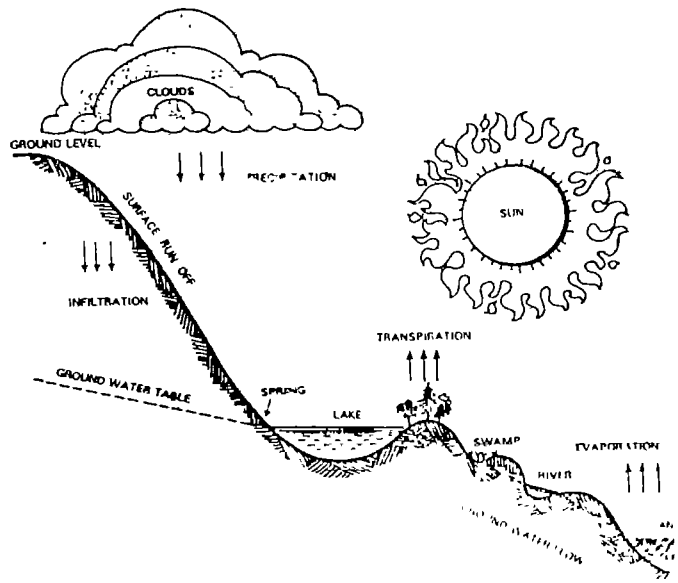
Improvement in	Percentage reduction in diarrhoeal morbidity
Water Quality	16%
Water Availability	25%
Water Quality & availability	37%
Excreta disposal	22%

(Ref : Interventions for CDD among young children, improving water supplies & excreta disposal facilities, Ersay, Feacham & Hughes - WHO Bulletin)

Hence, it is very important that the drinking water is safe and potable. The ground water from deeper strata is safe and dependable if the chemical compositions are within the limits. This is located and tapped by drilling tubewells to a depth of about 100 metres.

WATER RESOURCES

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 and 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. The hydrological cycle is illustrated in figure 1.



Whenever it falls on land, a certain proportion filters into the ground

and percolates through the pores and fractures in the subsoil and rocks to lower-lying parts of these formations. The volume open to hold and transmit such "groundwater" varies from fractions of one per cent upto 30 percent of the total soil and rock volume. Such groundwater can be accessed by digging (where the "Water table is shallow) or drilling vertically where the water table is deep and installing a tubewell.

In order to bring safe water in the tubewell above ground to the users, a village level operational and maintainable India Mark III hand pump is installed over the tube well. An India Mark III handpump with a good concrete platform, adequate drain and foot stand installed over the tubewell would prevent contamination of the safe tubewell water, ensure strong foundation and trouble free longer life of the hand pump.

The appropriately installed handpump with good concrete platform should be operated properly and maintained periodically by the users.

For longer life of the pump:

* The pump handle should be operated fully to the top and bottom for full flow of water.
* The handle chain should be lubricated with grease.
* The bolts and nuts with the pump should always be kept tight.
* The excess water from the pump should be disposed off to a garden or a soak pit.
* The pump surroundings should be kept clean.
* The community should safeguard the hand pump as their own property.

HANDPUMP : A SOURCE OF SAFE WATER

Why is water from a handpump better than water from other sources?

Water from streams, ponds, stepwells and open wells usually carry disease causing germs. In case of India Mark III deepwell handpump the water is drawn from deeper strata. The tube well is also sealed by the handpump so that harmful germs cannot enter. Hence the deepwell handpump is one of the safest sources of clean, potable water.

The handpump brings safe drinking water to the users. So it is important that the handpump does not fail. The handpump must work well and for a long time.

Why was the India Mark III handpump developed?

In villages, handpumps are used by many people. Sometimes they are used continuously for upto 18 hours a day. If the handpump breaks down, it may take from one to four weeks for the handpump repair & maintenance teams at the block level to carry-out the repairs. This may cause village communities to remain without a safe source of water for long periods.

The India Mark III (VLOM) handpump was developed to overcome this difficulty. This handpump is made of very strong materials and it seldom breaks down. The handpump can be easily repaired by village mechanics with simple tools and minimum skills. This handpump can also be maintained by village women themselves with a few simple tools and little training. Thus India Mark III handpump is more suitable for Village Level Operation and Maintenance.

Why is proper installation of the handpump so important?

A properly installed handpump will provide safe, potable water to the users throughout the year. If the handpump is installed correctly, it will work properly and will need very little maintenance. Proper installation will lead to fewer breakdowns and hence the handpump users will be provided with a source of safe drinking water.

Do you drink only safe water? Do you set an example to the villagers?

Only water from a deep well handpump or water which is known to be safe should be used for drinking purposes. This is important for your own benefit and for that of your family members particularly children. When you work to install a handpump in the village, the villagers will often offer you drinking water. Befor drinking the water they offer you must inquire about its source. If it is from an open well, pond or a stream, don't drink it. Tell the villagers that you drink only handpump water, because it is safe. Advise them to do the same. In this way, you will set an example to the villagers. The villagers can see that you are healthy. They can see that you only drink protected water. You do what you say. Your example will show the villagers that safe water is linked with good health.

In this way you can teach the villagers some very important things. You can teach them to value their hand pumps more and to look after their handpumps better.

Then the handpumps which you install will work better and last longer. And so your work will become easier and the villagers will stay healthy.

Many children will grow up healthier because you provided them with safe drinking water. You can be proud of your work.

What should you tell the villagers when you install or repair a handpump?

Here are four important things about handpumps. You should help the villagers to understand these things.

One:

Water from a handpump is safer than water from other sources. Water from rivers and ponds can contain disease carrying germs. If we drink this water, we can get ill. The water from a handpump is protected from disease causing germs as it comes from deeper strata and is not prone to surface contamination. So, if we drink water from a handpump, we will stay healthy.

Two:

People must use their handpumps properly. You should show the villagers how to use the handpump correctly.

Three:

People must maintain the handpumps installed in their villages themselves so that the handpump does not breakdown frequently.

Four:

The villagers must contact the village handpump mechanic if their hand pump breaks down. The mechanic can undertake most of the minor repairs within the village using the tools and spares available . For attending to major replacements and overhauling the Block maintenance team can be contacted. You should advise the handpump mechanic exactly whom to contact and how to contact in case of a major breakdown.

VILLAGE LEVEL OPERATION AND MAINTENANCE (VLOM) CONCEPT

The experiences of people engaged in rural water supply programmes all over the world especially by WORLD BANK, UNICEF, UNDP and other donor agencies during the IDWSS decade have lead to the development of handpump concepts and detailed designs that can accommodate probable workload and conditions of use in the field, limitations on maintenance and repair, industrial facilities available and the realities of the scale of demands. One concept that has developed is the VLOM concept. VLOM means "Village Level Operation and Maintenance". Under the VLOM concept, lot of efforts have been made to design and develop hand pumps with the following criteria :

* The borehole designed and constructed in a manner appropriate to the handpump and local conditions.

* Routine maintenance can be done by the user community, which decides when to carry out repairs, who does it, and who will be responsible for paying for the repairs.

* Minor repairs can be carried out at village level by villagers themselves with minimum skills, training and tools.

* Handpumps are robust and reliable under field conditions.

* Handpump manufacture, installation and maintenance is cost effective.

The VLOM principles have been well received by the Government of India and State governments as well as Bureau of Indian Standards and hand pump manufacturers who quickly responded to the reliability problems identified in laboratories/field testing at various places and worked to develop hand pumps which can be easily repaired by hand pump caretakers or local mechanics. The outcome of such an effort is the modification of the India Mark II hand pump to meet the principles of the VLOM concept. This modified version of the India Mark II is named as India Mark III (VLOM) handpump.

The India Mark III (VLOM) hand pumps are now supplied and successfully installed in large numbers in many States. Feed back from field confirms that India Mark III is a VLOM hand pump in all aspects fulfilling the principles of the concept.

WATER QUALITY PARAMETERS

These are the water quality standards summarised from WHO International Standards for Drinking water. Only the most important parameters are presented.

Parameters (1)	Undesirable effect that may be produced (2)	Highest desirable level (3)	Minimum Permissible level (4)
A. PHYSICAL :			
Colour (Units)	Discolouration	5	50
Odour	Odours	Unobjectionable	Unobjectionable
Taste	Taste	Unobjectionable	Unobjectionable
Total Solids (mg/1)	Taste Gastrointestinal irritations	500	1500
Suspended Matter (Units)	Turbidity Gastrointestinal irritations	5	25
B. CHEMICALS			
pH (Units)	Taste	7.0 to 8.5	6.5 to 9.2
Calcium (mg/l)	Excessive Scale formation	75	200 600
Chloride (mg/l)	Taste Corrosion in hot water systems	200	
Fluoride (mg/l)	Mottling of teeth Disfiguring of skeletons	1.0	1.5
Total hardness as mg/l of CaCO3	Excessive scale formation	100	500
Mineral Oil(mg/l)	Taste Odour	0.01	0.30
Phenolic subs.(mg/l)	Taste	0.001	0.002

C.TRACE ELEMENTS			
Arsenic (mg/l)	Toxic	—	0.05
Copper (mg/l)	Astringent taste Discolouration Corrosion of pipes; fittings and utensils	0.05	1.5
Cyanide (mg/l)	Toxic	—	0.05
Iron (mg/l)	Taste Discolouration Constipation Turbidity Growth of iron Bacteria	0.1	—
Lead (mg/l)	Toxic	—	0.1
Manganese (mg/l)	Taste Discolouration Turbidity Deposits in pipes	0.05	0.05
Zinc	Astringent taste	5.0	15.0
D.PESTICIDES			
DDT (mg/l)	Toxic	—	0.05
PCB	Toxic	—	Nil

The test characteristics of drinking water have been given in the annexure.

INDIA MARK III (VLOM) HANDPUMP

BASIC FEATURES

The India Mark III (VLOM) handpump can be used in deepwell conditions upto 50 mtrs. The India Mark III (VLOM) handpump (IS : 13056) is identical in design to the India Mark II deepwell handpump (IS : 9301) except the open top cylinder, 2 1/2" (65mm) riser pipe and water tank holder to suit the 65mm riser pipe (refer to the adjacent figure for sectional details). The India Mark III (VLOM) handpump has the following lead features -

Pump head

* The pump head is provided with a centre hole of 75 mm dia on the bottom flange.
* The handle assembly has a 70 mm dia bearing housing.
* An additlonal 6 mm plate welded with guide bush is provided separately.
* Stroke length of 125 is provided.

Water Tank

* Water tank assembly is fitted with 65 mm NB coupling to suit the 65 mm NB GI riser pipe.
* Water tank height has been increased by 25 mm to offer more storage and prevent overflow due to an increased stroke.
* Pedestal height has been reduced by 50 mm to a more convenient pump height for the user.

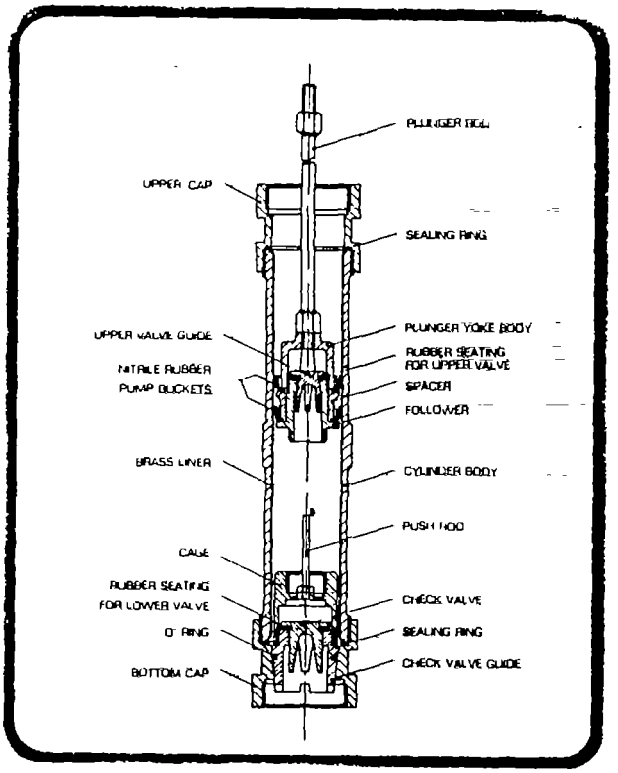
Cylinder

* 65 mm ID cast iron open top cylinder with brass liner is fitted with a bottom end cap to suit check valve and top end cap to facilitate extraction of plunger and check valve assemblies for repairs with out lifting the riser main.
* Nitrile rubber washers are provided in place of leather in the piston assembly.
* The cylinder assembly has a top cylinder cap to suit 65 mm NB medium class riser pipe, and the bottom cylinder cap has a conical housing to receive and pickup the check valve. The top end cap is threaded to suit 65 mm NB threads while the lower end cap has 50 mm NB threads for use of short filters. No pipe is required to be installed below the cylinder.
* The cylinder height is increased to 355 mm as against 304 mm for the India Mark II handpump.

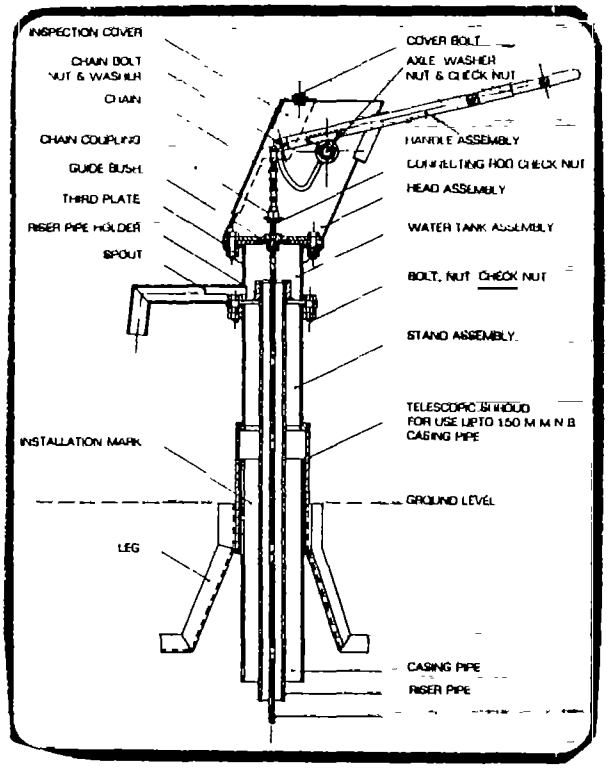
* Upper guide valve and check valve are two piece valves.
* Special design for conical housing and pickup check valve design.
* The spacer is modified with collar to centralise the nitrile bucket washer.

By providing an open cylinder, the connecting rods and plunger assembly with cup washers can be pulled out without removing the riser pipes. This enables easy repair and maintenance work at the village level. Further, by providing an additional plate on the pump head, the complete pump head assembly with the handle can be easily removed and fixed. This also makes maintenance simpler. Even a village mechanic with some skills can repair this pump with simple tools, whereas in other handpumps, special tools and more trained mechanics are required to carry out maintenance and repair activities.

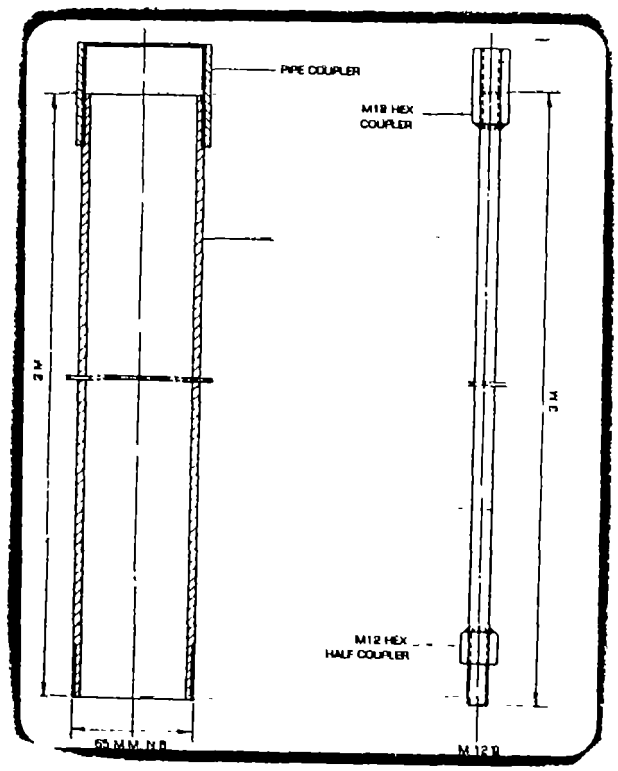
SECTIONAL DETAILS OF CYLINDER ASSEMBLY



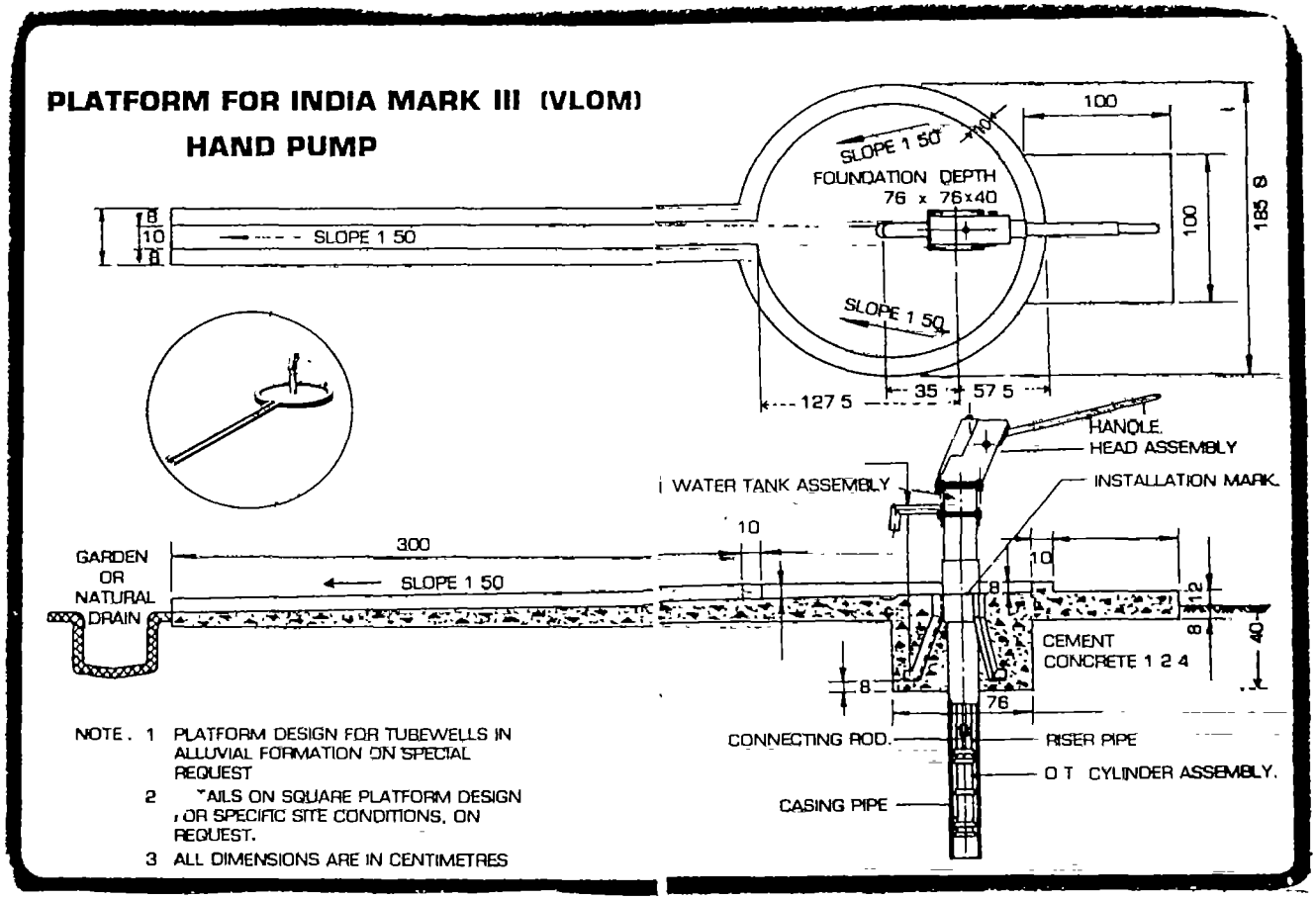
SECTIONAL DETAILS OF PUMP HEAD ASSEMBLY

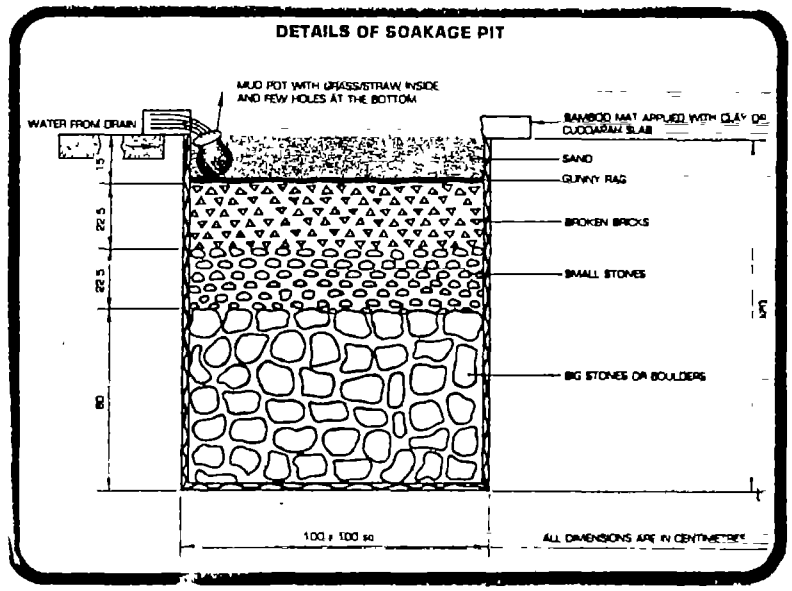


DETAILS OF RISER PIPE AND CONNECTING ROD



DETAILS OF HANDPUMP PLATFORM AND SOAKAGE PIT





BIS PUMP AND PIPE STANDARDS

The following standards formulated by BIS are available for the India Mark III (VLOM) handpumps and riser pipes.

1. IS 13056 - 1991 - Deepwell handpump specifications.

2. IS 1239 - Part 1 1979 - Specifications for mild steel tubes, tubular and other wrought iron fittings.

Riser pipe specifications for India Mark III (VLOM) deepwell handpumps :

GI pipe used for the handpump will be of 65 mm NB GI screwed and socketed of medium grade, Hot dipped galvanised pipe conforming to IS 1239 (Part 1) - 1979. Each riser pipe shall be of 3 metre length with a tolerance of +0, -25 mm with tapered thread on both ends.

The sockets used for the above riser pipes shall be manufactured from seamless pipe or machined from solid bar conforming to grade Fe401-S of IS 1239 (Part 2) -1982 and shall be hot dip galvanised. One end of the riser pipe shall be fitted with hot dip galvanised socket and the other with a thread protector.

Galvanised coating on the tubes shall be in accordance with IS 4736 - 1968.

SPECIFICATIONS FOR INDIA MARK III (VLOM) DEEPWELL HAND PUMP

A. GENERAL REQUIREMENTS

1. The material, tolerances, etc., shall be as given in respective figures.

2. The bolts and nuts used for handpump assembly shall conform to IS 1367 (Part 14) : 1984.

3. The riser pipe holder welded in the water tank shall be machined from seamless tube or solid bar conforming to Grade Fe 410 S of IS 226:1975.

