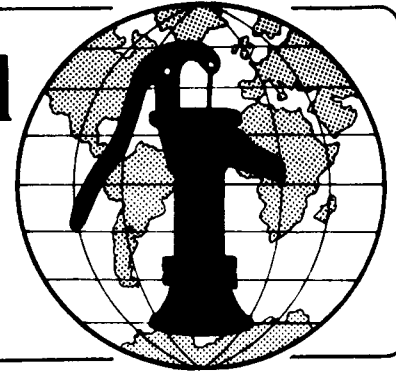


# Water for the World



## Operating and Maintaining Hand Pumps Technical Note No. RWS. 4.O.3

It is relatively easy to construct a water supply and to install the necessary pumping equipment to provide water to a village. A consideration too often overlooked is whether it will be operating one, two, five, or more years later. Too often, the system will become inoperative because of lack of knowledge of and attention to operation and maintenance.

Hand pumps have been installed in many villages throughout the world and in a number of different situations. Unfortunately many of them have become inoperative. As a result, there has been considerable effort to develop a better hand pump. This has led to worthwhile and necessary improvements but there is not now, nor is there likely to be, a "perfect" pump that will continue working without proper operation and maintenance. See Figures 1 and 2. The easier it is to

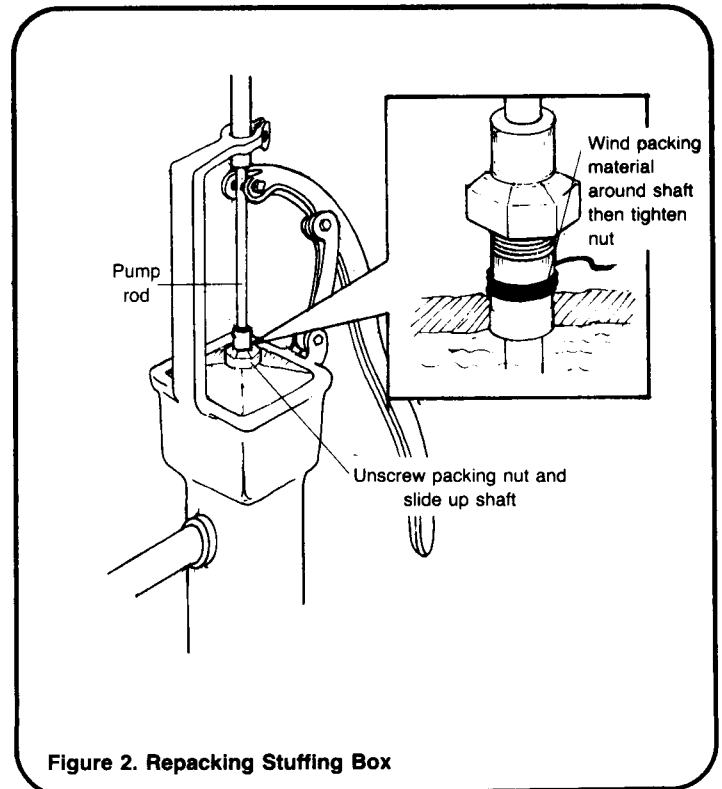


Figure 2. Repacking Stuffing Box

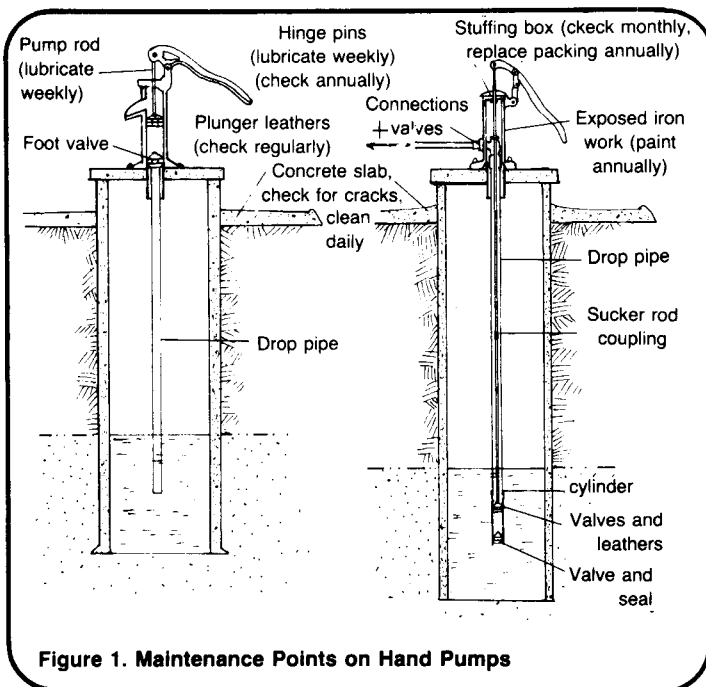


Figure 1. Maintenance Points on Hand Pumps

obtain water without a hand pump, the more likely it is that the pump will not be maintained and, once failure occurs, that the pump will not be repaired. For this reason it is essential that the village recognize the positive benefits of an improved water source. Only then will that village be motivated to see that the improvements are maintained or, as economics allow, increased.

