



MAINTENANCE OF SMALL WATER SUPPLY, SANITATION AND IRRIGATION SCHEMES

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1 WATER SUPPLY SCHEMES

Hand pumps

1.1 OPERATION AND MAINTENANCE OF HAND PUMPS

Hand pumps require day-to-day preventive maintenance, keeping the area around the pump clean and lubricate particular parts on a regular basis.

Furthermore on annual basis the pump needs to be inspected and if failures occur immediate repairs need to be activated. Few of these repairs should be carried out during the inspection, like:

- Replace packing in hand pumps
- Replace worn bolts and cotter pins on pumps
- Replace worn or broken pump handles
- Replace washers in pump compression spouts
- Replace worn sucker rods
- Replace pump cylinders (worn leathers)
- Replace defective valves at watering points
- Replace necessary fittings
- Replace manhole covers

1.2 OPERATING AND MAINTAINING MECHANICAL PUMPS

Often the manufacturer has developed a maintenance manual for the pump. If the manuals are not available, they should be ordered at the manufacturer.

Common preventive maintenance schedules are:

Daily:

- Turn pump on/off as required
- Check pump for excess heat in motor or bearing
- Check controls for proper operation
- Check water level in well
- Check piping for leaks
- Check condensation in pump house
- Check chemical levels
- Check oil level, pressure and fuel level if internal combustion engine
- Record water and electric motor readings
- Record system pressure
- Record chemical residuals
- Record unusual observations
- Record fuel used, hours run, internal combustion engine
- Correct problems identified

Monthly:

- Lubricate pump
- Check amperage on electric motor
- Report on water use for last month

Semi-annually:

- Lubricate pump house door hinges
- Close and open gate valves in pump house
- Test blow off is furnished

Other intervals:

- Change oil, oil filters, fuel filters in accordance with manufacturers
- Each fall check backup heating system

1.3 OPERATING AND MAINTAINING HOUSEHOLD WATER CONNECTIONS

A good operation and maintenance program includes activities as opening and closing all the gate valves in a system every six months and flushing fire or flush hydrants every six months. The total system should be inspected every week. If water meters were installed they should be removed and tested every 3 to 5 years.

1.4 DETECTING AND CORRECTING LEAKING PIPES

Leaks may occur without detection because they are often relatively small and do not create immediate problems such as washing out a road or draining a water tank. Small leaks can continue for years undetected, however, even minor leaks get worse and eventually can cause significant damage. Leaks are particularly expensive if the water has to be pumped or is scarce. Leaks can be easily detected when the system is fully metered and accurate water production and use records are maintained.

Leaks can also be visually be detected. Visual observation should be made every six months of signs of leaks such as a slump in the material over a trench, abundant vegetation growth or surface moisture. Valve covers should be removed and the valve box visually inspected for moisture. Furthermore a water use analysis is recommended every year. After a repair is made the line must be disinfected and flushed. One way to do this is to application of chlorine tablets.

1.5 OPERATING AND MAINTENANCE OF CHEMICAL DISINFECTING UNIT (CHLORINATION)

The chlorine tank has to be refilled with freshly prepared solution once or twice per week. Chlorinators regularly need to be adjusted and cleaned of chlorine salts. When hoses get affected they need to be replaced. If a steel chlorine tank is used it needs to be painted annually.

1.6 OPERATING AND MAINTENANCE OF SEDIMENTATION BASIN

To maintain the sedimentation basin, the solids or sludge that settle to the bottom of the basin must be removed. The frequency of sludge varies between six to eight weeks. If the water is very turbid, sludge removal should take place more often.

1.7 OPERATING AND MAINTAINING SLOW SAND FILTERS

Once the filter is constructed, it must be put into operation. Preparation of the filter takes several weeks as the sand bed as the sand bed must adequately prepared to act as a biological filter.

After several months of operation, a filter will need cleaning (scraping). After 20-30 scrapings, or several years, the filter bed will reach its minimum thickness (0.5 - 0.8 m above the gravel layer) and new or washed filter sand should be added to the filter bed.

1.8 MAINTAINING WATER STORAGE TANKS

The maintenance of water storage tanks is necessary to ensure the quality of the water stored. Maintenance of tanks basically involves two important procedures: prevention of contamination and cleaning (2 times per year) the tank periodically to ensure that water is fresh. All storage tanks should be checked monthly to ensure that all necessary maintenance is done when needed.

1.9 MAINTAINING SPRING WATER CAPTATION

Water should be permitted to flow out freely all the time so that it will not find another way out of the aquifer. Operation may include activities such as opening or closing valves to divert the water to a reservoir, a conduit or a drain. The spring and surrounding should be kept clean. The surroundings should be cleaned weekly. After each flood it is necessary to check the turbidity and on a yearly basis the spring should be disinfected cracks repaired.