4. a. The riser pipe shall be 65 mm nominal bore, hot dipped galvanized, screwed and socketed in 3 metre length with a tolerance of +0/-50 mm conforming to IS 1239 (Part 1) 1979 medium class. One end of the riser pipe shall be fitted with hot dipped galvanized socket and the other with a thread protector.

   b. The socket shall be manufactured from seamless pipe or machined from solid bar conforming to Grade Fe 410 S of IS 226 : 1975 with the dimensions (length and diameter) as specified in IS 1239 (Part 2) :1982 and shall be hot dipped galvanized.

5. The welding shall be done in accordance with IS 9595:1980. Welding for stainless steel components shall conform to IS 2811:1987.

6. The castings shall conform to Grade FG 200 or higher grade of IS 210:1978.

7. The bronze castings shall conform to Grade LTB 2 of IS 318:1981.

8. The connecting rod shall be of 12 mm diameter conforming to bright bar of type 4 and Grade 2 of 3 of steel other than free cutting steel conforming to IS 9550:1980. The electro-galvanizing shall conform to service condition No.4 of IS 1573:1986. Alternatively, the connecting rod may be manufactured from stainless steel Grade 04 Cr 18 Ni 10 conforming to IS 6603:1972.

9. The steel plates/sheets, angle iron and square bars for fabrication of pump shall conform to Grade Fe 410 S of IS 226:1975.

10. Polytertraflouroethylene (PTFE) tape or equivalent shall be used on the riser pipe joints before installation.

11. Plunger rod of 12 mm diameter shall conform to Grade 04 Cr.18 Ni 10 of IS 6603:1972.

12. The connecting rods and plunger rod shall be fitted with HDPE thread protectors at ends before despatch.

B. ANTI-CORROSIVE TREATMENT

1. Electrogalvanizing

a. The following shall be electrogalvanized and passivated conforming to service condition No.4 of IS 1573:1986.

1. Connecting rod,
2. Bearing spacer,

b. All bolts, nuts and washers in the assembly except high tensile bolts shall be electro-galvanized and passivated conforming to service condition No.3 of IS 1573:1986.

2. Galvanizing

The following assemblies/parts shall be hot dip galvanized according to IS 4759:1984:

a. Stand assembly
b. Water tank assembly
c. Head assembly
d. Handle assembly, and
e. Third plate.

The galvanized assemblies shall be given chromate conversion coating Type C as per IS 9839:1981.

3. Painting

The exterior surfaces of cast iron components shall be given the following treatment.

a. One coat of red oxide primer, conforming to IS 2074:1979.
b. Two coats of synthetic enamel paint conforming to IS 2932:1974.
Chain assembly shall be boiled in graphite grease for better anti-corrosion.

C. TESTING

1. Sampling

Unless otherwise specified in the contract or order, the procedure given in IS 2500 (Part 1) : 1973 shall be followed for sampling inspection. For the characteristics given under D2, the single sampling plan with inspection level III and AQL of one percent as given in Tables 1 and 2 of IS 2500 (Part 1):1973 shall be followed.

2. Visual and Dimensional Tests

a. All the pumps shall be examined for finishing and visual defects.

b. All critical dimensions of the assemblies shall be checked for conformance with the figures.

c. The handle shall have reasonably good surface contract with the top and bottom portions of the bracket.

d. Riser pipe holder shall be checked for vertically. Plain round mandrel of 300 mm length shall be screwed to the water tank coupling and the verticality shall be checked with the help of tie square. For the entire length of the mandrel a maximum of 1 mm tilt may be allowed.

e. The flanges shall be reasonably flat to provide proper matching of the holes to ensure unrestricted insertion of the bolts.

f. After putting the pump on perfect level over the platform, alignment of the rod with respect to the guide bush shall be checked as given below.

g. A rod of 100 mm length and 12 mm diameter shall be fitted to the chain coupling. The handle shall be raised and lowered gently. The rod shall pass through the guide bush freely.

h. The handle shall be checked for lateral play at the end of square section of handle which shall not exceed 2 mm on either side.

i. The clearance between the handle and the bracket shall not be less than 1.5 mm.

j. The stroke of the pump shall be 125 +- 4 mm.

k. The connecting rod and plunger rod shall be examined for straightness

and the formation of the threads. The hexagonal coupler shall also be subjected to similar checks. The hexagonal coupler shall be stress relieved before welding to avoid cracks since these are manufactured from cold drawn bars.

l. The manufacturer shall produce test certificates of all the raw materials of the components.

m. When pump head assembled with handle assembly, it shall be possible to insert handle axle by using soft hammer. The fitment of the bearing and inner race of the bearing shall rotate freely.

n. The cylinder assembly shall be checked for leakage of water. The cylinder shall be filled with water and water level is checked after 5 minutes. There shall be no leakage of water.

o. The check valve and plunger valve shall move freely after assembly.

3. Routine Tests

Two complete pumps including cylinder out of the batch selected shall be subjected to the following tests in addition to the tests in D.2. above.

a. The pumps including cylinder assembly shall be dismantled and all the components shall be checked in detail for critical dimensions conforming to the drawings.

b. The cylinder assembly (other than those selected for dimensional checks) of the pumps shall be placed fully submerged in a barrel of 200 litres water capacity. The pump shall be printed and test shall start only after getting continuous flow of water through the spout. The water shall then be collected in a container for 40 continuous strokes to be completed in one minute and the discharge thus measured shall not be less than 15.0 litres.

4. Criteria for Conformity

The lot shall be considered conforming to the requirements of this specification if the pumps selected according to D.1 and D2 satisfy the following requirements.

a. The number of pumps not meeting the requirements of a characteristic inspected under D.2 does not exceed the corresponding acceptance number as specified in IS 2500 (Part 1):1973.

b. The pumps selected according to D3 meet the requirements as given in 3(a) and 3(b).

5. Guarantee

The pump and accessories shall be guaranteed for 12 months from the date of installation or 18 months from the date of supply whichever is earlier against bad workmanship/bad material. The life of rubber components shall, however, be guaranteed for only 6 months from the date of supply.

6. Marking

a. The pump head, cylinder and connecting rod shall be marked as under.

b. The pump head shall have a name plate with the name of the manufacturer and serial number of the pump head assembly. In addition the head flange, the third plate, the water tank assembly top flange shall have steel punch impression of manufacturer's identification mark before galvanizing. The impression shall be deep enough so that they shall not be covered under galvanizing.

c. The cylinder body shall have manufacturer's identification mark, marked in raised letters. The serial number shall be marked on the cylinder by steel punch.

d. Each connecting rod shall have steel punch impressions indicating manufacturer's identification mark, month and year of manufacture on the 50 mm long hexagonal coupler.

e. Each cylinder shall be marked with 'OTC' with minimum 10 mm letter sizes.

7. Packing

a. Unless otherwise specified in the contract or order, the packing shall be according to IS 12732:1989.

b. Riser pipes shall be packed as laid down in IS 4740 : 1979.

c. The chain shall be smeared with graphite grease prior to despatch.

d. An extra hexagonal nut should be attached to chain for use of locking the last connecting rod with chain coupling.

SITE SELECTION CRITERIA

SITE SELECTION CRITERIA

Proper site selection is essential to ensure optimal utilization of the handpumps for drinking and cooking water. Proper selection based on community involvement constitutes the basis for their participation in the process of installation, use and maintenance of handpumps.

The total population in a village (habitation/hamlet) is taken as the basic unit of reference to decide, on a flat rate basis, the target population in the rural drinking water supply programme. For this purpose a village-wise list of habitations/hamlets and their respective populations is prepared. Thereafter, the handpump site selection for the different habitations/hamlets is carried out with involvement of the people. The criteria for site selection are enumerated below.

However, as socio-economic conditions and patterns of habitations vary from village to village, no uniform site selection criteria can be applied in all cases.

* The number of handpumps should be worked out on the basis one for an average population of 150 people with a provision that the minimum distance of the handpump will not be more than 0.5 km.

* In case of hamlets, if the population of the individual hamlet is less than 50, one handpump should be provided.

  If there are a number of hamlets with populations less than 50 in each, the handpump(s) should be installed at site(s) which is/are equidistant from the hamlets . However, the distance should not be more than 0.5 km from each habitation.

* The handpump site should always be accessible socially. For public gathering places like markets, panchayat offices, bus stands, etc. additional handpumps may be provided.

* Wherever possible, the site selected should be on the way to traditional water sources, where womenfolk go for bathing and washing. This will facilitate collection of drinking/cooking water from the handpump while returning to their homes.

* The handpump site should be on Government land. Where it becomes absolutely necessary to locate a handpump on private land, prior written consent of the private land-owner, in the proper form, should be obtained beforehand. Sample of Land Agreement Form is attached in **Annexure I.**

* The handpump site, if located on private land donated by the land-owner, should be clearly demarcated so as to facilitate access by the users.

* Site should be selected in areas with enough land to construct the standard platform and drain. Activities that are normally carried out near a drinking water source should not be hampered due to less space.

* The handpump site should be so located that it facilitates the drilling work for installation of tubewell/handpump. It should be away from overhead electrical lines, telephone lines and trees as far as possible.

* The handpump site should have scope for satisfactory drainage to a nullah, river, tank, kitchen garden, etc. In case of disposal of drainage water to a kitchen garden, owner's consent should be obtained beforehand.

* The trend of the future growth of the village should be given due consideration in selecting the site so as to give the maximum possible benefit to the future beneficiaries.

* A village plan showing the location of the existing safe sources should be prepared. The proposed locations for the handpumps should be marked on the plan after considering the various criteria. This will help to distribute the handpumps rationally, increase accesibility and reduce distance to source.

PEOPLE'S PARTICIPATION

Proper selection with community involvement is important for their participation in the process of installation, use and maintenance of the handpumps.
People's participation in site selection may be ensured in the following manner.

* Constant interaction with villagers to enquire about some possible sites.

* Interaction with women and local leaders to identify the most suitable site.

* Involvement of people from the potential beneficiary zone during the conversations and discussions.

* Special attention to women's perspective with matters of their concern like distances and surroundings of the proposed handpump sites (Will they feel free to go there?).

* Creation of opportunities for the community members to freely and openly express their views on community problems.

* Obtaining consensus among the beneficiaries through group discussions. The WATSAN committee should be involved in this process.

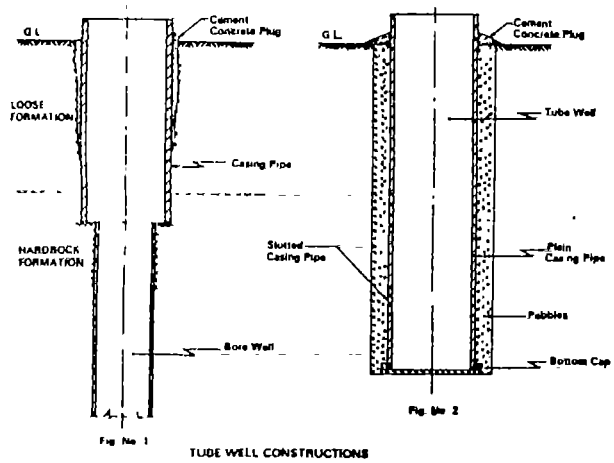
Pre-conditions for installation of India Mark II & Mark III handpumps

A handpump is a pumping device. The borewell yields water to the hand pump. The well also serves as housing for the handpump. The borewells on which a handpump is to be installed must yield sufficient water to the pump, and should have large enough diameter to facilitate free installation and removal of the pump assembly,

Now a days, India Mark II and India Mark III handpumps are well provided on the drilled for the village water supply.

For installation for India Mark III handump the well should be minimum 45-50 m deep and should have minimum diameter of 100 m through the depth, and should yield minimum 1000 lph discharge. To facilitate proper installation the casing pipe should extend atleast 20 cms. about ground level. However, since the 65 mm in case of Mark II handump - the well should have minimum 115 mm diameter, and should have been provided with 125 mm casing pipes.

Sanitary protection of well is equally important. And hence before installation of the hand pump - the annular space around the casing pipe be grouted using cement.



TUDE WELL CONSTRUCTIONS

In desertic areas a separate cattle trough may be provided along with the handpumps. In such cases the platform design maybe altered accordingly. However, waste water from the handpump should not be used as drinking water for cattle.

TOOLS AND ACCESSORIES

INSTALLATION TOOLS

Special tool kit

The special tool kit for installation of the India Mark III VLOM handpumps comprises of the following:

1.	2 1/2" Self-locking clamp	-	1 no.
2.	2 1/2" Heavy duty clamp	-	1 no.
3.	2 1/2" Water Tank pipe lifter	-	1 no.
4.	Connecting rod coupling spanner	-	1 no.
5.	Handle axle punch	-	1 no.
6.	Connecting rod lifter 'T' type	-	1 no.
7.	Connecting rod lifter 'Socket' type	-	1 no.
8.	Check valve lifting adapter	-	2 nos.
9.	2 1/2" pipe lifter	-	3 nos.
10.	Connecting rod vice	-	1 no.
11.	Chain coupler supporting tool	-	1 no.
12.	Bearing mounting tool	-	1 no.
13.	M6 ring spanner	-	1 no.
14.	Tool box [to accommodate all the above items except item nos. 1,2 and 9]	-	1 no.

TOOL NO.1 - SELF LOCKING CLAMP:

This tool should be used for holding the riser pipe while lifting or lowering. While lifting the pipes, the handle of self-locking clamp need not be opened. It is fully automatic and the jaws open and close automatically.

TOOL NO.1 - HEAVY DUTY CLAMP/VICE :

While lowering the pipes, the jaws should be opened slowly and pipes should be lowered with the help of pipe lifters. Never try to open the jaws unless the lifters are on the pipe and load is being taken by them. Insert the pipe lifters' handle in the self-locking clamp socket and lock one pipe wrench as shown step 7 of risre pipe installation. This eliminates one person who is otherwise required for unscrewing and tlghtening the riser pipes.

TOOL NO.3 - TANK PIPE LIFTER:

This tool should be used to lower or lift the water tank with the riser pipe [Refer step 11 of riser pipe installation].

To use this tool, screw it on to water tank coupling. and use 2 or 3 lifting spanners equally spaced on the tank pipe lifter to raise or lower water tank assembly.

TOOL NO.4 - CONNECTING ROD COUPLING SPANNER

This tool should be used for tightening and unscrewing the connecting rod coupler, faster and with ease [Refer step 2 in installation of check valve, plunger, connecting rods and pump head]. It reduces the effort required for the operation.

TOOL NO.5 - HANDLE AXLE PUNCH:

This tool is used for fixing and driving out the handle axle without damage to axle threads.

A. While fixing the handle axle, the sequence is as under:
   i. One person should hold the handle parallel to the ground.
   ii. Insert the handle axle punch through axle left bush and bearings.
   iii. Insert the handle axle through right axle bush so that threaded portion goes into the handle axle punch.
   iv. Hold the handle axle punch by one hand and hammer gently the handle axle.
   v. Hammer the handle axle till threaded portion comes out through left bush. The handle axle punch would have come out by then.

B. For driving out the handle axle the operation sequence is:
   I. Remove axle nuts and washers.
   II. Insert handle axle punch on taper portion of axle.
   III. One person should hold the handle parallel to the ground.
   Iv. Hammer gently handle axle punch until you are able to pull out axle by hand.

TOOL NO.6 - CONNECTING ROD LIFTER 'T' TYPE:

This tool should be used for raising or lowering the last [top] connecting rod [refer step 9 in installation of check valve, plunger, connecting rods and pump head].

   I. Cut threads on the top of the connecting rod, if no threads are on it.
   II. Screw the tool to the connecting rod threads with check nut.
   III. Lift or lower the connecting rods as required.

TOOL NO.7 - CRANK SPANNER:

The crank spanners are used for tightening or loosening flange bolts, check nuts, chain nyloc nut and anchor bolts, cover bolt, axle nuts, etc.

TOOL NO.8 - PIPE LIFTERS :

This tool is used to ralse or lower riser pipes. These lifting spanners are suitable for 65mm (2 1/2" dia) pipes (refer step 11 under riser pipe installation).

i. Pipe lifters should be spaced equally around the rising main.
ii. Use two lifters to lower or lift upto 30 meters of rising main.
iii. Use three lifters if the riser pipes are more than 30 meters. Do not use pipe wrenches for lifting or lowering the riser pipes.
iv. You can also use one lifting spanner to lock the pipe with the help of a pipe wrench.

TOOL NO.9 - CONNECTING ROD VICE:

This tool is used for lowering or lifting the connecting rod and for holding the same while connecting rod is cut and threaded. Used to hold connecting rod while unscrewing and screwing the same. (refer step 4, 5 and 6 under installation of check valve, plunger, connecting rods and pump head).

TOOL NO.10 - CHAIN COUPLER SUPPORTING TOOL:

This tool should be placed between the chain coupler and the bottom flange of head assembly to facilitate easy fixing of chain on to the handle assembly. The entire weight of the handpump is supported by this tool (refer step 19 and 23 under installation of check valve, plunger, connecting rods and pump head).

TOOL NO.11 - CONNECTING ROD LIFTING ADAPTER:

This tool should be screwed on to the top connecting rod and bolted on to the handle then the handle is pulled downward suddenly. It will help in releasing check valve assembly together with the plunger assembly in case of 'O' ring in the check valve assembly is tightly jammed) against cylinder bottom cap which in turn releases the water column in the rising main to facilitate the removal of piston and check valve assembly.

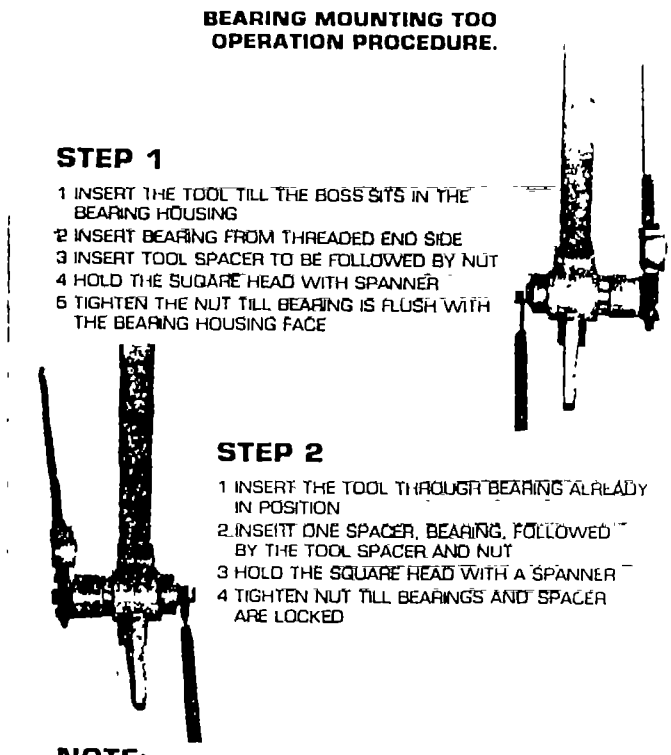
TOOL NO.12 - M16 RING SPANNER:

This tool should be used for loosening or tightening the push rod in the check valve assembly in the cylinder.

TOOL NO.13 - BEARING MOUNTING TOOL:

With the help of this tool bearings can be fitted very easily in the bearing housing of handle assembly.

BEARING MOUNTING TOOL OPERATION PROCEDURE



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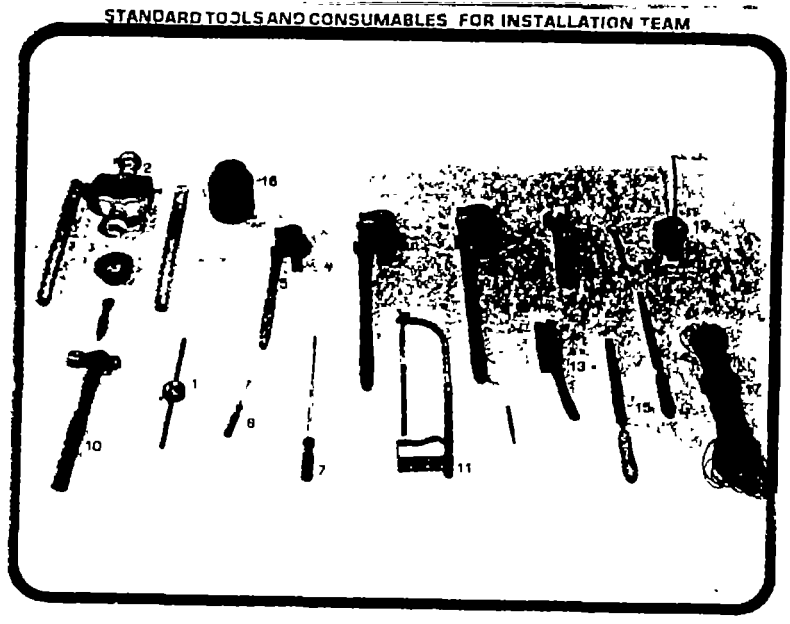
Standard tools and consumable

A tool kit comprising the following standard tools is recommended for the installation team.

1.	M12 x 1.75 pitch button die with die holder	-	1 set
2.	Die set of 2 1/2" 0 (65 mm N.B.) pipe with holder	-	1 set
3.	36" (900 mm) pipe wrench (stilton type)	-	1 No.
4.	600 mm pipe wrench (stilton type)	-	1 No.
5.	450 mm pipe wrench (stilton type)	-	1 Nos.
6.	M17 x M19 double ended spanners (10mm x 12mm)	-	2 No.
7.	Screw driver 300 mm long	-	1 No.
8.	Screw driver 150 mm long	-	1 No.
9.	250 mm adjustable spanner	-	1 No.
10.	1 Kg (approx) ball pen hammer with handle	-	1 No.
11.	300 mm hacksaw frame with spare blades	-	1 Set
12.	Pressure type oil can with oil	-	1 No.
13.	Wire brush	-	1 No.
14.	250 mm half round file with handle	-	1 No.
15.	250 mm flat file with handle	-	1 No.
16.	Graphite grease or multipurpose grease	-	1 Kg.
17.	Nylon rope (3 mm thick)	-	75mtrs.

NOTE: In addition to the above, a pair of pipe stands are also recommended to be kept with the mobile team.

Shuttering India Mark III platform shuttering unit - 1 No.



Masonry tools and consumable

The following masonry tools are recommended to be kept with every installation team:

1.	Metal scoop (Big and Small)	-	2 sets
2.	Metal pan	-	4 Nos.
3.	Spade	-	3 Nos.
4.	Crow bar	-	2 Nos.
5.	Metal spirit level 250 mm	-	1 No.
6.	Wooden levelling plank (small and large)	-	2 sets
7.	20 litre bucket	-	2 Nos.
8.	2 litre mug	-	2 Nos.
9.	3 mtr. metal measuring tape	-	1 No.
10.	Quick setting compound	-	5 Kg. or 5 litres
11.	Pedestal cover plate	-	3 Nos.
12.	Bleaching powder	-	1 Kg.

MAINTENANCE TOOLS AND ACCESSORIES

Village mechanic tool kit.

The following tools are recommended to be kept with Handpump mechanics for normal maintenance.

1.	TOOL BOX/CANVAS BAG	-	1 no.

This bag is handy to accommodate all the tools and essential spares needed for repair.