### Useful Definition

**SUCKER ROD** - The rod which connects a windmill or hand pump to the pump cylinder in the well.

## Operation and Maintenance Programs

Various programs have been proposed and implemented to assure proper operation and maintenance. When coupled with community involvement, all have a good chance of success. These programs range from the village being totally responsible for operation and maintenance of the system to a government unit taking full responsibility. An alternative is cooperation between the community and an agency of central government to provide needed operation and maintenance. The specific means adopted will vary from place to place, from country to country and, in some situations, from village to village. It is imperative that the community recognize the importance of operation and maintenance and support the improvement.

Whatever method is used to provide operation and maintenance, it is absolutely essential that the village play a role and that this role is understood and agreed to by the village. As discussed above, one method of providing for continued operation and maintenance is a cooperative agreement between a unit of government and the village. The following is an example covering preventive maintenance, major repairs and an educational program.

### Example of Operational Procedures

Preventive Maintenance. Day-to-day maintenance of the hand pump is the responsibility of the village. In order to assure that this is accomplished, one of the villagers should be appointed the pump custodian. It is his or her responsibility to provide routine lubrication, keep the area around the pump clean and note wear for reporting to the field maintenance worker. Figures 1 and 2 identify key maintenance points.

A field maintenance worker should make routine inspections of all completed projects in the area. At the time of visits, he or she would determine what repairs could be made immediately. See Table 1 for examples of on-the-spot preventive maintenance repairs.

**Table 1. Typical Preventive Maintenance Repairs by Field Maintenance Worker**

1. Replace packing in hand pumps.
2. Replace worn bolts and cotter pins on pumps.
3. Replace worn or broken pump handles.
4. Replace washers in pump compression spouts.
5. Replace worn sucker rods.
6. Replace pump cylinders (worn leathers).
7. Replace defective valves at watering points.
8. Replace necessary fittings.
9. Replace manhole covers.

A member of the sanitation staff should accompany the field maintenance worker on the initial visit to each project to explain the project and make recommendations for a preventive maintenance schedule and procedure. The professional sanitation staff should assist the field maintenance worker in setting up routine inspection trips, advising on location and details of each project, and recommending methods of repair as shown in Figure 3. In addition, the professional sanitation staff should review inspection and repair reports so that they would be in a position to coordinate the field maintenance workers activities. The professional sanitation staff should notify the field maintenance worker upon the completion of a project and advise him or her of the details of all projects in the area. Table 2 is an example of an inspection report that can be used for the field work.

Major Repair of Breakdown. In case of major breakdown or failure of the project, the village leaders should notify the field maintenance worker who would then inspect the project and determine what is necessary for repairs. In the case of a major or unusual problem, the field maintenance worker should consult the professional sanitation staff and, if necessary, the professional sanitation staff should visit the project to make recommendations. If additional labor is necessary for repairs, the field maintenance worker will arrange hiring details with the village leaders. The necessary labor should be recruited from individuals who use the supply. The field maintenance worker would