1.10 MAINTENANCE OF DRILLED WELLS

The expected life of a drilled well is over 25 years. Operation of the well is usually not required. Apart from cleaning the apron daily and occasional cleaning the drain and repairing the fence (if there is one) there are hardly any maintenance activities. Rarely it is necessary to engage a specialised company when the well needs to be desilted or rehabilitated. The apron needs to be repaired on an annual basis.

2 MAINTENANCE OF SANITATION SCHEMES

2.1 OPERATING AND MAINTENANCE OF SUMPS, SOAKAGE PITS AND SOAKAGE TRENCHES

Properly constructed sumps can last 1 to 5 years and soakage pits and trenches 5 to 15 years. Maintaining these systems involves inspecting them for erosion and system failure. These inspections should be carried out at least once per year and necessary repairs should be initiated.

2.2 OPERATING AND MAINTAINING STABILISATION PONDS

Changes in weather, volume of daily flow, water temperature and winds can cause undesirable conditions on the pond surface, especially algae growth, scum layers and sludge mats. Daily monitoring and repair activities may be required.

Every two weeks the embankments and the pond site area need to be inspected. If a problem is found it should be addressed immediately. Furthermore it is necessary to check the sludge depth every year. If it is greater than one-third of the design pond depth, the pond needs to be drained and the sludge removed.

2.3 MAINTENANCE OF PRIVIES

A privy is basically a pit in the ground to collect the excreta, covered with a slab (and hole) and some kind of shelter. There are several types of privies varying from dry to wet disposal techniques. It goes without saying that privies should be thoroughly cleaned on regular basis. For a small family once per week is the minimum, but if privies are used for public use they should be cleaned daily if not more frequent. It is necessary to inspect the privies for public use at least once per month. The slab should be examined for cracks or other damages. During these inspections special attention should be paid to the lid and the mosquito/fly screen. The surroundings of the privies should also be checked with regard to appearance of termites. Termites may cause damages in the timber structures and should therefore be killed. The fly screen should be cleaned every 6 months.

The average replacement lives of latrines are usually:

- Pit latrine 4-6 years
- VIP 10 years

However this depends largely on the size of the pit and the number of users. A general rule of the thumb is to empty or start preparation for the construction of a new pit latrine when the contents in the pit reach 1.0 to 0.6 meters below the slab. 0.6 meters is considered the

fatal limit, because this space must be refilled with soil after which vegetation can be planted.

Aqua privies have drop pipes. These drop pipes need to be inspected at least once per six months. It should not be rusting or rotting and it should reach into the liquid. Every so many years the vault needs to be emptied. The emptying of the vault is a condition-based activity. If the depth of the sludge is more than half the liquid depth, the vault needs to be emptied. Inspections are usually carried out on a yearly basis. Depending on the size of the tank and the number of users the tank requires emptying every one to five years. Furthermore monthly inspections are required to identify defects on the squatting pan, seat or U-trap.

Compost toilets require many operation activities. It is recommendable to fill it each day with some grass, kitchen remaining, straw, etc. Once or twice per week the whole contents of the vault should be covered. Also once per week the toilet slab should be cleaned, but without using water. Usually ashes or powdered earth is used. The vault will fill with excreta and other materials. When the contents reaches 0.2 meter below the squatting slab the vault will be closed and other vault will be opened. The closed vault should be filled with fine soil. After 6 months the compost is ready to be removed from the vault.

A layer of leaves, weeds, grasses or similar material has to be thrown in the empty vault prior opening and use. Although compost latrines are reported to have a long life it is still recommendable to inspect the structure on a monthly basis.

Bucket latrines require emptying of the bucket whenever it is full. A bucket is likely to be full within one to three days. Once per month inspections are necessary of all the vital items, like: fly proof door, base of the latrine and the privy shelter.

3 MAINTAINING IRRIGATION SCHEMES

Canal Type	Width of Base	Height of Water
	(m)	(m)
A	10 - 20	> 3
B	8 - 10	2.5 -3.0
C	4 - 6	1.8 -2.4
D	2 - 4	1.3 -1.7
E	1 - 2	< 1 -1.2

Maintenance of irrigation schemes depends to a large extent on the canal dimensions and its hydraulic design. The FAO found some very rough guidelines for assessing maintenance needs of irrigation schemes. These guidelines are summarised in the table below.

	Type of Canal	Maintenance Cycle (years)	
IRRIGATION CANALS			
		Low silted water	High silted water
Silt clearance	A	8	3
	B	7	3
	C	6	3
	D	4	2
	E	3	2
Weed clearance	A, B, C, D, E	1	
Reshaping of berms	A, B, C, D, E	3	
Structures (metallic)			
<input type="checkbox"/> Large structures		6	
<input type="checkbox"/> Small/medium structures		3	
DRAINS			
Silt clearance	A, B, C	6	
	D, E	4	
Weed clearance	A, B, C, D, E	1	
Structures (all types)		3	
DAMS			
Weed clearance		1	
Soil conservation works		4	
Masonry		4	
Gates		2	
Electric engines		1	
<input type="checkbox"/> - revision		1	
<input type="checkbox"/> - overhaul		5	