2.	Connecting rod vice	-	1 no.
3.	Chain coupler supporting tool	-	1 no.
4.	Connecting rod lifter 'T' type	-	1 no.
5.	Rod Coupling spanner	-	1 no.
6.	Check valve lifting adapter	-	1 no.
7.	M17 x M19 double ended spanner	-	1 no.
8.	300 mm pipe wrench	-	1 no.
9.	250 mm screw driver	-	1 no.
10.	250 mm flat file with handle	-	1 no.
11.	M6 box spanner with handle	-	1 no.

[used for loosening or tightening the push rod in the lower assembly in the cylinder.]

12.	Handle Axle Punch	-	1 no.
13.	Bearing mounting tool	-	1 no.
14.	Ball pein hammer with handle		1 no.
15.	Hacksaw frame with 6 blades		1 no.
16.	M12 x 1.75p die with die holder	-	1 no.
17.	M17 x M19 Crank spanner	-	2 nos.

The spares shown in illustration are kept alongwith handpump mechanics tools in the same tool box. For details on these spares, please refer to Spare requirements.

Caretakers spanners

Fishing tools

Fishing is nothing but removing fallen pump components from the tubewells.

The fallen components can be referred to as the "FISH". In order to take out or "FISH OUT THE FISH", suitable 'nets' or fishing tools are required. To select a suitable "Fishing Tool", the following points have to be considered:

* Diameter of tubewell
* Depth of tubewell
* Depth at which the top of the component is lying inside the tubewell
* Type of component on top of the fallen assembly
* Size and diameter of component on top of the fallen assembly.

The 'fish' or the fallen components are of three types in general:

* G.I. pipes with couplings
** G.I. pipes without couplings or threads
*** Connecting rods

The fishing tools are designed and manufactured to fish out the components listed above in general.

TOOL NO.1 - ROD HOOK:

This tool is used to extract fallen connecting rods from a tubewell. To extract fallen connecting rods, lower this tool into the borewell by joining the tool to external connecting rods till the time the tool touches the connecting rod in the tubewell. Rotate the tool till the time the rod coupler in the fallen rod gets caught in the hook. Now lift the tool slowly without jerks.

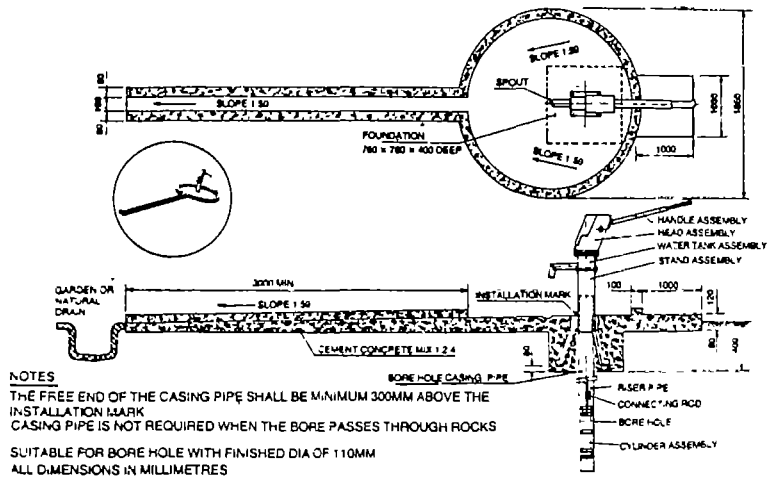
TOOL NO.2 - PIPE LIFTING TOOL 'A':

This tool is used to extract a single pipe or a column of riser pipes fallen into a tubewell and the top pipe is with a coupler.

INSTALLATION PROCEDURE

PLATFORM CONSTRUCTION

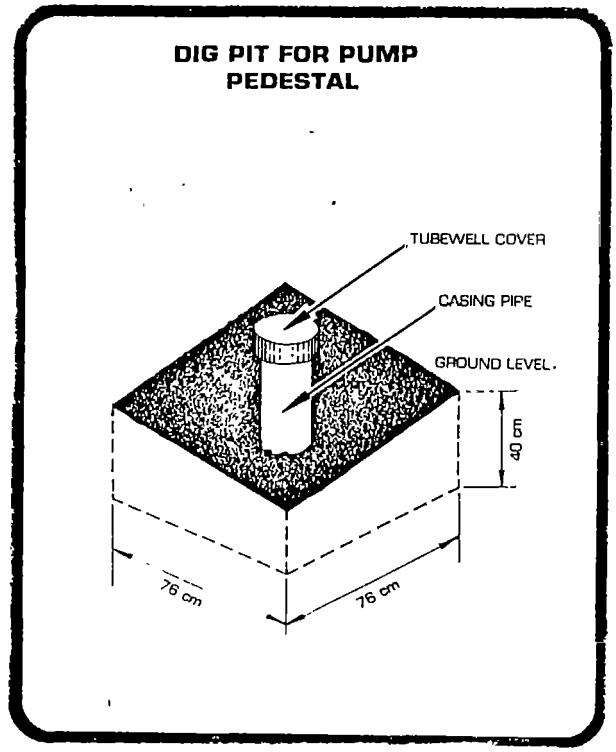
LAYOUT OF THE PLATFORM



STEP 1

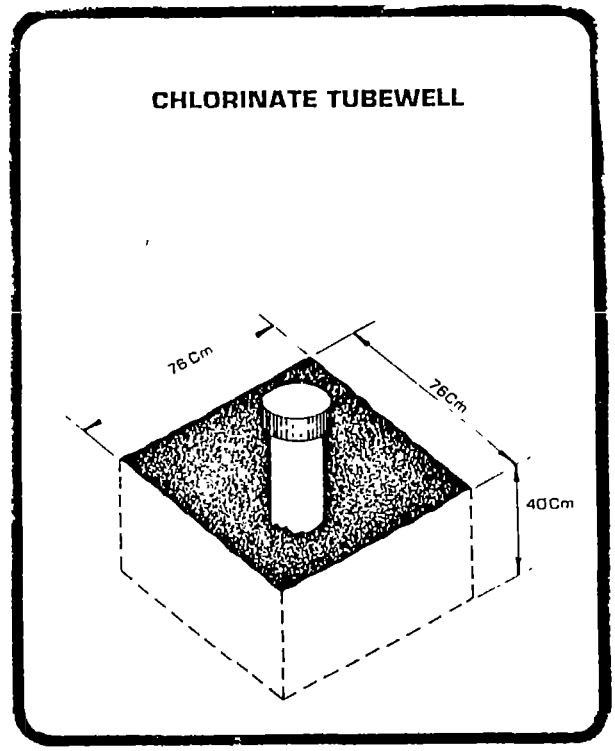
DIG A PIT FOR THE PUMP PEDESTAL

REMOVE THE TUBEWELL CASING PIPE COVER, MEASURE DEPTH OF TUBE WELL, STATIC WATER LEVEL AND ENSURE THAT THE TUBEWELL IS FREE FROM OBSTRUCTIONS.



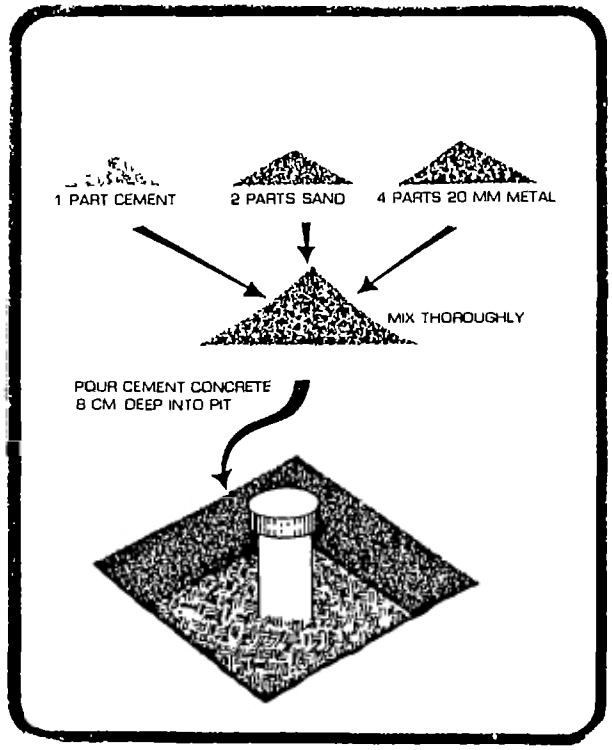
STEP 2 CHLORINATE TUBEWELL

MIX 300 GMS OF BLEACHING POWDER IN 15 LITRES OF WATER IN A BUCKET, STIR WELL AND POUR INTO THE TUBEWELL FOR CHLORINATION

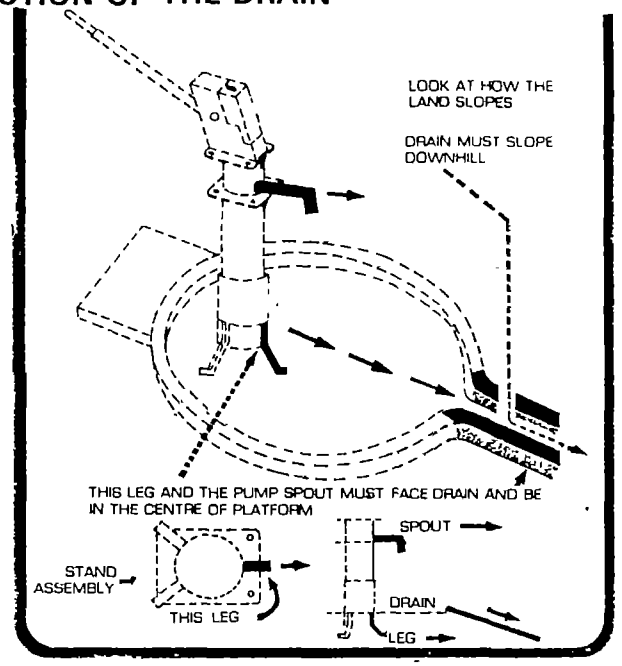


STEP 3 PREPARE CEMENT CONCRETE MIX

1 PART CEMENT, 2 PARTS SEND,
4 PARTS 20 MM METAL MIX THOROUGHLY
& POUR CEMENT CONCRETE UPTO 8 CM
INTO THE PIT.

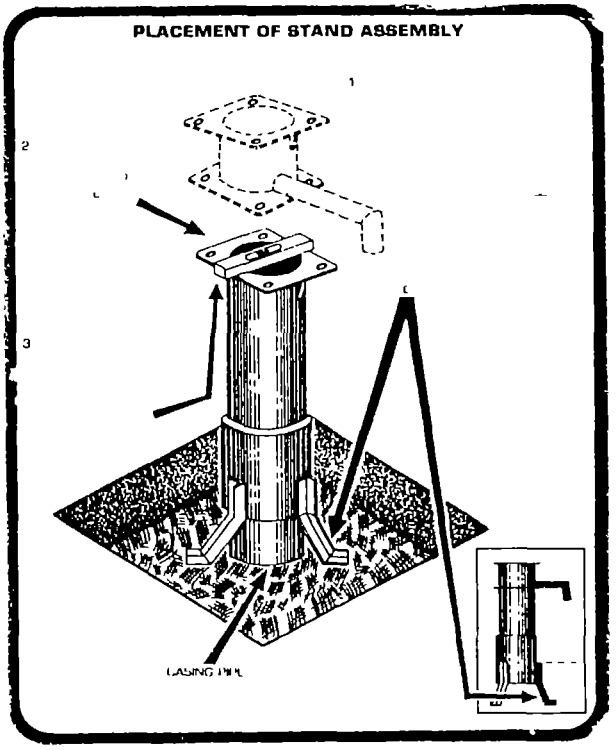


STEP 4 DECIDE THE DIRECTION OF THE DRAIN



STEP 5 PLACEMENT OF STAND ASSEMBLY

1. REMOVE TUBEWELL COVER
2. PLACE STAND ASSEMBLY OVER CASING PIPE SO THAT....
3. USE A SPIRIT LEVEL TO MAKE SURE THAT STAND ASSEMBLY IS VERTICAL WHEN YOU FIT WATER TANK, SPOUT WILL BE OVER THIS LEG IN THE CENTRE OF PLATFORM

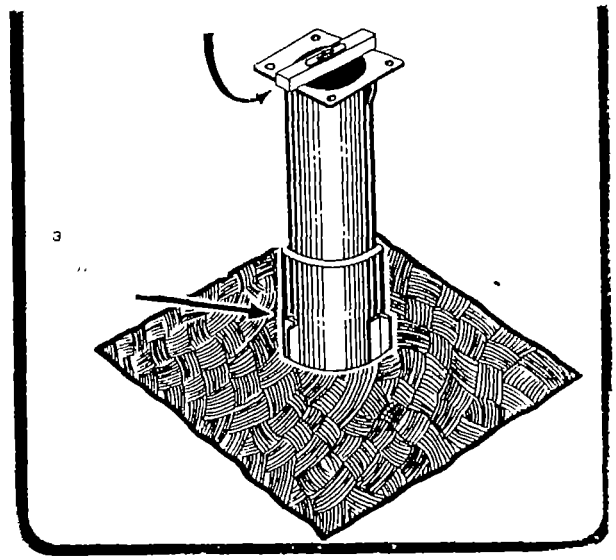


STEP 6 LEVEL STAND ASSEMBLY

1. FILL PIT WITH CONCRETE & RAM TO GET THE AIR BUBBLES OUT OF CONCRETE.

2. USE SPIRIT LEVEL TO CHECK THAT THE TOP FLANGE IS LEVEL.

3. CONSTRUCT PLATFORM TO TOP OF LEGS WHILE CONCRETE IS STILL WET.

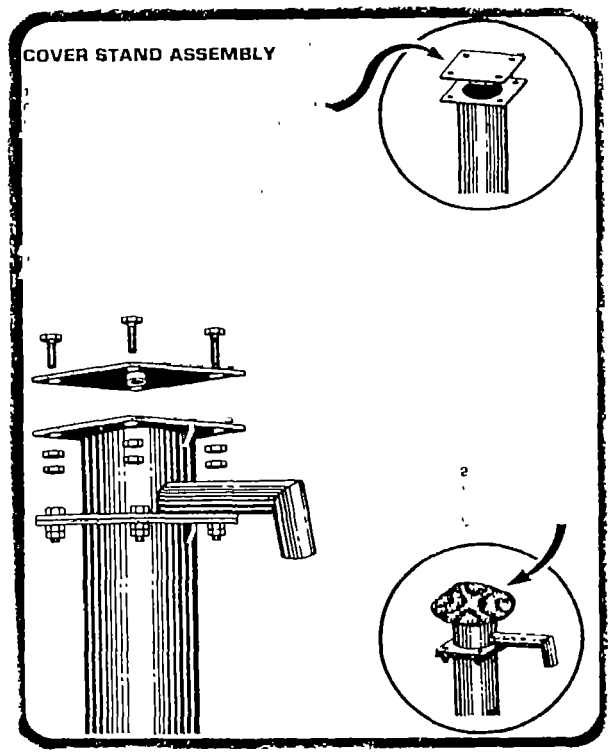


STEP 7 COVER STAND ASSEMBLY

1. COVER STAND ASSEMBLY SO THAT CHILDREN DO NOT PUT STONES IN THE TUBE WELL - IF YOU HAVE A COVER PLATE, USE IT.

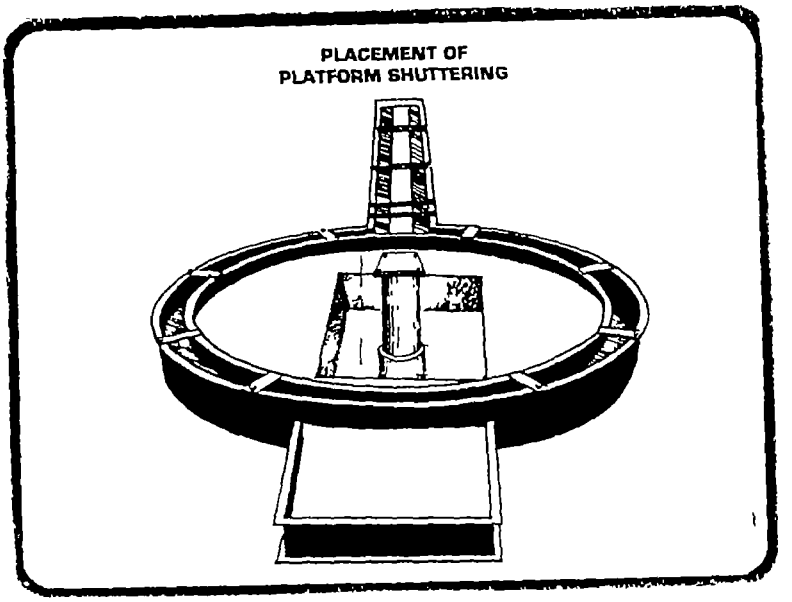
   - IF YOU DON'T HAVE A COVER PLATE..PLACE MIDDLE RANGE OVER WATER TANK AND BOLT IT.

2. WRAP A CLOTH AROUND AS SHOWN

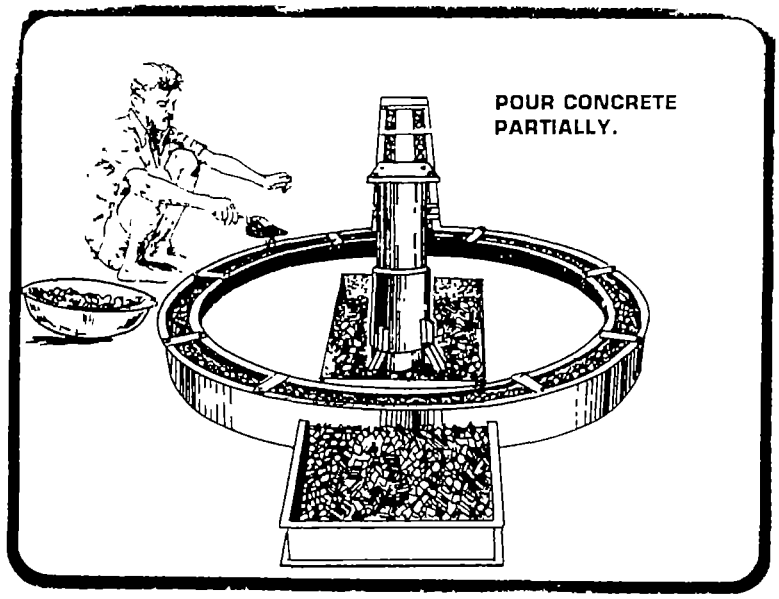


STEP 8 PLACEMENT OF PLATFORM SHUTTERING

1. LAY THE MILD STEEL PLATFORM SHUTTERING OVER THE LEVELLED GROUND AROUND THE PUMP PEDESTAL AND PREPARE THE GROUND FOR CONSTRUCTING THE PLATFORM AS PER DESIGN.



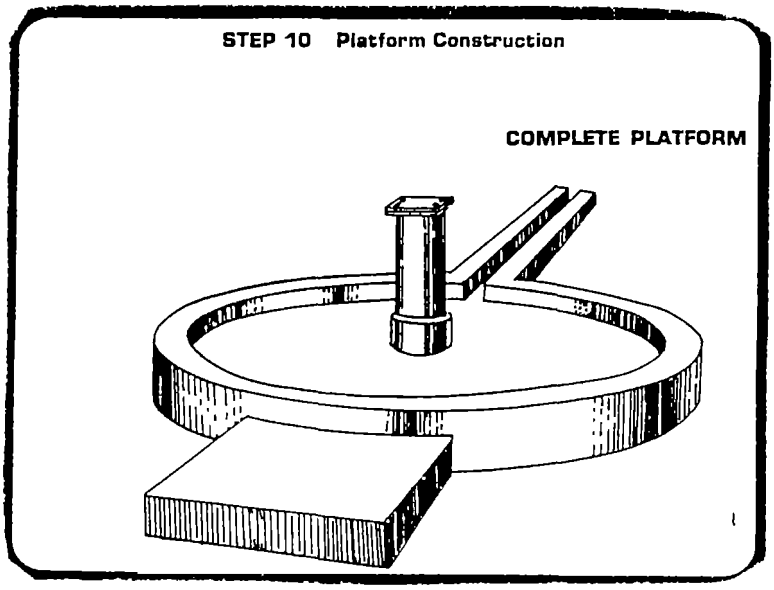
STEP 9 POUR CONCRETE



STEP 10 COMPLETE PLATFORM

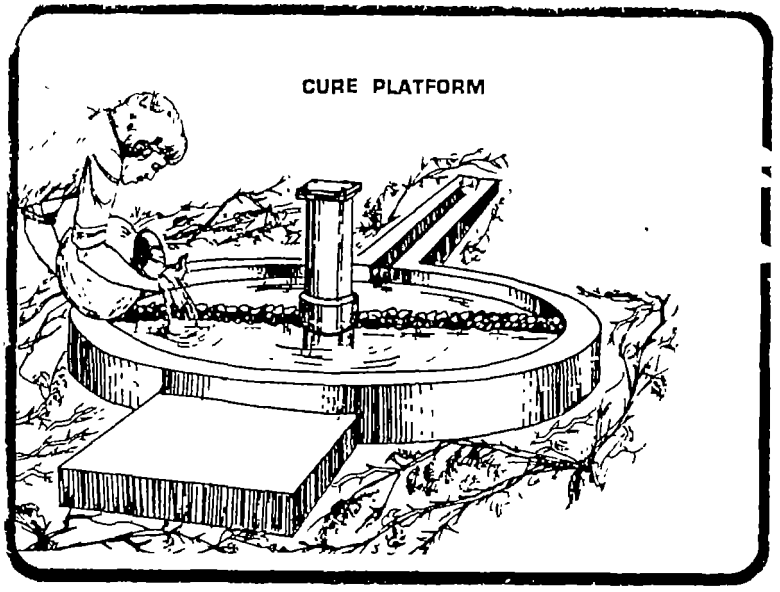
APPROXIMATE MATERIAL REQUIREMENT FOR CONSTRUCTION OF ONE PLATFORM

a) CEMENT .....6 BAGS.
b) SAND... .....0.40 M^3
c) METAL (20 MM SIZE)....0.80 M^3



STEP 11 CURE PLATFORM

* TO CURE CONCRETE, BLOCK DRAIN AND FILL PLATFORM WITH WATER.
* ASK VILLAGERS TO KEEP AWAY FROM PLATFORM.
* ALLOW CONCRETE TO SET FOR **SEVEN DAYS.**
* SPREAD THORNY BUSHES AND COVER THE PLATFORM TO AVOID PEOPLE OR ANIMALS STEPPING OVER IT.



CHLORINATION:

Chlorination should be done initially during the installation of a handpump and regularly every three months as a part of the maintenance schedule.

How to Chlorinate a Tubewell

a. Initially during the installation of handpump:

* Mix 300 grams of bleaching powder in 15 litres of water in a bucket thoroughly.
* Wait for 5 minutes to settle the insoluble particles.
* Pour the mixture into the tubewell.