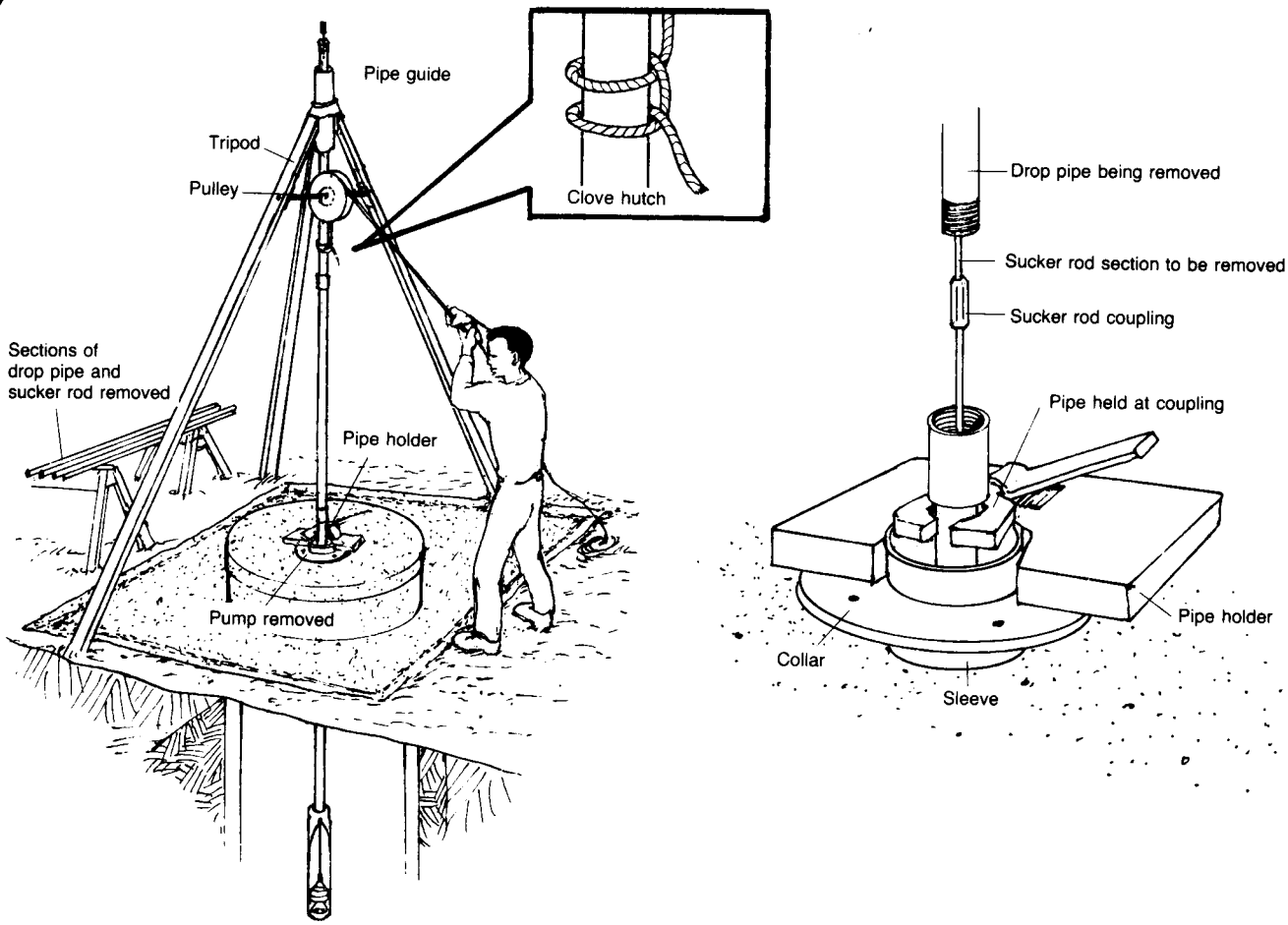


Figure 3. Raising Drop Pipe and Cylinder

estimate the labor and materials necessary for the repairs and submit this estimate to the professional sanitation staff for review and approval.

Educational Program. A cooperative effort between village community workers and the field maintenance worker should be undertaken to educate the village on preventive maintenance of the hand pump. They should inform the villagers of items to look for so that repairs can be made before they become too costly, and of the proper channels for requesting repairs, when necessary.

**Table 2. Sample Inspection Report**

Date \_\_\_\_\_

Region \_\_\_\_\_ Village \_\_\_\_\_

Location \_\_\_\_\_

Type \_\_\_\_\_

Description: (Check items which are a part of the system).

hand pump ( ); well slab ( ); watering point ( ); spring box ( );  
 storage tank ( ); pipe line ( ); manhole cover ( ); diversion wall ( );  
 windmill ( ); stock through ( ); other \_\_\_\_\_

<u>Hand Pump</u>	Good Condition	Repair or Replace	<u>Well Slab</u>	Repair or Replace
packing	( )	( )	good condition	( )
bolts	( )	( )	cracked	( )
cotter pins	( )	( )	manhole cover in place	( )
handle	( )	( )	manhole cover missing	( )
shaft	( )	( )	manhole cover replaced	( )
compression spout	( )	( )		
sucker rod	( )	( )	<u>Spring Box</u>	
cylinder	( )	( )		
mounting	( )	( )	good condition	( )
			cracked	( )
<u>Water Point</u>			manhole cover in place	( )
			manhole cover missing	( )
valve	( )	( )	manhole cover replaced	( )
mill hose	( )	( )	overflow satisfactory	( )
fittings	( )	( )	overflow needs repair	( )
stand	( )	( )	overflow repaired	( )
pipng	( )	( )	vent satisfactory	( )
vent	( )	( )	vent needs repair	( )
hose clamp	( )	( )	vent repaired	( )
			discharge satisfactory	( )
<u>Storage Tank</u>			discharge unsatisfactory	( )
			discharge repaired	( )
walls	( )	( )		
cover	( )	( )	<u>Pipeline</u>	
manhole cover	( )	( )		
bottom	( )	( )	good condition	( )
discharge	( )	( )	needs repair	( )
vent	( )	( )	estimate made	( )
valves	( )	( )		
pipng	( )	( )	<u>Diversion Wall</u>	
fittings	( )	( )		
			condition good	( )
<u>Windmill</u>			needs repair	( )
			estimate made	( )
packing	( )	( )		
discharge	( )	( )	<u>Other</u>	
seal	( )	( )		
			_____	( )
<u>Stock Through</u>			_____	( )
			_____	( )
walls	( )	( )		
pipng	( )	( )		
valve	( )	( )	<u>Field Maintenance Worker</u>	
apron	( )	( )		

**Technical Notes** are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.