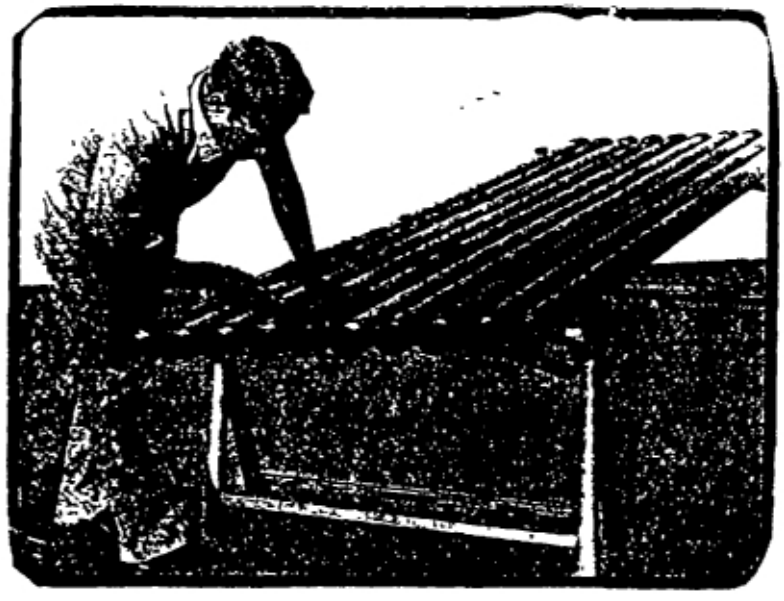
b. Every three months as a part of the maintenance schedule

* Mix 300 grams of bleaching powder in 15 litres of water thoroughly.
* Remove four bolts connecting water tank with pedestal. Push water tank with riser pipe assembly to the side.
* Pour Chlorine solution into open end of pedestal.
* Slide water tank and bolt it back to pedestal.
* Tighten the four bolts and nuts fully.
* The hand pump must not be used for atleast half an hour.
* Operate the handle to pump out excess chlorine in the bore/tube well water column.
* Collect a sample of the water for bacteriological examination in a sterile bottle. Seal and label the bottle.
* Send the sample for bacteriological examination.

SEVEN DAYS LATER

STEP 1

LAY OUT PIPES AS SHOWN.
CHECK THAT PIPES ARE THREADED ON BOTH SIDES.
CHECK THAT ALL THREADS ARE GOOD AND CLEAN.
ONE END OF THE PIPES SHOULD BE SOCKETED.



STEP 2

TEST THE CYLINDER IN A
BUCKET OF WATER.
IF THE CHECK VALVE LEAKS,
SCREW DOWN PLUNGER, PULL
OUT CHECK VALVE ASSEMBLY
AND CHECK ALL THE COMPONENTS

INSERT THE ASSEMBLY BACK
INTO CYLINDER, UNSCREW PLUNGER
AND TEST AGAIN TO ENSURE THAT THERE IS
NO LEAKAGE.

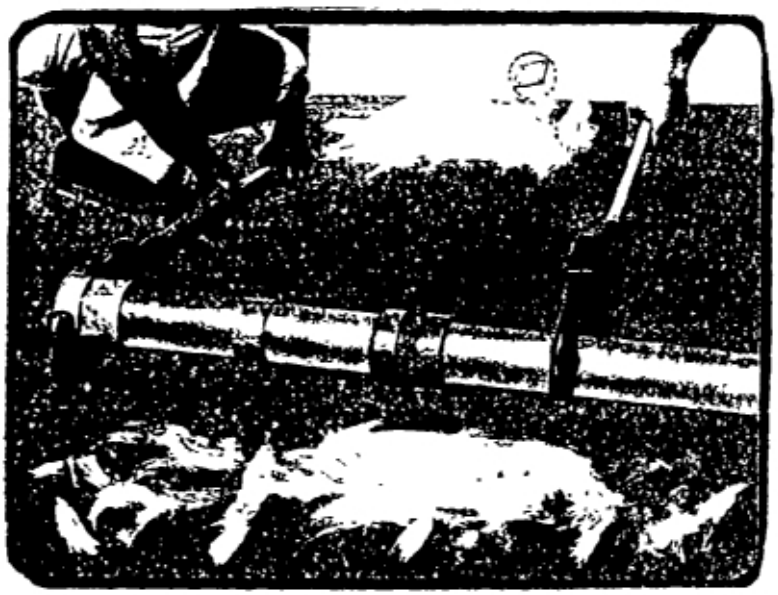
SCREW DOWN PLUNGER AGAIN,
PULL OUT ENTIRE ASSEMBLY FROM
CYLINDER AND KEEP IN A SAFE DUST
FREE PLACE.

STEP 3

1. REMOVE COVER OF STAND ASSEMBLY
   OR
   WATER TANK FROM PEDESTAL

2. SCREW DROP PIPE INTO CYLINDER
   BOTTOM CAP USING JOINTING COMPOUND
   TIGHTEN FULLY.

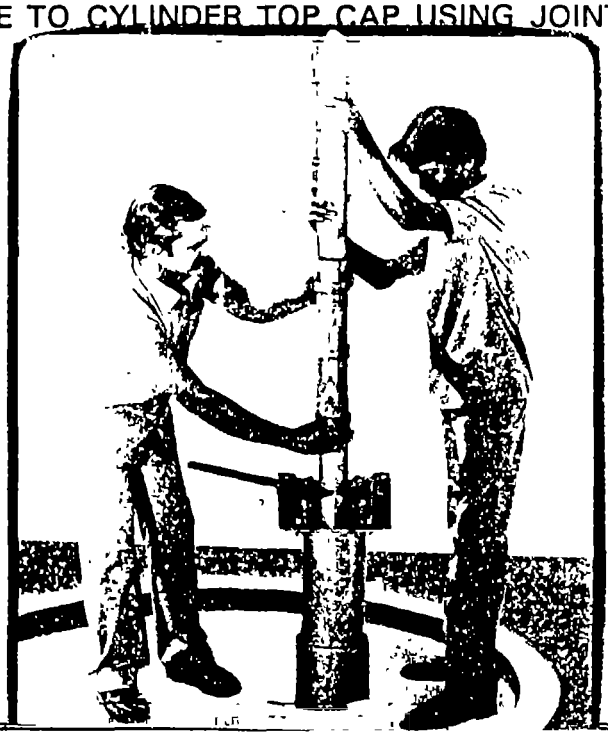
3. WIPE OFF EXCESS JOINTING COMPOUND
   OTHERWISE
   IT WILL SPOIL THE WATER IN THE TUBE WELL



STEP 4

BEYOND 30 METRES OF PIPE, USE OF TRIPOD AND CHAIN PULLEY BLOCK IS RECOMMENDED.

1. LOWER DROP PIPE INTO TUBEWELL.
2. INSERT SELF LOCKING CLAMP.
3. TIGHTEN SELF LOCKING CLAMP WITH FOUR BOLTS AND NUTS.
4. JOINT FIRST PIPE TO CYLINDER TOP CAP USING JOINTING COMPOUND. TIGHTEN FULLY.

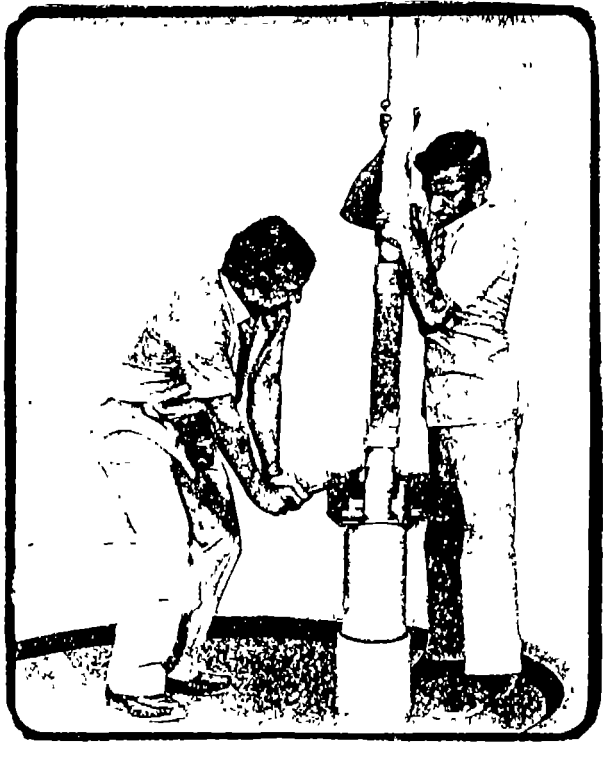


NEVER INSTALL A CYLINDER LESS THAN 6 METRES (20 FT.) FROM THE BOTTOM OF THE TUBEWELL.

STEP 5

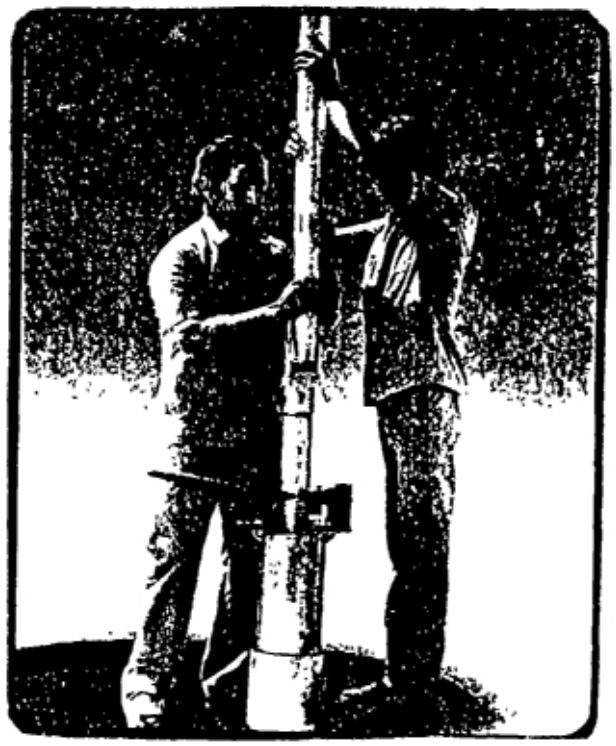
LOWER FIRST PIPE SCREWED ON TO THE CYLINDER TOP CAP SLOWLY

WHILE LOWERING PRESS HANDLE OF SELF LOCKING CLAMP DOWN



STEP 6

BRING NEXT RISER PIPE
AND SCREW WITH THE FIRST ONE.

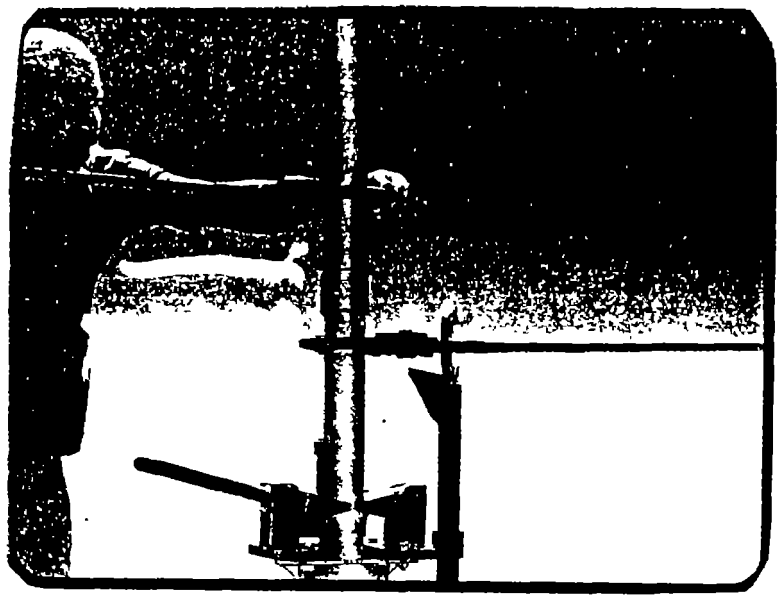


STEP 7

1. INSERT PIPE LIFTING SPANNER INTO THE BUSH OF SELF LOCKING CLAMP AND LOCK BOTTOM PIPE WITH WRENCH AS SHOWN.

2. TIGHTEN PIPES AS SHOWN.

USE JOINTING COMPOUND. WIPE OF EXCESS JOINTING COMPOUND.



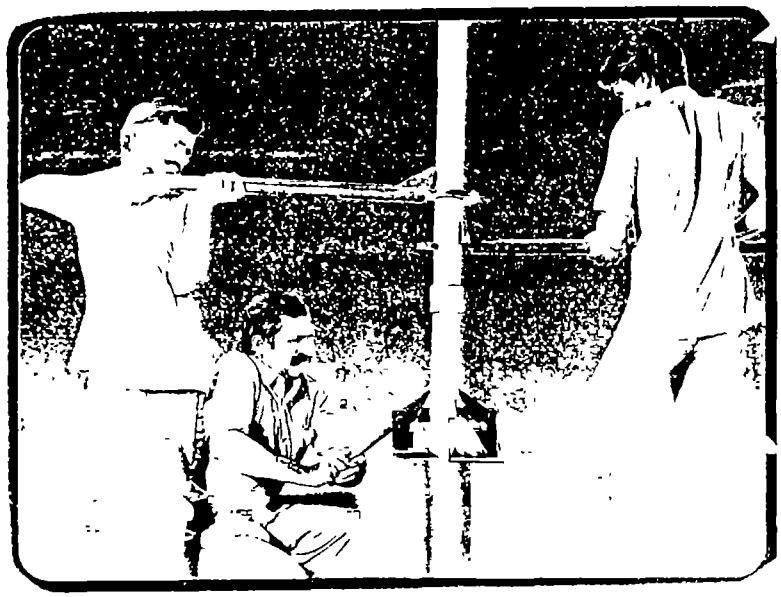
STEP 8

1. LOWER DOWN RISER PIPES GENTLY WITH THE HELP OF PIPE LIFTERS.

2.

KEEP ON LOWERING THE RISER PIPES INTO THE WELL TILL LAST PIPE

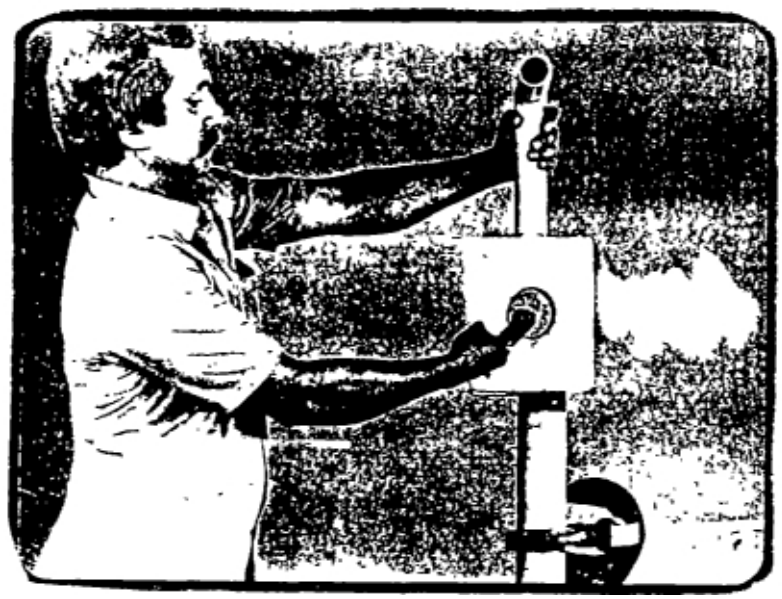
2. PRESS SELF LOCKING CLAMP JAWS ONLY WHILE LOWERING DOWN RISER PIPES.



STEP 9

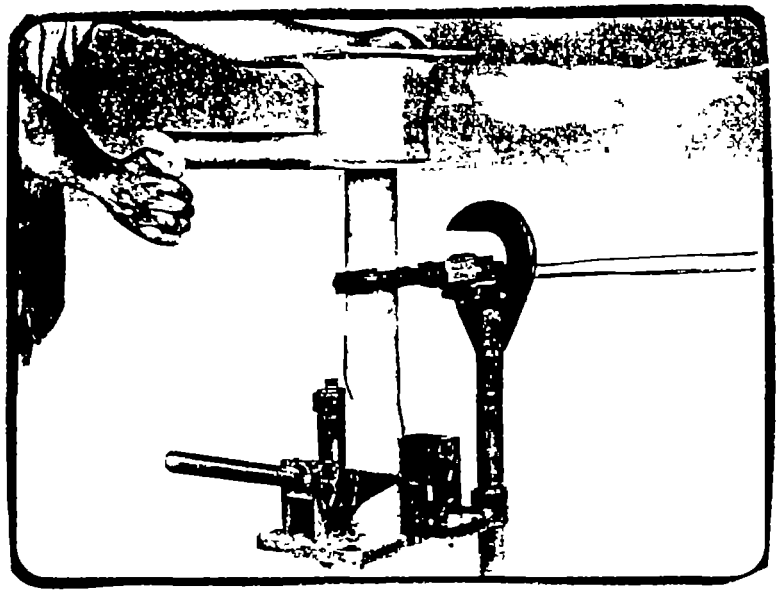
1. APPLY GREASE TO WATER TANK COUPLER THREADS.

2. SCREW WATER TANK WITH LAST PIPE THREADS. TIGHTEN FULLY.



STEP 10

1. LOCK RISER PIPE AS SHOWN IN STEP 7.

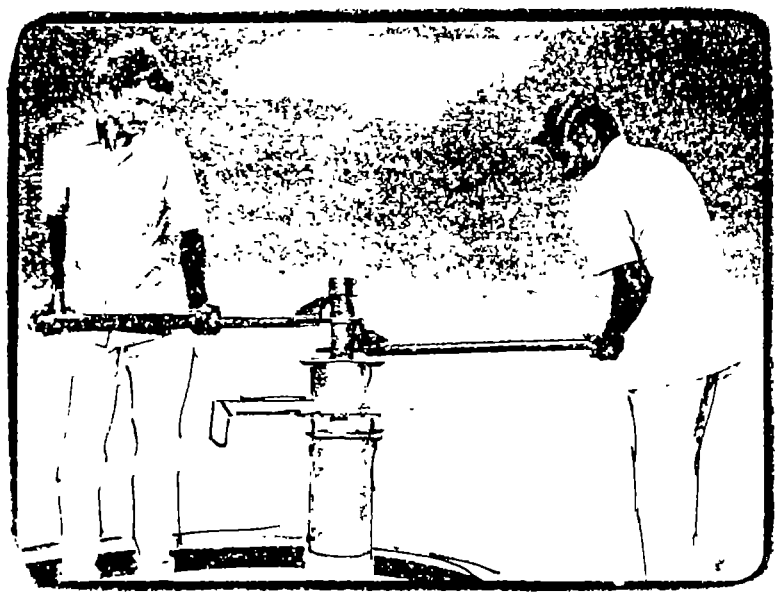


STEP 11

1. SCREW TANK PIPE LIFTER ON TO WATER TANK COUPLER AND HOLD IT WITH PIPE LIFTERS.

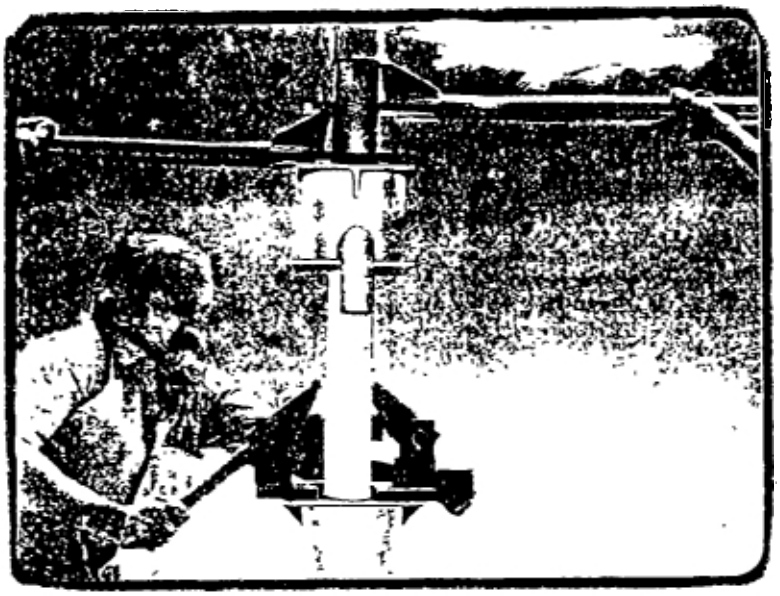
2. REMOVE FOUR BOLTS AND NUTS HOLDING THE CLAMP.

3. WITHDRAW THE SELF LOCKING CLAMP.



STEP 12

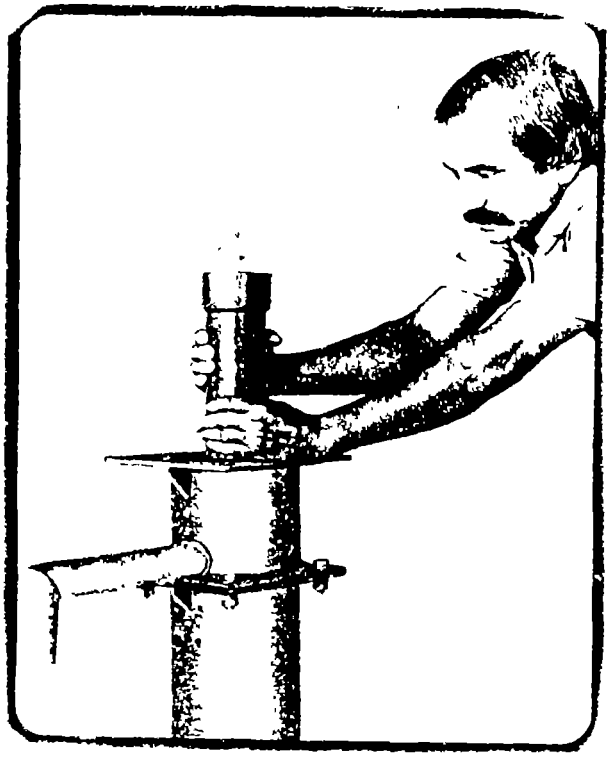
USE PIPE LIFTERS AND LOWER DOWN WATER TANK WITH RISER PIPES GENTLY AND PLACE ON STAND FLANGE.



STEP 13

1. FIX BOLTS, NUTS AND WASHERS AS SHOWN.

2. UNSCREW AND REMOVE TANK PIPE LIFTER AS SHOWN.

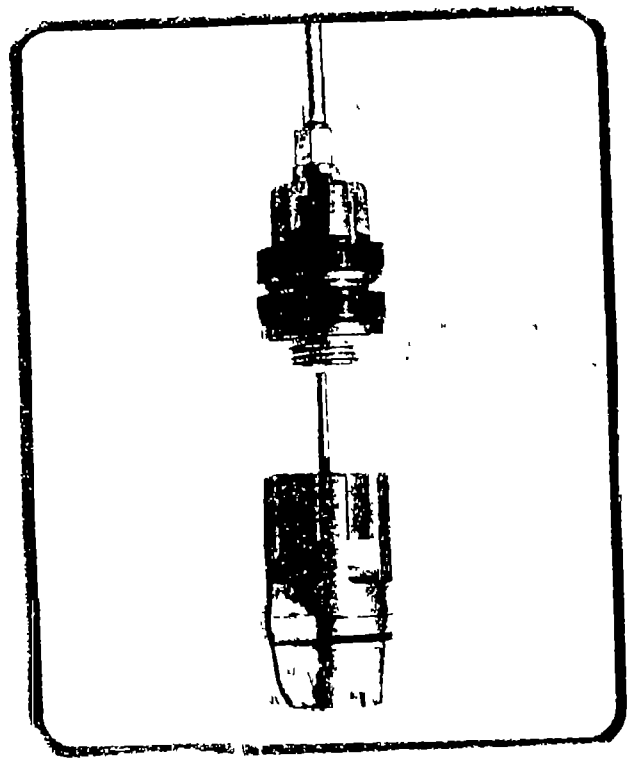


STEP 1 **INSTALLATION OF CHECK VALVE, PLUNGER, CONNECTING RODS AND PUMP HEAD**

CLEAN ROD THREADS AND ENSURE ALL THREADS ARE IN GOOD CONDITION BY LAYING THEM ON THE STANDS AS DONE IN CASE OF PIPES.

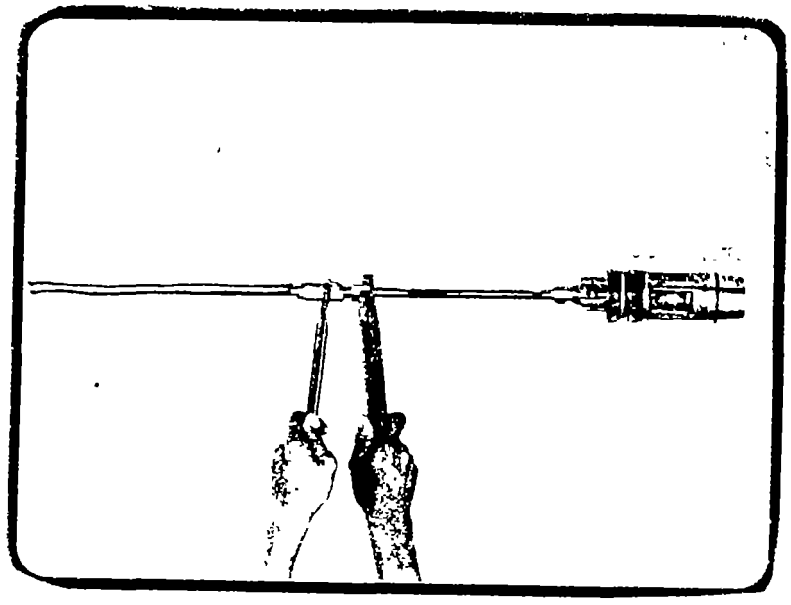
SCREW LOWER PICK UP VALVE (CHECK VALVE) ASSEMBLY BY TWO THREADS WITH (PLUNGER) ASSEMBLY.

LOWER VALVE CAN ALSO BE KEPT IN CYLINDER CAMP WHILE LOWERING RISER PIPES INITIALLY.

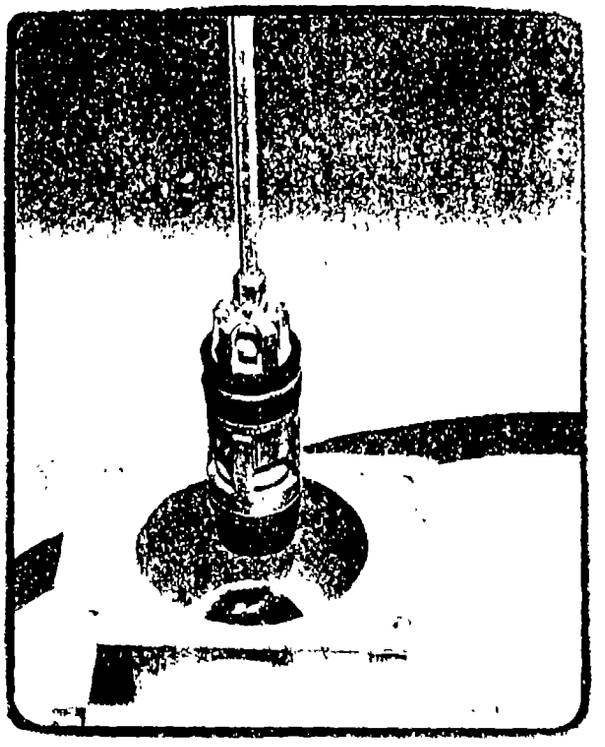


STEP 2

1. TIGHTEN THE FIRST CONNECTING ROD WITH THE PLUNGER ROD AS SHOWN.



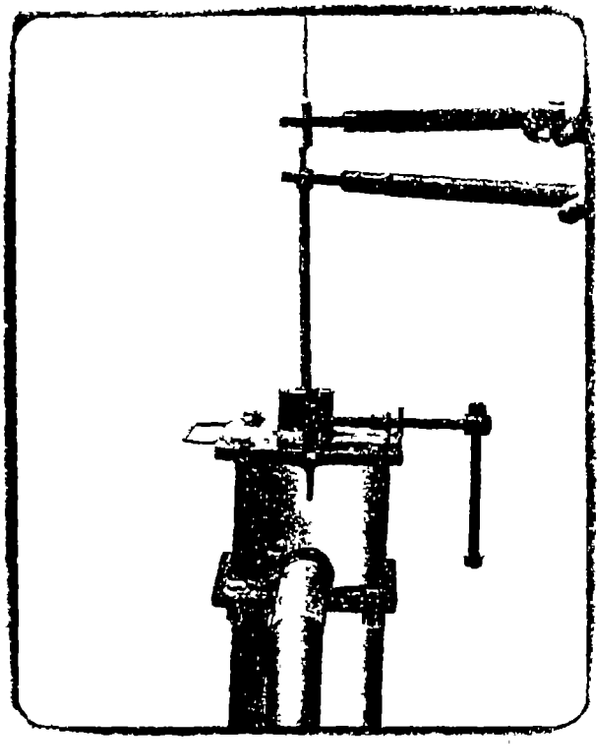
STEP 3



LOWER PLUNGER ASSEMBLY SCREWED WITH CHECK VALVE ASSEMBLY INTO THE RISER PIPES LOWERED AND TIGHTENED WITH WATER TANK RISER COUPLER.

STEP 4

LOWER THE FIRST CONNECTING ROD. INSERT CONNECTING ROD AS SHOWN AND POSITION THE ROD VICE ON THE WATER TANK.

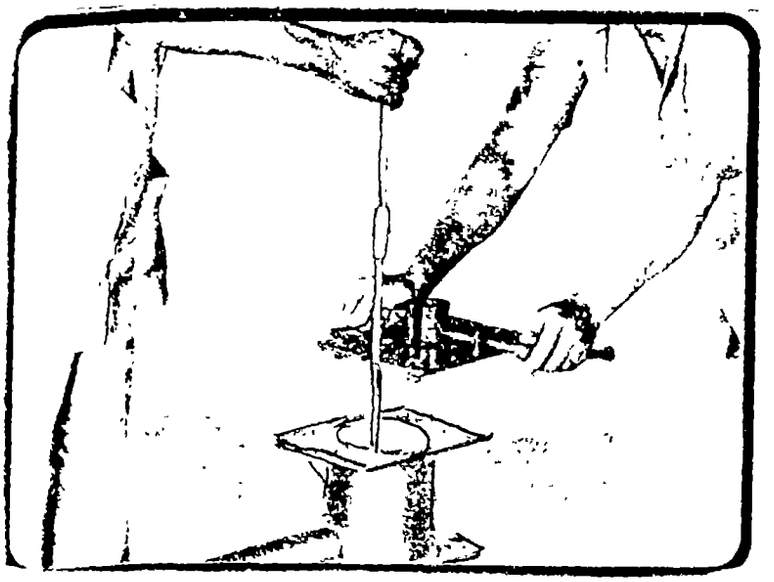


STEP 5

TIGHTEN REQUIRED NUMBER OF CONNECTING RODS VICE AS SHOWN AND LOWER THEM AS BEFORE.

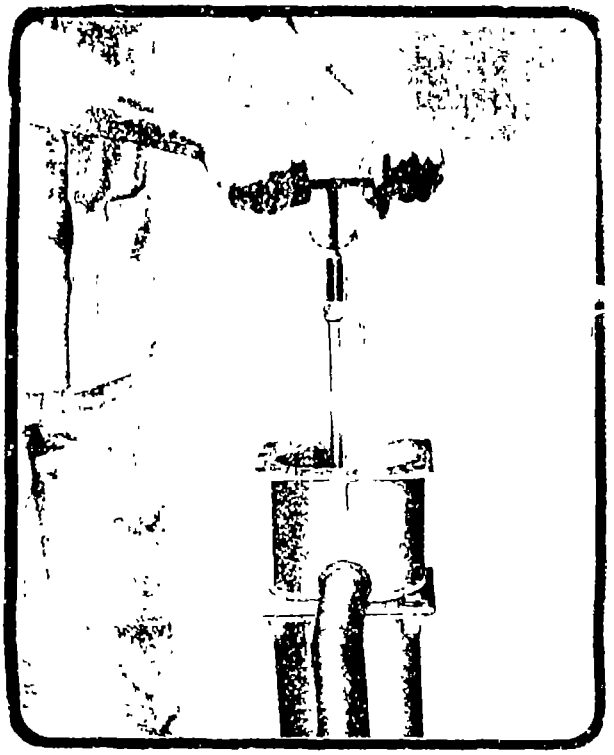
STEP 6

AFTER LOWERING REQUIRED NO. OF CONNECTING RODS REMOVE CONNECTING ROD VICE.



STEP 7

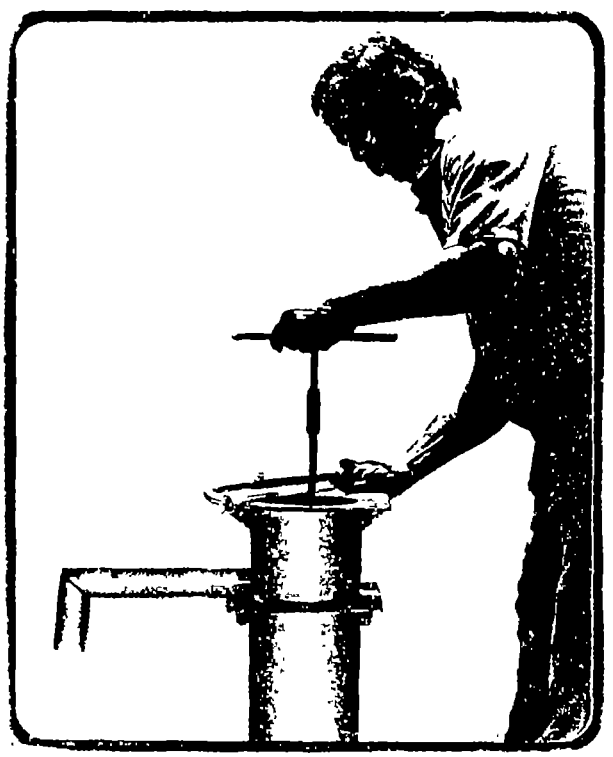
SCREW AND TIGHTEN THE ROD LIFTER ON THE THREADS AND TURN IT ANTICLOCKWISE SO THAT THE LOWER PIPE PICK UP VALVE (CHECK VALVE) IS UNSCREWED AND LEFT IN THE BOTTOM CYLINDER CAP.



STEP 8

1. PUSH THE CONNECTING ROD ASSEMBLY TO BOTTOM MOST POSITION.

2. MARK ROD IN LEVEL WITH TOP OF WATER TANK.



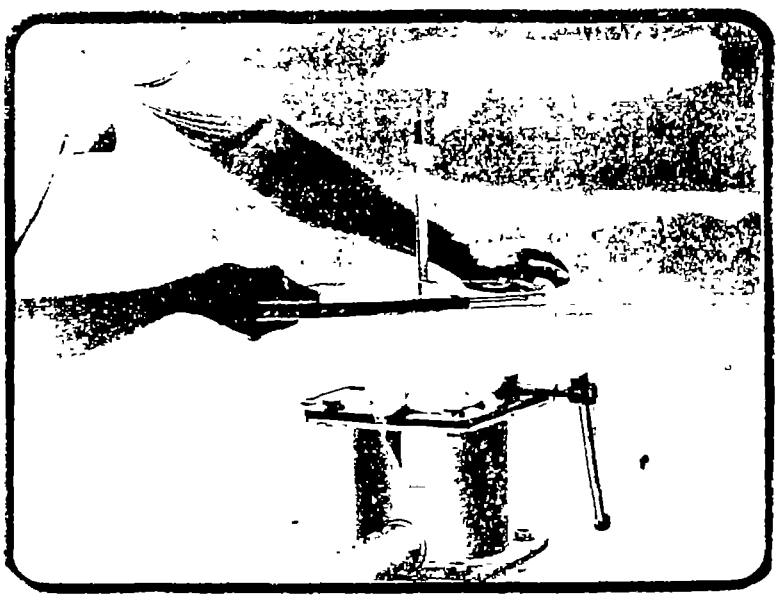
STEP 9

1. BY HOLDING THE ROD LIFTER, LIFT THE ROD ASSEMBLY AS SHOWN.

2. INSERT CONNECTING ROD VICE AS SHOWN.

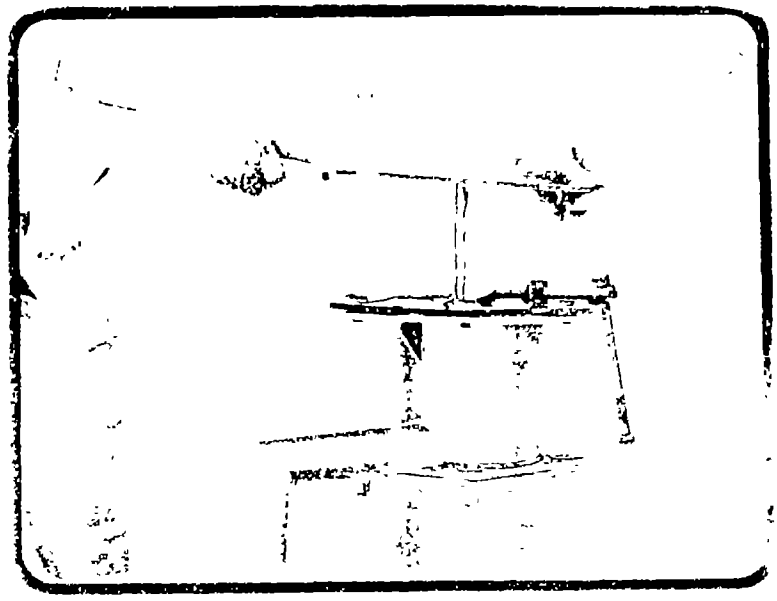
STEP 10

1. TIGHTEN THE CONNECTING ROD VICE.
2. UNSCREW THE CONNECTING ROD LIFTER.
3. WRAP CLOTH AROUND TOP OF CONNECTING ROD VICE SO THAT METAL CUTTINGS DO NOT FALL INSIDE THE RISER PIPES.
4. CUT THE CONNECTING ROAD AT THE MARK MADE EARLIER.



STEP 11

FILE THE TOP AS WELL AS THE EDGES OF THE CONNECTING ROD SMOOTHLY.



STEP 12

CHECK THREADS WITH CHECK NUT.
YOU MUST BE ABLE TO SCREW THE NUT ALL THE WAY DOWN BY HAND.

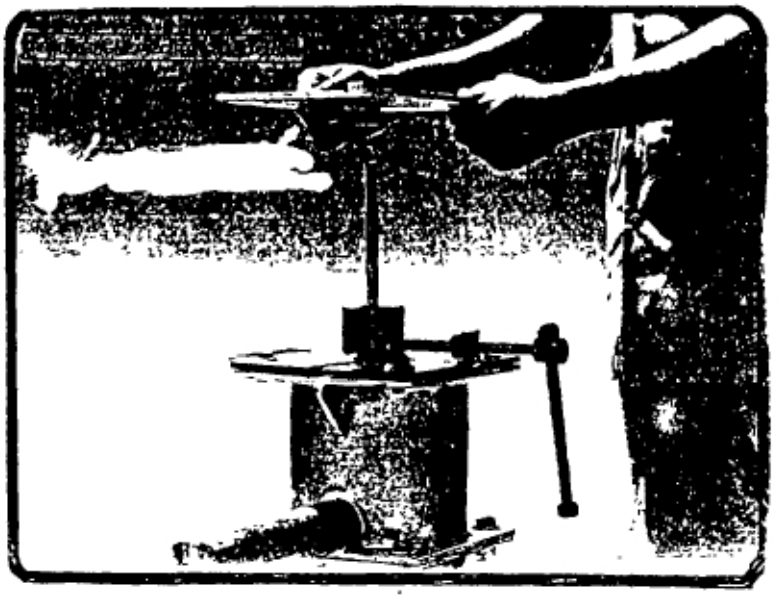
1. THREAD TOP OF CONNECTING ROD UPTO 45 MM LENGTH WITH M 12 ROD DIE SET. MAKE SURE THE THREADS ARE CLEAN AND TRUE.

2. LUBRICATE THE ROD WITH OIL WHILE CUTTING THREADS.

STEP 13

REMOVE THE METAL CUTTINGS AND CLOTH.

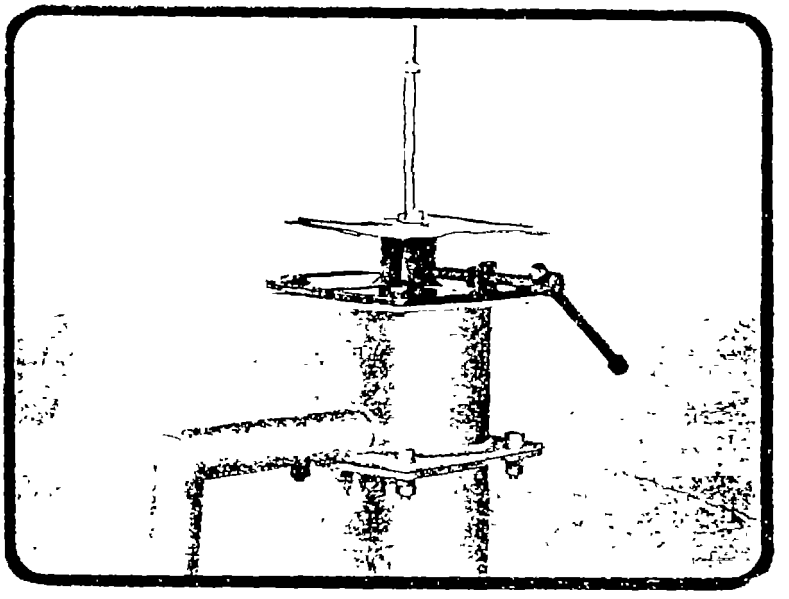
INSERT THE MIDDLE FLANGE VERTICALLY INTO THE CONNECTING ROD, AS SHOWN.



STEP 14

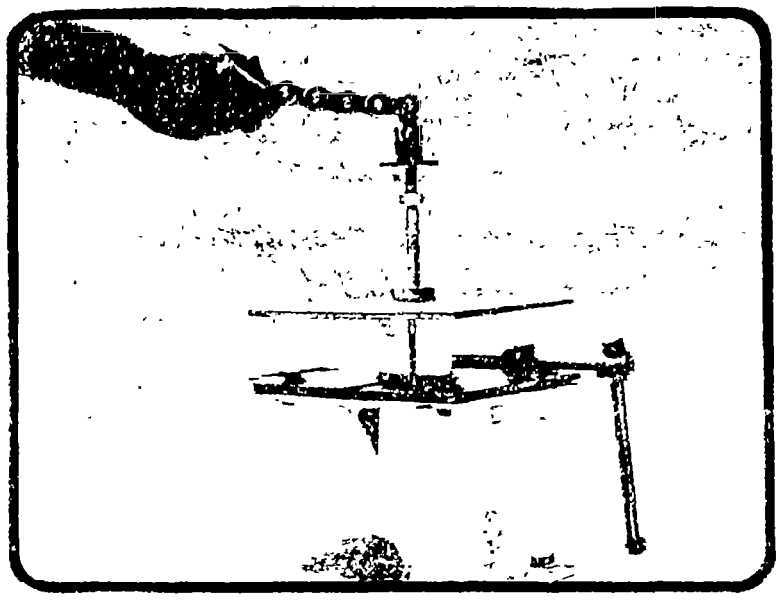
1. ALLOW MIDDLE FLANGE TO REST ON TOP OF CONNECTING ROD VICE.

2. FIX THE CHECK NUT ON THE CONNECTING ROD AS SHOWN.



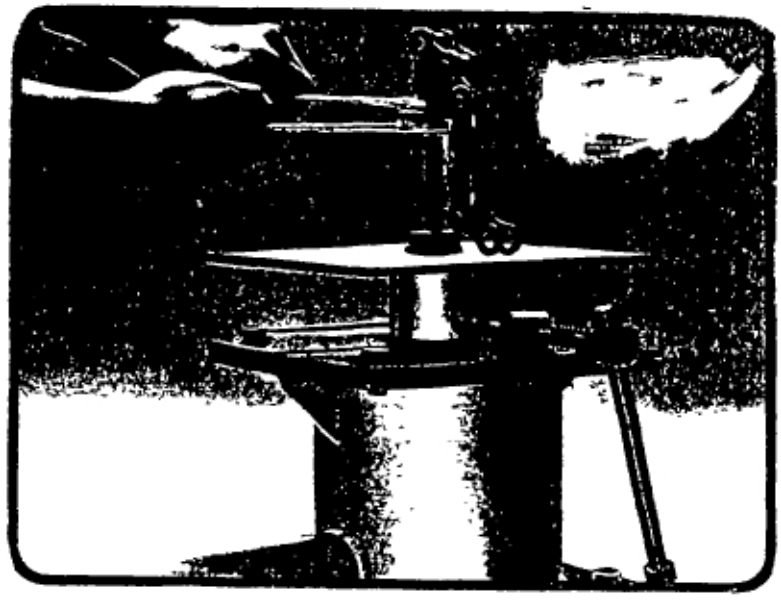
STEP 15

SCREW CHAIN COUPLER ON TO THE CONNECTING ROD THREADS BY HAND AS SHOWN.



STEP 16

TIGHTEN CHECK NUT IN THE CONNECTING ROD WITH THE CHAIN COUPLING USING M 17 X M 19 DOUBLE ENDED SPANNERS AS SHOWN.

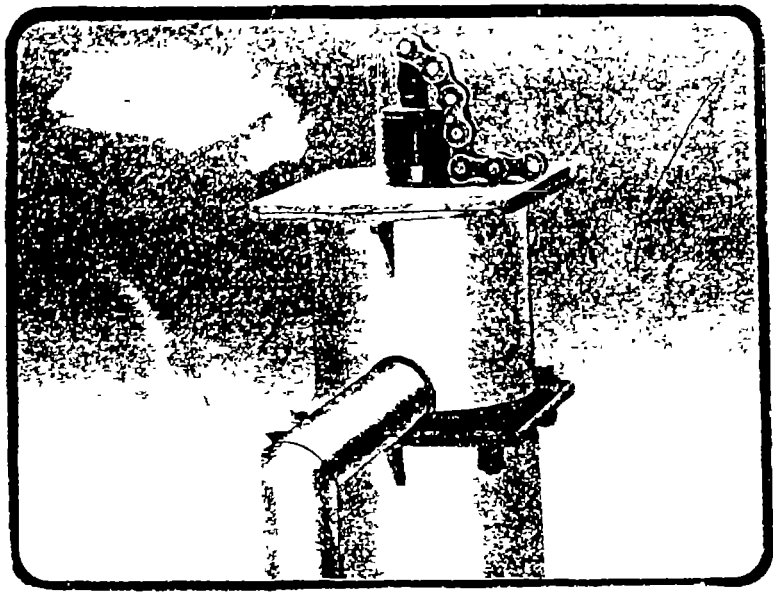


STEP 17

1. INSERT CHAIN COUPLER SUPPORTING TOOL BELOW THE CHAIN COUPLER AS SHOWN.

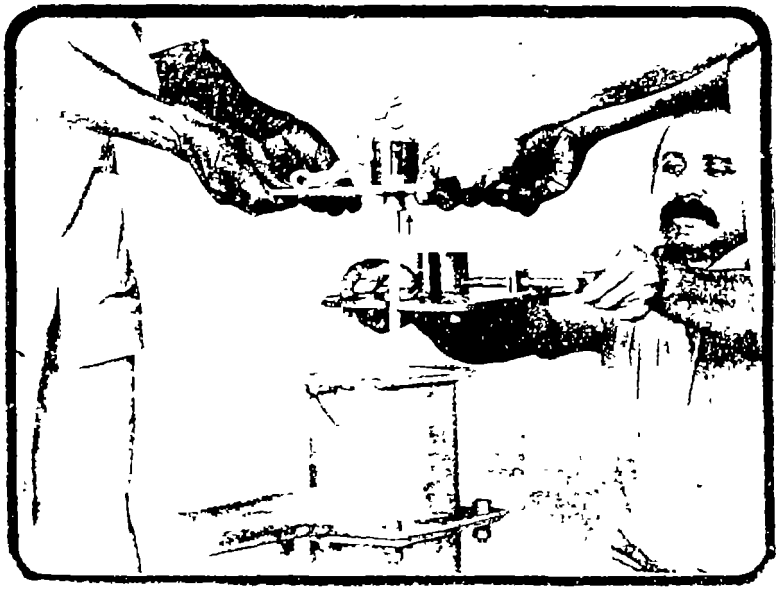
2. LIFT THE MIDDLE FLANGE AS SHOWN.

3. LOOSEN AND REMOVE CONNECTING ROD VICE.



STEP 18

NOW SLOWLY LOWER THE MIDDLE FLANGE ON TOP OF WATER TANK AND ENSURE THAT ALL FOUR CORNERS COINCIDE.

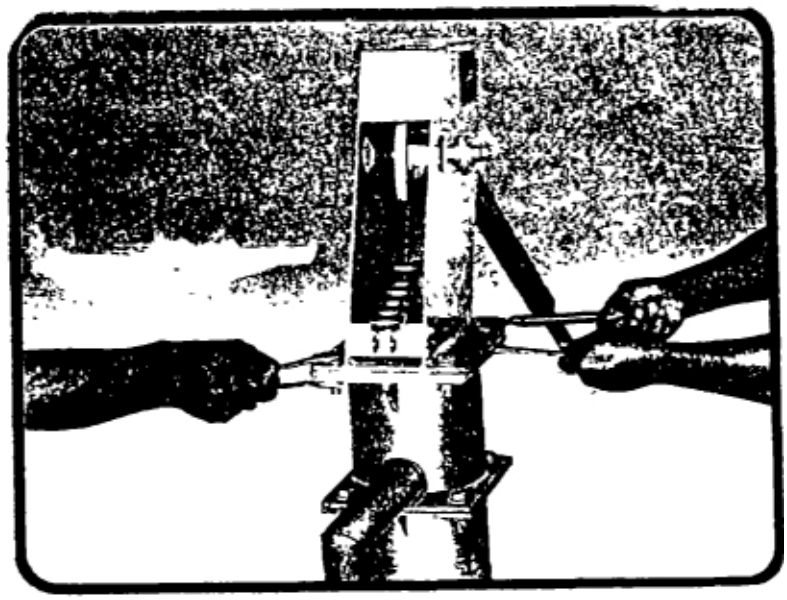


STEP 19

HOLD HEAD ASSEMBLY AS SHOWN.
INSERT CHAIN INTO HEAD THROUGH 75 MM DIA HOLE IN THE BOTTOM FLANGE,
LOWER HEAD ON TOP OF MIDDLE FLANGE.
ENSURE ALL FOUR CORNERS COINCIDE.

STEP 20

TIGHTEN HEAD, MIDDLE FLANGE AND WATER TANK WITH BOLTS AND NUTS.



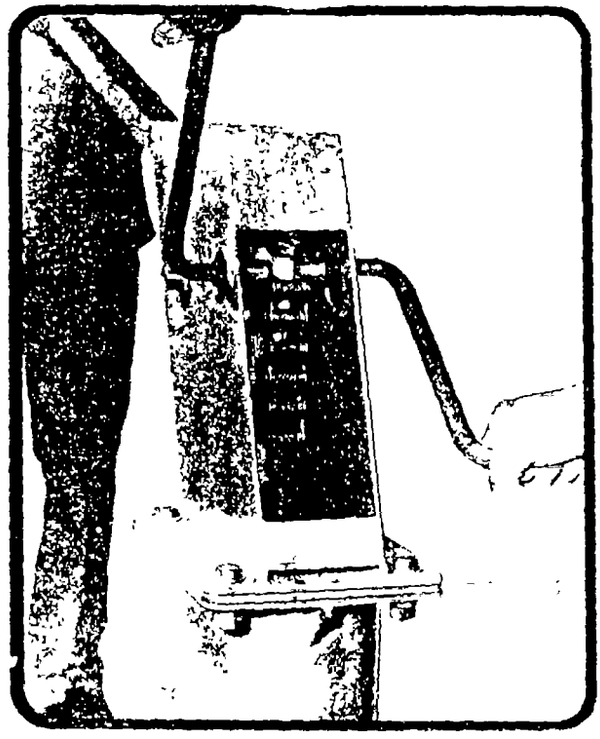
STEP 21

1. LIFT THE HANDLE UP AS SHOWN.

2. FIX FREE END OF CHAIN WITH HANDLE.

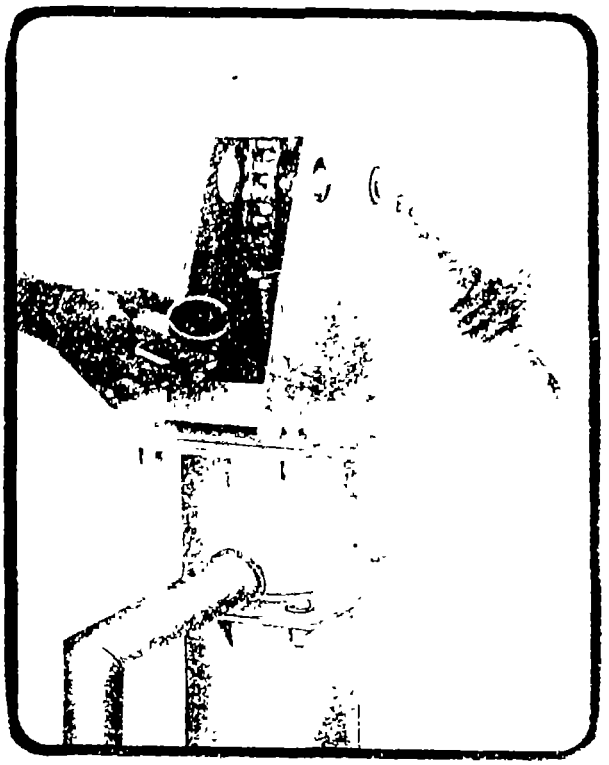
STEP 22

TIGHTEN NYLOC NUT WITH CRANK SPANNERS.



STEP 23

1. LOWER DOWN HANDLE.
2. REMOVE CHAIN COUPLER SUPPORTING TOOL.



STEP 24

1. LIFT HANDLE UP.
2. APPLY GRAPHITE OR MULTI PURPOSE GREASE ON CHAIN.

MAKE SURE THAT.....

* WHEN YOU PUMP, HANDLE TOUCHES TOP AND BOTTOM STOPS OF BRACKET. IF IT DOES NOT, REMOVE HEAD AND CHECK SETTING OF CONNECTING ROD STROKE LENGTH. [REFER STEP (8)]

* CONNECTING ROD MOVES UP AND DOWN FREELY IN GUIDE BUSH. IF IT DOES NOT, THE ROD MUST HAVE GOT BENT WHILE THREADING. CHECK THE ROD.

* YOU HAVE THREADED CHAIN COUPLER FULLY ON THE CONNECTING ROD AND HAVE TIGHTENED THE LOCK NUT.

* YOU HAVE TIGHTENED HANDLE AXLE NUT AND LOCK NUT COMPLETELY AND HANDLE AXLE IS FIRMLY RETAINED.

* YOU HAVE TIGHTENED CHAIN ANCHOR BOLT AND NYLOC NUT FULLY.

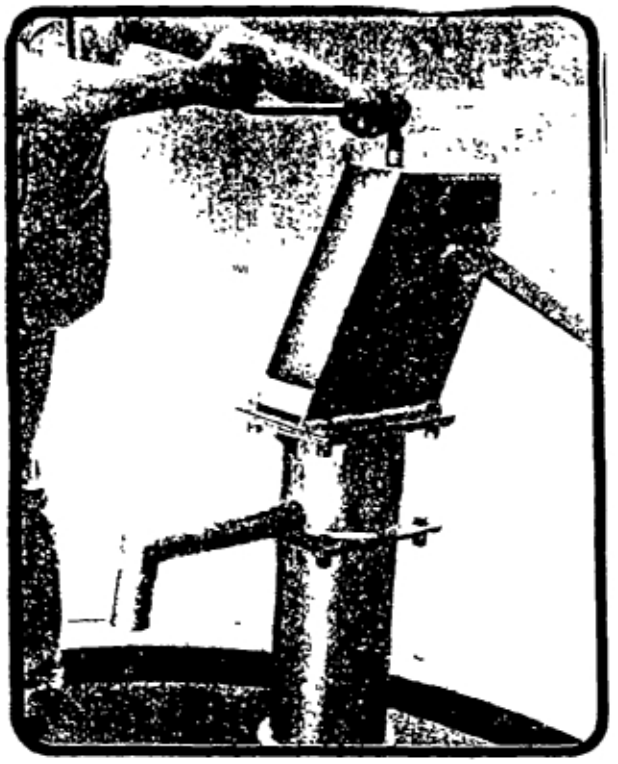
* ALL THE EIGHT FLANGE BOLTS AND NUTS ARE TIGHT AND YOU HAVE ALSO TIGHTENED THE LOCK NUTS.

* YOU HAVE LEFT NOTHING INSIDE THE HEAD ASSEMBLY.

STEP 25

1. FIX INSPECTION COVER.

2. TIGHTEN COVER BOLT FULLY BY CRANK SPANNER.

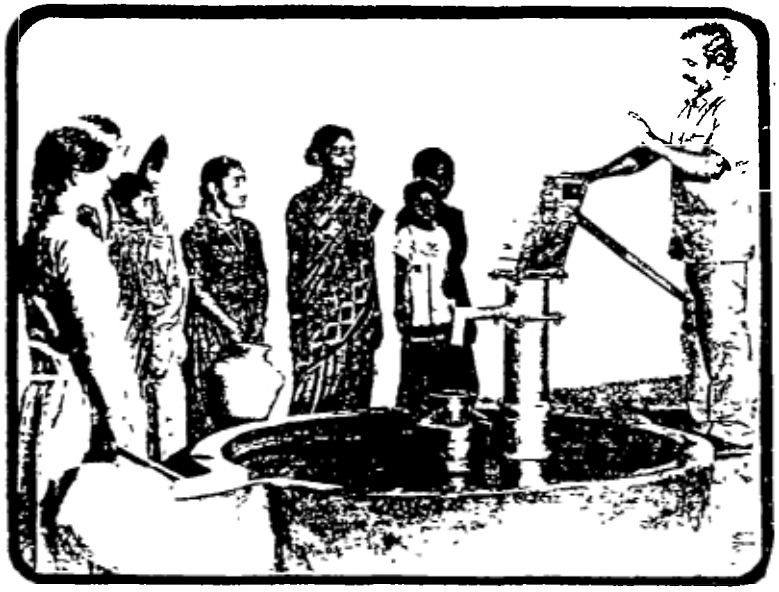


STEP 26

EXPLAIN THE OPERATION OF HANDPUMP TO THE VILLAGERS.

GUIDE LINES FOR HAND PUMP USERS

* Use the handpump gently.
* Operate the handle with long slow strokes without touching the top and bottom of the bracket.
* Operate the handle by holding it at the end.
* Inform the VLOM mechanic immediately when the pump breaks down.
* Keep the surroundings of the platform clean and dry.
* Any washing should be done at least 5 meters away from the handpump.
* Use waste water for plantation/gardening.
* Clean the platform regularly.



FINAL CHECK LIST

Before you leave, have you.....

* Explained to villagers about the importance of handpump for their health?

* Purged the tubewell surroundings?

* Checked quality and taste of water?
  The water of the well should be tested for bacteriological and chemical contents before installation/commissioning the handpump. Flouride enriched water source may be carefully evaluated prior to commissioning and after ascertaining the flouride content to be within the permissible limit of < 1.5 ppm. Alternatively, flouride treatment units may be installed alongwith the handpump.

* Explained to villagers that water from handpump may taste different or strange? You must explain that they should still drink it, because this water is safe. They will get accustomed to the new taste soon.

* Given the village hand pump mechanic/caretaker, address of your office, so that they can inform you of pump breaks down?

* Made a note of any problem with tubewell or hand pump, so that you can report the same to the higher officials and take necessary action?

* Explained to the WATSAN committee/villagers that the water of the handpump should be tested at least twice a year, preferably soon after the rains and whenever any pollution is suspected?

MAINTENANCE & OVERHAUL

HANDPUMP MAINTENANCE

The rural water supply programme in India has achieved significant progress in terms of coverage through the installation of India Mark II handpumps. Although sturdy and reliable, this handpump needs preventive and curative maintenance. The repair needs envisage special skills, manpower and tools to make replacements which may not always be available at the village level. Furthermore, studies have shown that as the number of installed handpumps increase in a district, the efficiency of a maintenance system through a centralized mechanism deteriorates. Studies conducted so far also indicate that centralized maintenance have high overhead costs.

In order to improve the IM-II handpumps, to enhance maintainability at village level and increase meantime before failure further developmental efforts have led to a village level operational and maintainable (VLOM) version of India Mark II known as India Mark III. In this handpump, 90% of the critical repairs can be carried out by a village mechanic with the help of users and with few tools. The focus now lies on developing a village based and community managed maintenance system for the India Mark III (VLOM) handpump. The basic concept is to promote maintenance of a handpump by the users themselves with minimal outside support.

With a phased introduction of India Mark III (VLOM) handpumps, and conversion of existing India Mark II handpumps to the India Mark III handpump, villagewise, it is envisaged that the maintenance system can be gradually changed from the existing centralized system to a community based handpump maintenance system.

PREVELANT MAINTENANCE SYSTEMS

Handpumps are the most widely accepted technological option for safe water for community water supply. While the India Mark II/III handpumps are reliable, robust and efficient pumps, like any other machine, they require a certain level of maintenance to function without breakdown. The different handpump maintenance systems prevailing in India are :-

1. Three Tier Maintenance System :

   The organisation of this maintenance system with 3 levels or tiers of functionaries gives the system its name. It was the first institutionalised attempt at involving the users in the maintenance of hand pumps. Essentially, the system proposes the following three tiers :

   i. A village level voluntary caretaker identified by the implementing agency

from among the nearby users of the pump. This caretaker is trained for conducting preventive maintenance, keeping the handpump surroundings clean and motivating the users to handle the pump properly. She/he also reports. any event of breakdown to the higher level of the system through a pre-printed post card.

ii. At the second tier is the Block Mechanic who looks after all the pumps in the block. His duty is to visit all pumps regularly and to undertake minor repairs of the above ground components. In case a major repair of the below-ground assembly becomes necessary, he too reports such repair needs to the next higher level.

iii. At the district level, the Mobile Maintenance Team constitutes the third tier and is expected to look after all the handpumps in the district. Being equipped with a vehicle and 5 workers, the mobile maintenance team undertakes all major repairs as and when necessary.

The operation of this system hinged on a crucial functionary, the village level handpump caretaker. It has been assumed, wrongly in most cases, that the voluntary Caretakers could be easily recruited and motivated to carry out simple preventive maintenance and communicate the need for repairs.

Independent evaluations of the functioning of the 3-tier system have invariably identified absence and shortage of Caretakers as one of the main reasons why the Three Tier System has not functioned effectively. Unrealistically high workload on Block Mechanics and the Mobile Team and improper work programming have often resulted in unusually high down-time, once a pump had broken down.

2. One Tier Maintenance System :

The search for an alternative system had begun soon after the introduction of the Three Tier System based upon its visible drawbacks and because of a growing belief that rural people could be empowered and enabled to maintain their own handpumps. The first such attempt was made by the Social Work and Research Centre (SWRC), a voluntary organisation based at Tilonia, Rajasthan. It was based upon a conviction that people who were users of handpumps, were capable of maintaining them.

If illiterate villagers could repair electric and diesel pumps, tractors and other agricultural implements which were much more sophisticated machinery than a hand pump, the actual repair task could be demystified and no skills needed to be imported from the district level to keep the pumps going. A village based Handpump Mistry - HPM could replace all the 3 tiers. The idea of a Handpump

Mistry was based on the premise that unemployed rural youth from economically poor families could be identified based on their mechanical aptitude and their skills upgraded by training so that they would undertake most common repairs necessary for a handpump.

This system had many advantages in terms of the ready availability of the HPM to the community and use of local skills in maintenance & repair. However, in the process of large scale implementation, it had its own problems including the identification of the right person as the handpump mistry; and bottlenecks in the provision of spare & tools to the handpump mistry.

3. Two Tier Maintenance System

In many States, this maintenance system went under the name of the Two Tier System and took different forms in different places. Most Two Tier Systems attempted to eliminate the need for Caretaker by increasing the numbers of Mechanics and Mobile Maintenance teams and decentralising them. These actions eliminated the need for the facing the difficult, unfamiliar (and more importantly, non-technical and non-engineering) task of recruiting and motivating Caretakers. Many a time, these modified versions of the Three Tier system completely did away with any semblance of community involvement sometimes.

The village based artisans such as blacksmiths, carpenters and cycle mechanics etc., after receiving training, necessary tools and spare parts, could take care of essential preventive maintenance and regular repair needs of about 20 to 25 pumps. They would need to be backed up and monitored by a second tier consisting of a Junior Engineer and his maintenance crew at the block level.

COMMUNITY BASED HANDPUMP MAINTENANCE

The Community Based Handpump Maintenance System, is a strategy for ensuring sustenance of the water supply through the handpump at the village level. It is a mechanism for planning, operating and maintaining the installed handpumps within the village itself. In a community based maintenance system -

the accountability for operation and maintenance of the handpumps shifts from the government implementing department to the community and its representatives;

the skills necessary for the maintenance are transferred to the representatives of the community through training;

Self sustainability for the water system in terms of the spare part procurement and servicing cost is ensured through contributions from the user groups.

Under this system of maintenance, the user groups select representatives to form a WATSAN committee. The WATSAN committee undertakes the responsibility of management, preventive maintenance as well as repair of the handpumps installed. It collects contributions from the users and uses the money to buy spares required for repair & maintenance.

Two user representatives are selected by the WATSAN committee to undertake preventive maintenance of the handpumps. Women handpump mechanics are selected & trained within the village to undertake repair of the handpump. The caretakers and mechanics work under the overall responsibility of the WATSAN committee. The skills necessary for maintenance & repair are transferred to the community representatives (caretakers & mechanics) through training.

The accountability for operation and maintenance lies with the WATSAN committee. Self-sustainability in terms of procurement of spares and servicing cost is ensured through contributions from user groups.

The process of sensitizing the people in the community and mobilizing them for community based maintenance is achieved through a motivational campaign or a Village contact drive. The village contact drive is conducted to initiate the formation of the WATSAN committee.

A village contact drive comprises of planned series of activities at the village level directed towards creating awareness, stimulating enquiry and initiating action from within the communities. During the contact drive people are motivated to come together, take collective action and secure decisions in their own favor.

During village contact drives the following activities are undertaken as part of social mobilization. These activities are directed to culminate in the formation of a village WATSAN committee for community based maintenance.

* Collection of baseline information about the village by contacting people's representatives and governmental functionaries including school teachers and anganwadi workers.

* Awareness creation through - organization of rallies around the village with participation of children, shouting slogans related to messages on safe water and hygiene practices, writing slogans and wall paintings in the whole village, pasting educational posters at vantage points, organization of drama, puppetry shows, bhajan mandalis and other communication activities in the evening with the involvement of local people.

* Participatory needs assessment through organization of village corner/mohalla meetings, village mapping etc. to initiate discussions among the people for formation of WATSAN committee.

Role of women

Studies conducted all over the world have shown that women are the water carriers and handlers in most societies and by virtue of their domestic functions are the managers of water at the household level. They are also the principle influencer of the family's sanitary habits. A women's perspective can, therefore, contribute a great deal to the better planning, functioning and utilization of the improved facilities, especially when they are made aware of the linkages existing between safe water and health and are provided with appropriate training and support.

Women are more than target groups. They are active agents who can contribute to decision making, generation of ideas, mobilizing labor, providing resources, and disseminating and implementing innovations. By involving women in the planning, operation and maintenance stages, the community water supply projects can be expected to be more effective in achieving their objective of sustaining availability of safe water for better health. Moreover, the active participation of women leads to improvement in their status in society as also generates appreciation for their role in development.

Women can participate in the implementation of community water supply projects and contribute to decision-making by providing information on :

- locations for facilities that are convenient for women;
- schedules for using facilities that fit women's work patterns or time use;
- design of technologies that suit women and are easy for women to use.

In addition, women have the potential to provide preventive maintenance and to repair any malfunctioning in the water supply facility, thus ensuring sustained water supply to the community.

STRUCTURE

PANCHAYAT LEVEL

WATSAN Committee

One committee per village or panchayat.
7-8 members including 3-4 women members.

Selection criteria

Is a resident of the community.
Preferably a woman from the user community.
Has leadership qualities.
Is willing to undergo training.
Is able to read and write.
Is inclined to serve the community voluntarily.

Village Handpump Caretakers

One woman user representative per handpump.
Member of WATSAN committee.

Selection criteria

Preferably a woman from the user community.
Is a permanent resident of the village.
Preferably is literate and motivated to undertake the activity.
Willing to make herself free from household responsibilities, and work without financial compensation.

Handpump Mechanic

One woman user representative per handpump trained as a mechanic.
Member of WATSAN committee.

Selection criteria

Preferably a woman from the user community.
Preferably is literate and is motivated to undertake repair of handpumps.
Is willing to undergo training.
Is willing to travel and repair handpumps in a larger area.

BLOCK OR DISTRICT LEVEL-

Back-up Maintenance and Monitoring Team

A master mechanic and two helpers.
Tools to carry out major replacements/repairs

RESPONSIBILITIES

The roles and responsibilities of different components of the community based handpump maintenance system are :

WATSAN committee members

* Select the user representatives and village level mechanics/maintenance workers for the handpumps installed and coordinate their training with the implementing department.

* Open an account in the bank or post office to deposit contributions from users of the handpump.

* Coordinate the repair work, provide tools and spares for repairs to the handpump mechanic, supervise and pay for the services of the mechanics based on the time taken for repair on monthly basis.

* Collect contribution for maintenance of handpumps from the users through the panchayat, pay the village caretaker / mechanics for the repair and maintenance service and keep record of income and expenditure on maintenance.

* Procure spares and tools needed for the maintenance and repair of the handpumps from the implementing department or the local market, pay for them through the contributions collected and keep record of their use.

* Promote health and environmental sanitation activities in the village through village meetings, organizing clean village drives and other motivational programmes in liaison with the government departments.

* Take responsibility for village sanitation and undertake activities to maintain a clean environment around the handpump and in the village.

* Inform the backup maintenance team if the handpump breakdown is beyond the capability of the village handpump mechanic.

Village handpump caretaker

* Be an active member of the WATSAN committee.
* Undertake preventive maintenance of the handpump.
* Ensure the surroundings of the handpump and platform are clean.
* Act as a motivator to promote health and hygiene practices, proper use of the handpump and sanitation in the village.
* Inform the WATSAN committee regarding the repair needs of the handpump in the village.

GUIDE LINES FOR MAINTAINING HAND PUMPS

* Clean the platform regularly.
* Keep the surroundings of the platform clean and dry.
* Ensure that no rubbish is thrown near the pump.
* Keep the drain always clean.
* Make the soak pit away from the pump.
* Keep animals away from the pump and make compost far away from the pump.
* Grease the chain regularly.
* Check the chain bolt and nut very often to ensure that they are in tact and not in loose condition.
* Check all the M12 bolts and nuts regularly to ensure that they are always tight.
* Check for any cracks around the pedestal in the platform and rectify immediately.

Handpump mechanics

* On receiving information regarding handpump breakdown, collect the tools and spares require for the repair from the village WATSAN committee.

* Carry out handpump repairs with help from the caretaker, WATSAN committee members and the community.

* Account to the WATSAN committee for the spares used and time spent on the repair.

* Receive payment for the services from the WATSAN committee on a monthly basis.

* Help the WATSAN committee to maintain a record of the handpump repair.

* Act as a motivator to promote health and hygiene practices, proper use of the handpump and sanitation in the village.

Backup maintenance and monitoring team

* Provide backup support to the WATSAN committee for carrying out the major repairs/replacements for all handpumps in the block.

* Maintain a supply of quality spare parts and tools to the committees, on payment, for handpump maintenance.

* Carry out water quality tests/analysis on all samples of handpump water in the block periodically.

* Monitor the activities of the WATSAN committee. Incase the committee of a particular village is inactive, mobilize the people for selection of a new set of members for the committee.

* Monitor the working of the caretakers and mechanics. Incase they are not performing their duties adequately, initiate the selection and training of another caretaker/mechanic within the village.

GENERAL MAINTENANCE SCHEDULE

India Mark III deepwell hand pumps should be properly and regularly maintained to ensure continuous supply of safe drinking water to the rural people. This will prevent breakdowns and ensure continuous working of the hand pumps. The moving parts in the India Mark III handpump above and below the ground level are few and therefore maintenance is very simple.

India Mark III handpump is like any other machinery. Any machine is to be kept clean, if for no other reason than that, in cleaning, all parts are inspected for formation of rust, insufficient lubrication, loose bolts, nuts, etc. and also for missing parts in time to prevent major failures.

The following schedule of maintenance is drawn out and recommended for the caretakers to carry out once a month :

[A] Examine the pump carefully and check whether:

* Water discharge is satisfactory.
* Handle is shaky.
* Guide bush has excessively worn out.
* All bolts, nuts and washers are in position.
* Chain has worn out.
* Chain guide is excessively worn out.
* complete handpump is firm at its foundation.

The following schedule of maintenance is recommended for the mobile maintenance teams to carry out once a year:

[B] Pull out the pump and follow the instructions given below:

* If chain, bearings and spacer are damaged, replace them.
* If handle guide is badly worn out, replace handle assembly.
* If any pipes are damaged replace them.
* Replace Cup washers, 'O' ring, sealing rings or any other part found defective in cylinder.
* Check the condition of water tank riser pipe holder. If threads are worn out replace water tank.
* Check all sub assemblies for crack in weld and other visual defects. If defects are serious replace sub-assemblies.
* Reinstall the pump as per instructions given in this manual.
* If the pump is painted, then paint the pump head inside/outside with the recommended colour after cleaning/sending the surfaces.
* If the pump is fully galvanised, wash the surface with clean water.
* Never apply emery paper to clean galvanized surfaces.

PREVENTIVE MAINTENANCE

The care taker should check on a routine basis the following -

* the pump pedestal is firm on its base. If it is loose arrange for fresh foundation by reporting to the appropriate higher authority, before the pump and foundation are damaged.
* water discharge is satisfactory [i.e.] whether it is as usual, little or delayed.
* the handle is easy or difficult to operate.
* all the eight flange bolts and nuts are tight.
* handle axle nuts are tight.
* handle chain nyloc nut is tight.
* the chain is lubricated. If not, apply graphite or multipurpose grease.
* the inside of the pump is free from trash or dirt.

CURATIVE MAINTENANCE

Curative maintenance is carried out by a team of one or two handpump mechanics on an India Mark III handpump only when a trouble is noticed and the cure is within their scope. Whenever situation warrants, the village handpump mechanic can replace the following parts in the hand pump with the tools and parts available in their kits.

* Rubber 'O' ring for the check valve seat in the cylinder.
* Nitrile Rubber cup washers.
* Check valve rubber seating.
* Upper valve rubber seating.
* Bolt.
* Nut.
* Chain, anchor bolt, nut and washer.
* Ball bearings
* Pump axle.

The mechanics can also replace a connecting rod assembly with the tools provided and the spare assembly made available at the site.

For removal and refitting of pump head, connecting rods and cylinder assemblies, the handpump mechanics should follow the procedures given under DISMANTLING OF PUMP.

"REGULAR PREVENTIVE MAINTENANCE CAN AVOID CURATIVE MAINTENANCE."

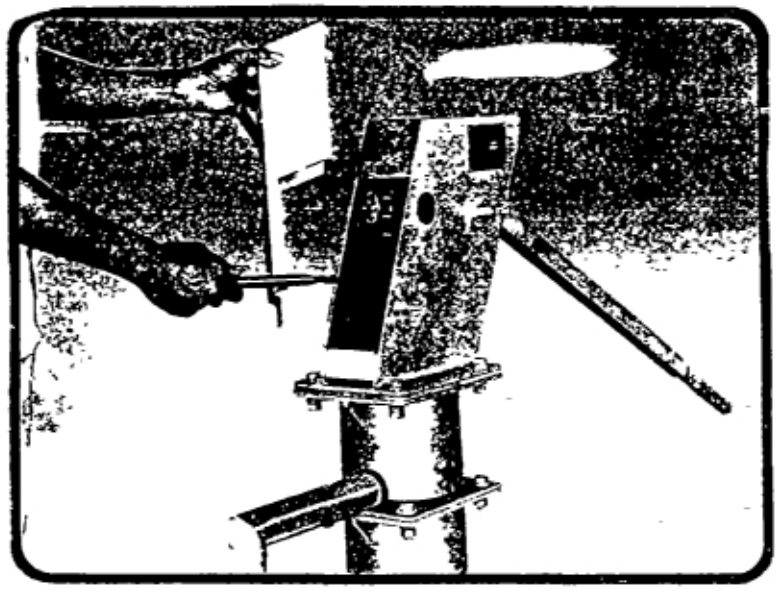
DISMANTLING OF HAND PUMP

STEP 1

LOOSEN PUMP HEAD COVER BOLT.

STEP 2

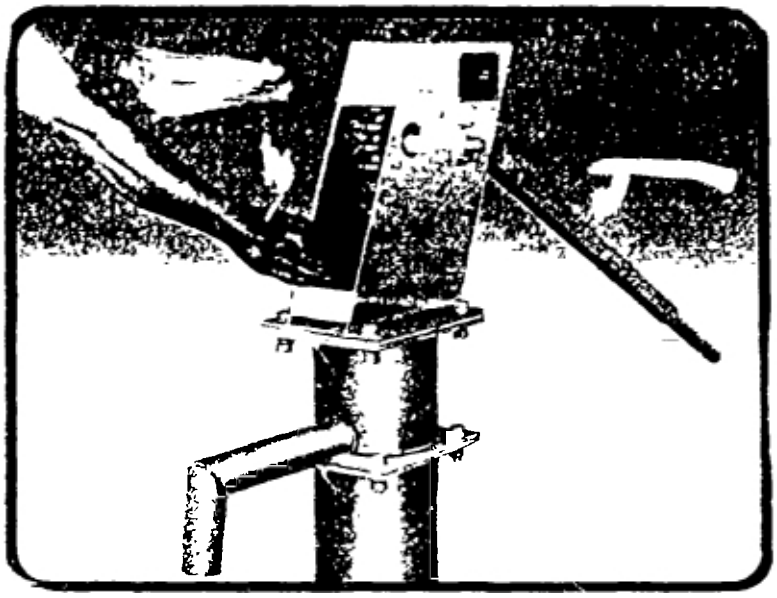
REMOVE INSPECTION COVER



STEP 3

1. LOWER THE HANDLE.

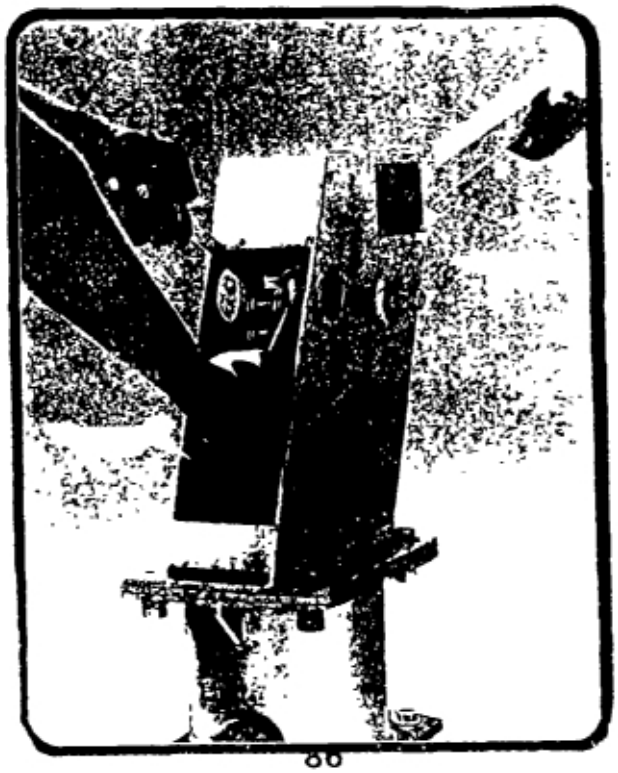
2. INSERT CHAIN COUPLER SUPPORTING TOOL BELOW THE CHAIN.



STEP 4

1. LIFT HANDLE TO TOP POSITION.

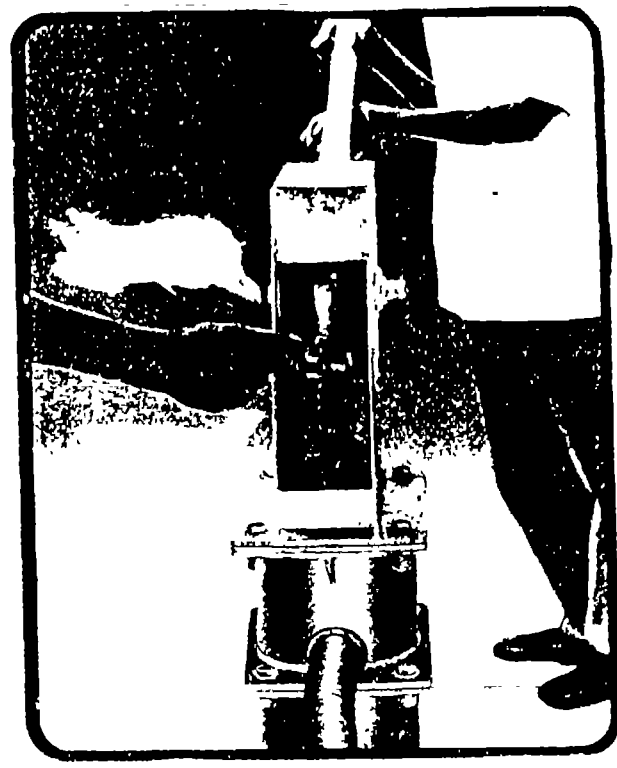
2. LOOSEN NYLOC NUT.



STEP 5

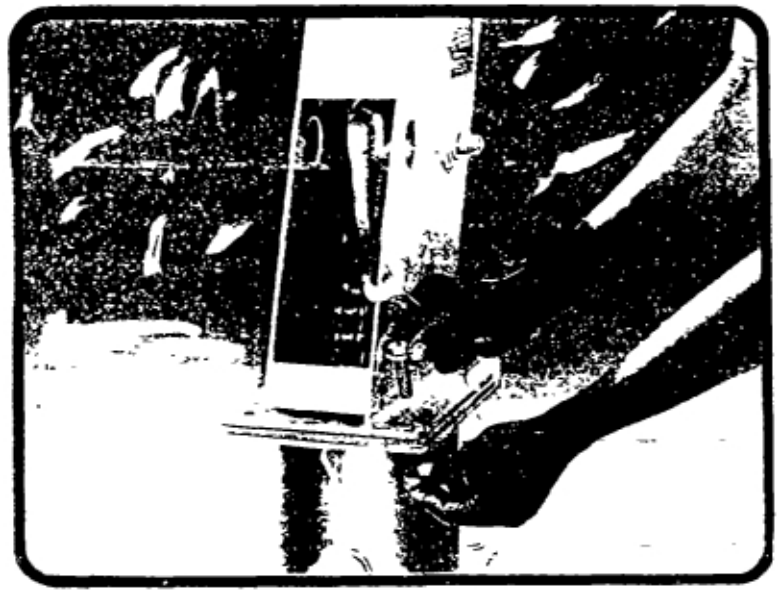
1. REMOVE NYLOC NUT WASHER AND ANCHOR BOLT.

2. PULL OUT CHAIN FROM THE HANDLE.



STEP 6

LOOSEN BOLTS AND NUTS CONNECTING HEAD AND WATER TANK. REMOVE THEM.

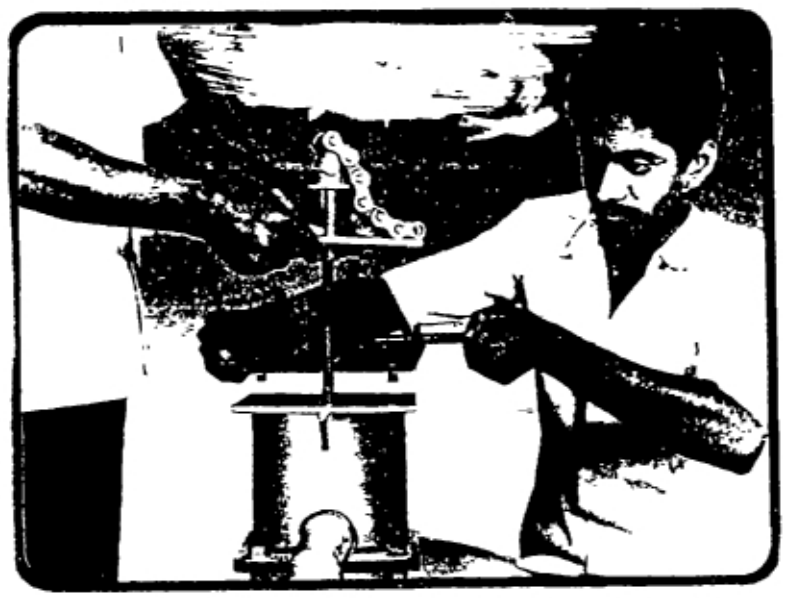


STEP 7

LIFT AND REMOVE HEAD ASSEMBLY LEAVING CHAIN BEHIND THROUGH 75 MM DIA HOLE IN BOTTOM FLANGE.

STEP 8

LIFT CONNECTING ROD BY HOLDING MIDDLE FLANGE AND INSERT CONNECTING ROD VICE.



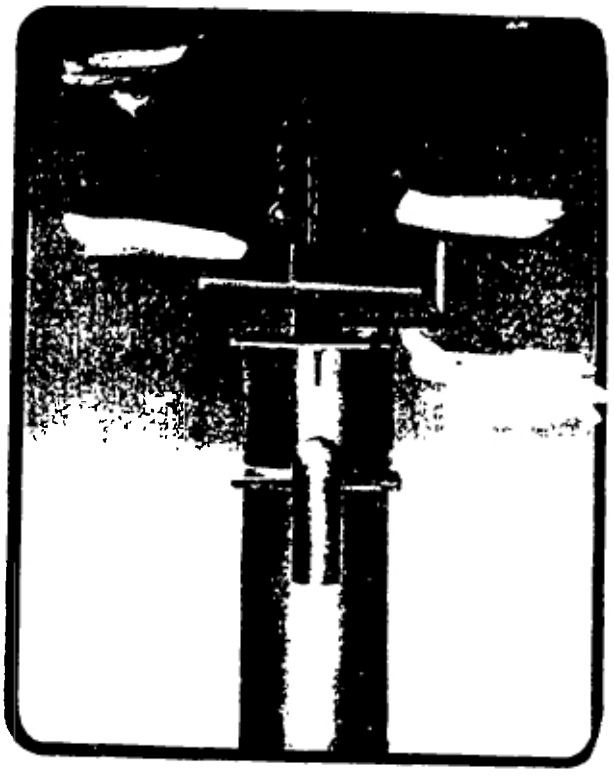
STEP 9

1. PLACE ROD VICE GENTLY ON WATER TANK TOP FLANGE AND TIGHTEN THE SAME.

2. GENTLY PLACE MIDDLE FLANGE ON THE VICE.

3. LOOSEN AND REMOVE CHAIN ASSEMBLY FROM CONNECTING ROD.

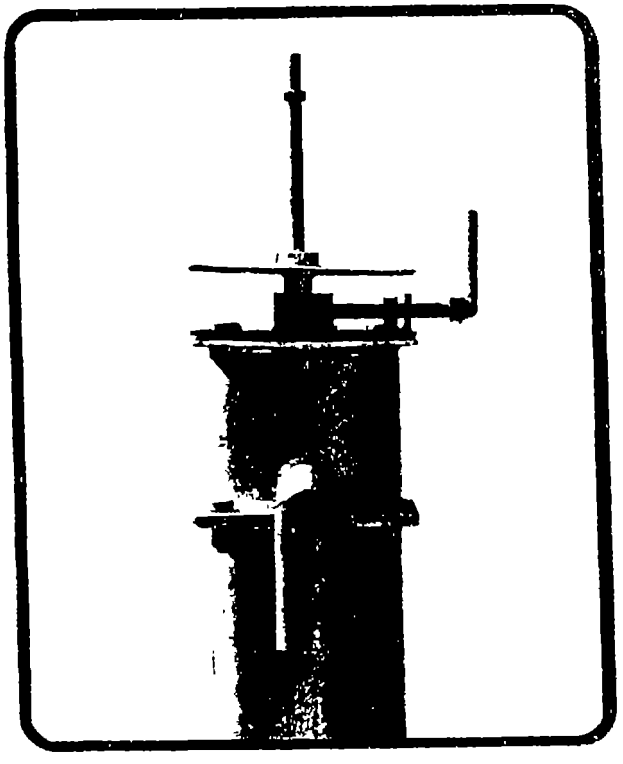
4. REMOVE CHAIN COUPLER SUPPORTING TOOL.



STEP 10

1. REMOVE CHECK NUT.

2. REMOVE MIDDLE FLANGE.

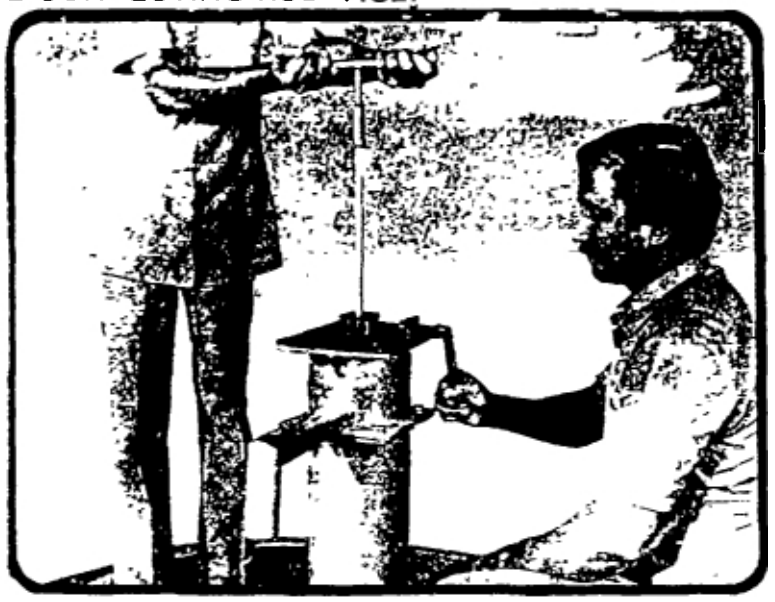


STEP 11

1. TIGHTEN ROD LIFTER AS SHOWN.

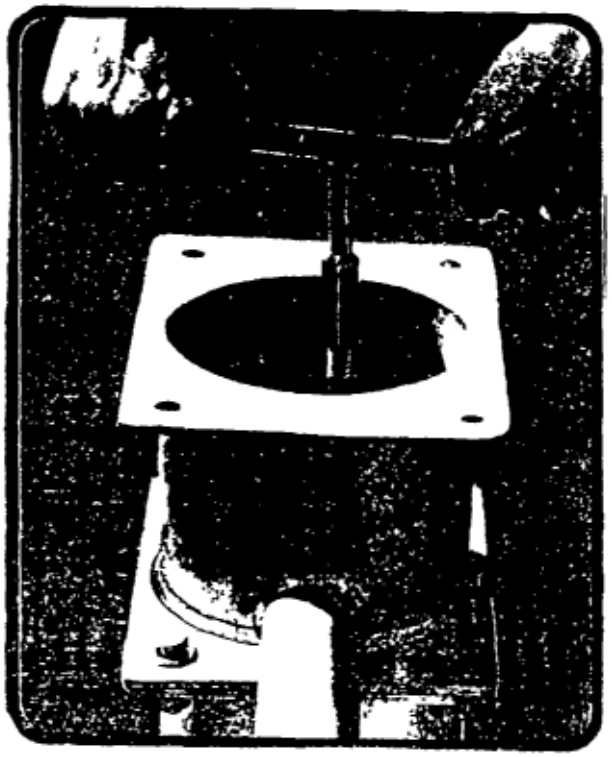
2. HOLDING THE ROD LIFTER FIRMLY,
SLOWLY LOOSEN VICE AND
GENTLY LOWER THE CONNECTING RODS.

3. REMOVE CONNECTING ROD VICE.



STEP 12

ROTATE ROD LIFTER IN CLOCKWISE
DIRECTION SO THAT PLUNGER ASSEMBLY
INSIDE IS SCREWED WITH CHECK
VALVE ASSEMBLY.



STEP 13

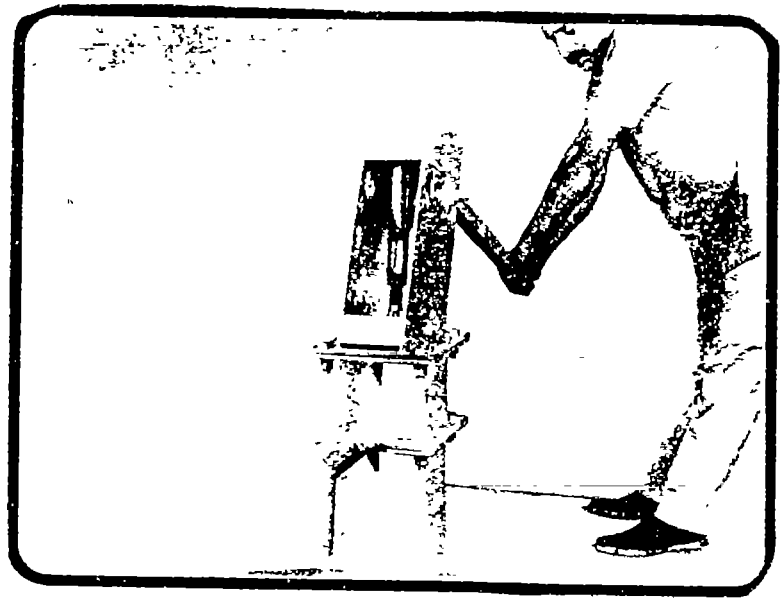
1. REMOVE ROD LIFTER.

2. CONNECT THE ROD LIFTING ADAPTER.

3. PLACE HEAD ASSEMBLY AND CONNECT THE LIFTING ADAPTER TO THE HANDLE.

STEP 14

PUSH HANDLE DOWN SUDDENLY AND WAIT TILL WATER COLUMN IN RISING MAIN DRAINS.



STEP 15

1. LIFT HANDLE UPWARD SLOWLY.

2. DISCONNECT ADAPTER.

STEP 16

1. REMOVE HEAD ASSEMBLY.

2. SCREW ROD LIFTER.

3. LIFT CONNECTING ROD.

4. INSERT CONNECTING ROD VICE AND TIGHTEN.

STEP 17

REMOVE ROD LIFTER.

1. HOLD THE ROD.
   SLOWLY LOCSEN VICE AND LIFT ROD.

2. TIGHTEN VICE AS SHOWN.

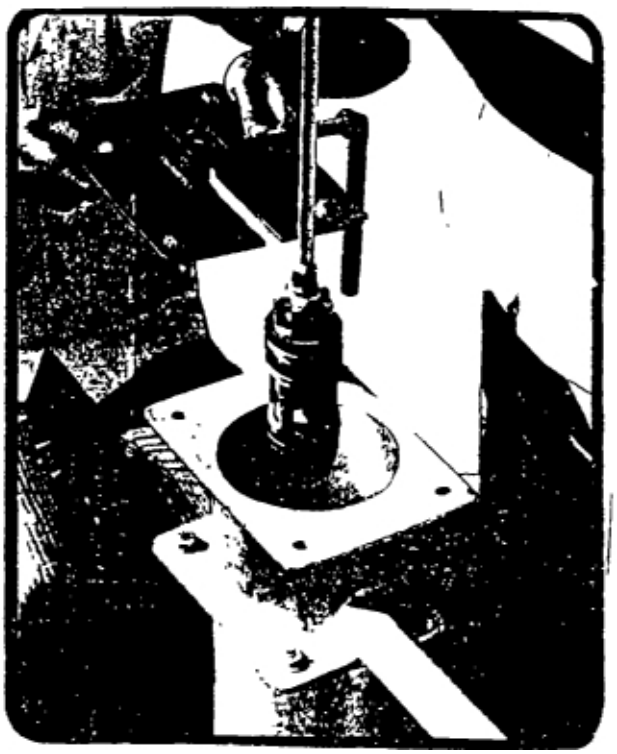
3. LOOSEN AND REMOVE FIRST
   CONNECTING ROD.

REPEAT THE PROCESS TILL THE LAST CONNECTING ROD WITH PLUNGER AND CHECK VALVE IS PULLED OUT.

STEP 18

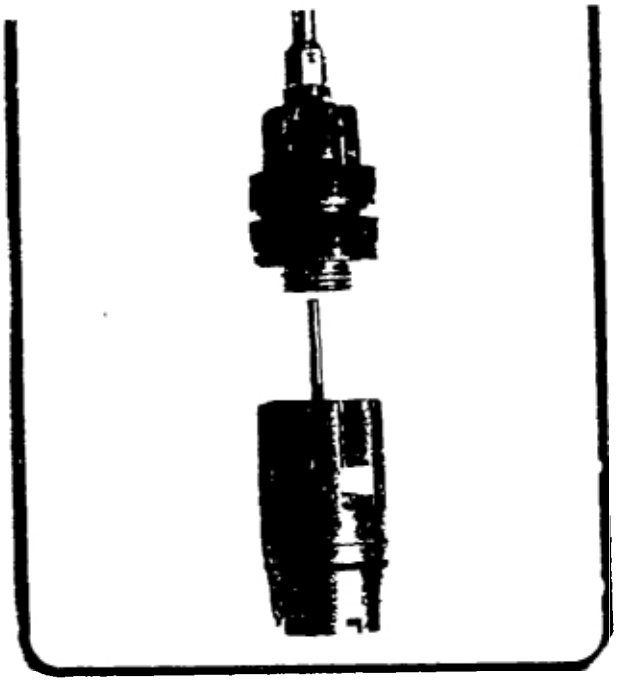
1. LOOSEN AND REMOVE CONNECTING ROD VICE.

2. REMOVE PLUNGER WITH CHECK VALVE.



STEP 19

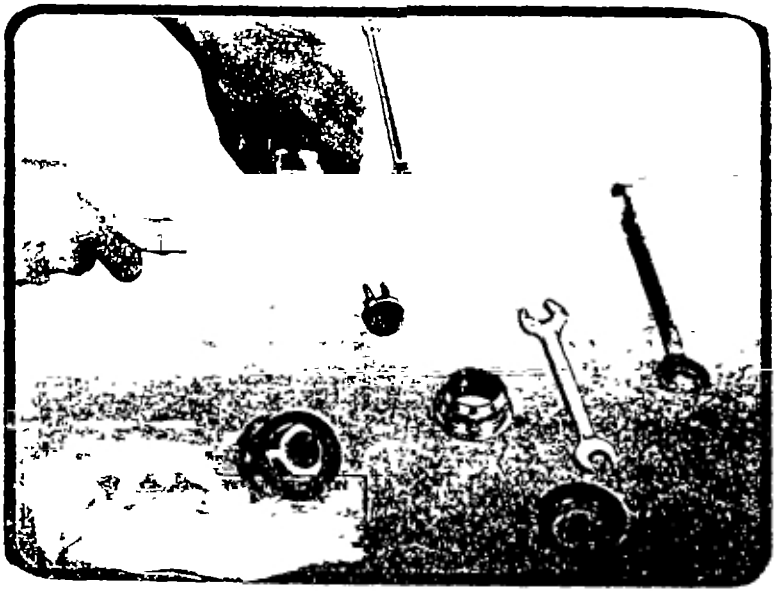
UNSCREW PLUNGER FROM PICK UP VALVE (CHECK VALVE).



STEP 20

DISMANTLE ALL COMPONENTS FROM PLUNGER AND CHECK VALVE ASSEMBLIES AND INSPECT.

REPLACE WORN OUT AND DAMAGED COMPONENTS. ASSEMBLE PLUNGER AND CHECK VALVE ASSEMBLIES AND ERECT THE PUMP.
AFTER CHECKING WHETHER THE PUMP IS WORKING WELL IN ALL ASPECTS.



HAND PUMP OVERHAUL

SL. NO.	PART/WORK	COULD BE CARRIED OUT BY	
		HANDPUMP MECHANIC	MOBILE MAINTENANCE TEAM
1.	PUMP BODY		
a.	Clean pump head, water tank inside and outside and pedestal outer surface above ground with a clean cloth.	YES	YES
b.	Clean the chain, if necessary apply grease.	YES	YES
c.	Check and if found necessary replace handle ball bearings.	YES	YES
d.	Check all nuts and bolts including anchor bolt and nyloc nut, clean the threads and if found necessary, replace the worn out/damaged nuts and bolts.	YES	YES
e.	If axle is found damaged, replace.	YES	YES
2.	CYLINDER COMPONENTS Pull out the plunger and check valve assemblies as per the procedure laid out in this manual and replace worn out components.	YES	YES
3.	CONNECTING RODS Pull out the connecting rods as per the procedure laid down in this manual and check for bent rods, damaged threads, etc. and replace the rods wherever necessary.	YES	YES

4. PLATFORM

a.	If cracks are present in the platform, fill up the cracks with cement and plaster the exposed place.	NO	YES
b.	If the hand pump pedestal is loose in the platform, dig a 76 x 76 x 52 cms square pit around the pedestal base (from top of platform) and fill the same with 1:2:4: cement concrete mixture and allow it to cure for 7 days. Disconnect the chain from the handle and instruct villagers not to use the pump for 7 days. The curing/setting time can be reduced if quick setting cement-compound is used.	NO	YES
5.	RISER PIPES Pull out the pipes as per procedure and check for cracks, bends, damaged or worn out threads and damaged or worn out couplers. Replace if necessary.	NO	YES
6.	CYLINDER BODY AND CAPS Pull out the riser pipes with cylinder body and caps as per procedure and check for cracks, damaged or worn out threads. Replace if necessary.	NO	YES
7.	CHLORINATE the tubewell, after completion of hand pump overhaul, as per procedure given in this manual.	YES	YES

TROUBLE SHOOTING CAUSES - REMEDIES

A. THAT CAN BE CARRIED OUT BY HANDPUMP MECHANICS

	TROUBLE		CAUSE		REMEDY
1.	Pump handle works easily but no flow of water.	*	Worn out cylinder rubber cup washers.	*	Replace rubber cup washers.
		*	Valve seats worn out.	*	Replace valve seats.
		*	Connecting rod joint disconnected.	*	Pull out connecting rods and join connecting rods wherever necessary.
		*	Broken chain	*	Replace chain.
2.	Delayed flow or little flow of water	*	Leakage in cylinder, check valve or upper valve.	*	Pull out plunger and check valve assemblies replace rubber seats.
		*	Worn out O ring.	*	Replace O ring.
		*	Rubber cup washers worn out.	*	Replace rubber cup washers.
3.	Folding of chain during return stroke.	*	Rubber cup washers got jammed inside the cylinder.	*	Replace rubber cup washers.
4.	Noise during operation	*	Bent connecting rod.	*	Change defective rod.
5.	Shaky Handle	*	Loose handle axle nuts.	*	Tighten handle axle nuts.

		*	Worn out ball bearings	*	Replace ball bearings.
		*	Spacer worn out or damaged.	*	Replace spacer.
		*	Worn out/ damaged axle.	*	Replace axle.

B. THAT SHOULD BE CARRIED OUT BY MOBILE MAINTENANCE TEAM

1.	Pump handle works easily but no flow of water.	*	Water level gone down below cylinder assembly.	*	Add more pipes and rods.
2.	Delayed flow or	*	Damaged rising main.	*	Replace damaged pipe.
3.	Noise during operation	*	Shaky foundation	*	Check foundation and redo the same, if necessary.
4.	Shaky handle	*	Worn out ball bearings.	*	Replace ball bearings
		*	Spacer worn out damaged.	*	Replace spacer.
		*	Bearings loose in bearing housing.	*	Replace handle assembly.

SPARE REQUIREMENTS

HANDPUMP MECHANIC SPARE PARTS KIT

The following essential spares are recommended to be kept in the VLOM took kit itself, so that it remains handy for the VLOM mechanic.

a]	Rubber 'O' ring for check valve seat	4
b]	Nitrile rubber cup washer	4
c]	Check valve rubber seating	2
d]	Plunger valve rubber seating	4
e]	M12 x 40 mm long galvanised bolt	4
f]	M12 galvanised nut	8
g]	Multipurpose grease	200 gms.
h]	Handle axle (stainless steel)	1
i]	Ball bearing	2
j]	Chain assembly	1
k]	Chain anchor bolt, nut and washer	2 sets.
l]	Handle axle washer M12	1
m]	Handle axle spacer	1
n]	Inspection cover bolt and washer	2 sets.
o]	M6 check nut	1
p]	Check valve	1
q]	Plunger valve	1

RECOMMENDED SPARES FOR TWO YEARS NORMAL MAINTENANCE (100 Handpumps)

The following spares are recommended to be procured and store for each VLOM India Mark III hand pump installed for two years normal maintenance.

SPARES FOR PUMP HEAD:

		QTY.
1.	Hexagonal bolts M12 x 1.75 x 40 mm long	8 Nos. x100
2.	Hexagonal nuts M12 x 1.75	18 Nos.
3.	Washers M12	10 Nos.
4.	High Tensile Bolt M10 x 1.5 x 40 mm long	1 No.
5.	Nyloc Nut M10 x 1.5	2 Nos.
6.	Handle axle [stainless steel]	1 No.
7.	Washer [4 mm thick] for handle axle	1 No.
8.	Bearing [6204 Z]	2 Nos.
9.	Spacer	1 No.
10.	Chain with coupling	1 No.
11.	Bolt for front cover M12 x 1.75 x 20 mm long	2 Nos

SPARES FOR CYLINDER:

1.	Nitrile rubber cup washers	4 nos.
2.	Upper valve rubber seating	2 nos
3.	Check valve rubber seating	2 nos.
4.	Rubber 'O' rings	4 nos.
5.	Rubber sealing rings	4 nos.

SPARES FOR CONNECTING RODS AND G.I. RISER PIPES:

1.	Hexagonal rod coupling M12 x 1.75 x 50 mm long	2 nos.
2.	Pipe sockets (65 mm N.B. Medium grade hot dip galvanised)	4 nos.

NOTE: In addition to the above spares we also recommend the stocking of complete pumps to take care of sub-assembly replacement to the tune of 3% of the total number of pumps installed in the field.

NUMBERING OF HANDPUMPS

In order to identify the installations and keep record of the handpump maintenance, the Kardex system may be used.
The formats of the handpump installation card and the handpump maintenance card are given below.

ANNEXURES

SAMPLE FORMATS

3.1. CHECKLIST FOR A VILLAGE CONTACT DRIVE

1. Name of sponsoring agency : _____

2. Name of implementing agency : _____

3. Non-Governmental Organization (s): _____
4. Information about the village :

   - Name of village _____
   - Block _____
   - District _____

5. Population of the village : _____

   - Male _____
   - Female _____

6. Information about the Village Contact Drive :

   - Date _____

   - Duration From _____ To _____

7. Activities conducted :

   - Rally through the village yes/no
   - Slogan raising yes/no
   - Pasting of posters yes/no
   - Slogan writing yes/no
   - Wall painting yes/no
   - Village corner meetings yes/no
   - Large group meetings yes/no
   - House to house contact yes/no
   - Baseline survey yes/no
   - Puppetry show yes/no
   - Drama/street theatre yes/no
   - Any other activity undertaken yes/no
   - village mapping with community participation yes/no

Name of the reporting official :_____Signature _____
Designation : _____ Date:_____

3.2 PARTICULARS ABOUT WATSAN COMMITTEE :

WATSAN committee formed Yes/No

If No, Why? _____

_____

_____

If yes, is it a registered body ? _____

Has the Committee open an account in the Bank/P.O. Yes/No

Permanent address of Committee : _____

_____

_____

Name of committee members	Age	Sex	Address	Occupation	Designation in the WATSAN Committee

Name of the reporting official :_____Signature _____

Designation : _____ Date:_____

3.3 FORMAT FOR INFORMATION ON HANDPUMP CARETAKERS

Village handpump caretaker selected Yes/No

If No, Why? _____

_____

_____

Sno	Name of the caretaker	Age	Sex	Husband's name	Occupation	Qualification	Address	Trg. taken

Name of the reporting official :_____ Signature _____

Designation : _____ Date:_____

3.4 FORMAT FOR INFORMATION ON HANDPUMP MECHANICS

Handpump mechanics selected Yes/No

If No, Why? _____

_____

_____

Sno	Name of the mechanic	Age	Sex	Husband's name	Occupation	Qualification	Address	Trg. taken

Name of the reporting official :_____Signature _____

Designation : _____Date:_____

LAND AGREEMENT FORM

I/We, Shri/Smt._____

S/O./W.O./Shri._____

Village : _____

P.O._____ Distt._____ State ____hereby recognize this agreement, to the Panchayat Samiti of_____Block, for the transfer of required land measuring for the installation of India mark III handpump by the Zilla Parishad,_____ distt. in our village for public use.

I/We/Our successors will have no right on the land required for the installation of India Mark III handpump with standard platform and drain, from my/our land/holding, Katha No :_____ Plot No._____adjacent to the public road, till the presence of handpump on this land. There will be no objection from my/our successors' side regarding the use of handpump on the particular land for any sort of correlating activities by any persons.

Witness :

1) Name : _____

Address : _____

Signature:_____

2) Name : _____ Signature/Thumb impression

Address : _____ Place :_____
Signature:_____ Date :_____

TEST CHARACTERISTICS FOR DRINKING WATER

The table below indicates that potable water should meet various physico-chemical standards. The undesirable effect due to the presence of excessive concentration of various constituents is also summarized in the table. It can be seen the while excessive solids cause gastrointestinal irritations, the pH, chloride, mineral oil, phenol, etc. change the taste of water. The presence of even a trace quantity of heavy metal ions imparts toxicity to water. fluoride in excess concentration causes mottling of teeth and also disfigures the skeletons leading to "skeletal fluorosis". The presence of iron in the water which is normally observed in ground water besides imparting a brown colour to water also produces turbidity and enhances the growth or iron bacteria.

Besides, the physico-chemical standards the drinking water should also meet the bacteriological standard which is measured in terms of 'Coliform Court'. The bacteriologically safe water should be free from any pathogenic organism.

TEST CHARACTERISTICS FOR DRINKING WATER

Sr. No.	Substance or Characteristic	Requirement (Desirable limit)	Undesirable effect out-side the desirable limit	Permissible limit in the absence of alternate source	Remarks
A.	**Essential Character-istics**				
1.	Colour, Hazel Units, Maximum	5	Above 5, consumer acceptance decreases.	25	Extended to 25 only if toxic substances are not suspected, in absence of alternate sources.
2.	Odour	Unobjectionable	-	-	a) Test cold and when heated. b) Test at several dilutions.
3.	Taste	Agreeable	Test to be conducted only after safety has been established	-	

4.	Turbidity	5	Above 5, consumer acceptance decreases	10	-
5.	pH value	6.5 to 8.5	Beyond this range the water will affect the mucous membrane and/or water supply system.	No relaxation	-

Sr No	Substance or Charact-eristic	Requirement (Desirable limit)	Undesirable effect out-side the desirable limit	Permissible limit in the absence of alternate source	Remarks
6.	Total hardness (as $CaCO_3$ mg/1, Maximum	300	Encrustra-tion in water supply structure and adverse effects on domestic use.	600	-
7.	Iron (as Fe) mg/1, maximum	0.3	Beyond this limit taste and appearance are affected, has adverse effect on domestic uses and water supply structures and promotes iron bacteria	0.1	-
8.	Chlorides (as ClO) mg/1, Maximum	250	Beyond this limit, taste, corrosion and palatability are affected.	100	-

9.	**Residual, free chlorine, mg/1, Maximum**	**0.2**	-	-	**To be applicable only when water is chlorinated Tested at consumer end. When protection against viral infection is required should be min. 0.5**

TEST CHARACTERISTICS FOR DRINKING WATER

Sr No	Substance or Characteristic	Requirement (Desirable limit)	Undesirable Effect out-side the desirable limit	Permissible limit in the absence of alternate source	Remarks
B.	**Desirable Characteristics**				
1.	Dissolved solids mg/1, Maximum	500	Beyond this palatability decreases and may cause gastro-intestinal irritation	2000	-
2.	Calcium (as Ca) mg/1, Maximum	75	Encrusta-tion in water supply structure and adverse effects on domestic use.	200	-
3.	Copper (as Cu) mg/1, Maximum	0.05	Astringent taste, discolouration and corrosion of pipes, fittings and utensils will be caused beyond this.	1.5	-

4.	Manganese (as Mn) mg/1, Maximum	0.1	Beyond this limit taste and appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	-

Sl. No.	Substance or characteristic	Requirement (Desirable limit)	Undesirable effect out-side the desirable limit	Permissible limit in the absence of alternate source	Remarks
5.	Sulphate (as SO4) mg/1, Maximum	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	May be extended upto 400 provided (as Mg) does not exceed 30.
6.	Nitrate (as NO3) mg/1, Maximum	45	Beyond this metha emolobinemia takes place	100	-
7.	Fluoride (as F) mg/1, Maximum	1.0	Fluoride may be kept as low as possible. High Fluoride may cause fluorosis	0.002	-
8.	Phenolic compounds (as C6H5OH) mg/1, Maximum.	0.001	Beyond this, it may cause objection-able taste and odour	0.002	-
9.	Mercury (as Hg) mg/1, Maximum	0.01	Beyond this, the water becomes toxic	No relaxation	To be tested when pollution is suspected.
10.	Cadium (as Cd),mg/1, Maximum	0.01	Beyond this, the water becomes toxic	No relaxation	To be tested when pollution is suspected.
11.	Selenium (as Se), mg/1, Maximum	0.01	Beyond this, the water becomes toxic	No relaxation	To be tested when pollution is suspected.

TEST CHARACTERISTICS FOR DRINKING WATER

Sr. No.	Substance or Characteristic	Requirement (Desirable limit)	Undesirable effect outside the desirable limit	Permissible limit in the absence of alternate source	Remarks

12.	Arsenic (as AS), mg/1, Maximum	0.05	Beyond this, the water becomes toxic	No relaxation	To be tested when polluted.
13.	Cyanide (as CN), mg/1, Maximum	0.05	Beyond this limit, the water becomes toxic	No relaxation	To be tested when polluted.
14.	Lead (as pb), mg/1, Maximum	0.05	Beyond this limit, the water becomes toxic.	No relaxation.	To be tested when pollution.plumbosolvency is suspected.
15.	Zinc (as Zn) mg/1 Maximum.	5	Beyond this limit it can cause astgringent taste and an opalescence in water.	15	To be tested when pollution is suspected.
16.	Anionic detergents (as MBAS) mg/1, Maximum.	0.2	Beyond this limit it can cause a light froth in water.	1.0	To be tested when pollution is suspected.
17.	Chromium (as Cr6+) mg/1, Maximum.	0.05	May be carcinog-enic above this limit	No relaxation	To be tested when pollution is suspected.
18.	Polynuclear aromatic hydro-carbons (as pAH) mg/1, Maximum	-	May be carcinog-enic.	-	-

Sr. No.	Substance or Characteristic	Requirement (Desirable limit)	Undesirable effect out-side the desirable limit	Permissible limit in the absence of alternate source	Remark
19.	Mineral oil mg/1, Maximum	0.01	Beyond this limit undesirable taste and odour after chlorination takes place	0.03	To be tested when pollut-ion is suspec-ted
20.	Pesticides mg/1, Maximum.	Absent	Toxic	0.001	-

21.	Radioactive materials: a) Alpha emitters Bq/1 Max. b) Beta emitters pci/1, Maximum.	-	-		
22.	Alkalinity mg/1, Maximum	200	Beyond this limit taste becomes unpleasant	600	-
23.	Aluminium (as Al) mg/1, Maximum.	0.03	Cumulative effect is reported to cause dementia	0.2	-
24.	Boron, mg/1, Maximum	1	-	5	-

Refer IS : 10500/1991 for Drinking Water Specification