

101/5903

2 5 5 . 1

8 7 G U

December 1987

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
DEPARTMENT OF PUBLIC HEALTH ENGINEERING
UNICEF-ASSISTED RURAL WATER SUPPLY AND SANITATION PROGRAMME

GUIDELINE AND SPECIFICATION FOR CONSTRUCTION
OF POND SAND FILTER (PSF)

UNICEF NATIONAL CENTRE
INTER-DEPARTMENTAL GROUP
FOR RURAL WATER SUPPLY AND
SANITATION (IRCS)

1. INTRODUCTION

Ground water is the main source of rural water supplies of Bangladesh. According to an assessment by DPHE/UNICEF, the ground water in a part or whole of some 20 coastal Upazilas contain chloride in excess of 1000 ppm rendering any type of tubewell unfeasible. Consequently the people of these affected areas use the surface sources such as pond, canal and rivers for their all water needs including drinking. All these surface sources are highly polluted and therefore not safe for direct human consumption. Hence the programme objective of reduction of diarrhoeal morbidity by providing safe water cannot be met.

Of these sources, ponds are extensively used particularly in dry season when the number of users rises manyfold. The ponds are replenished by rain water mainly in monsoon.

It has therefore been a priority to develop a low cost, appropriate community type Pond Sand Filter for the salinity-affected areas. In order to develop an appropriate Pond Sand Filter research and development activities have been carried out in recent years. Finally an appropriate successful design has been developed jointly by DPHE and UNICEF in Dacope testing area. This design was approved in the DPHE's 87th Technical Committee meeting held on 11 August 1987. The Technical Committee decided that this design should be adopted in the current ADP programme (1987-88) in a limited area. Further expansion will be made gradually and over the next two or three years all affected Upazilas will adopt PSF construction as a regular programme.

The drawing of the PSF is shown at ANNEX-A.

LIBRARY INTERNATIONAL REFERENCE
CENTRE FOR RURAL WATER SUPPLY

2551-87GU-5903

ISBN 5903
255.1 87GU

2. ADP 1987-88

40 PSFs will be constructed during 1987-88. The Upazilawise breakdown is shown below:

<u>DPHE Division</u>	<u>Sub-Division</u>	<u>Upazilas</u>	<u>No. of PSFs</u>
Khulna	Khulna Sadar	Dacope	5
		Koyra	5
	Bagerhat	Rampal	10
		Mongla	10
Barisal	Jhalkathi	Kathalia	10

The activities will be charged to the DPHE Project for Water Supply In The Coastal Areas.

3. SITE SELECTION CRITERIA

Selection of a proper site meeting the following requirements is very important and the key to proper construction, operation and maintenance.

- a) A PSF will be constructed only in those parts of the coastal areas where no tubewell (STW, DTW, VSST and SST) is feasible because of high salinity (over 1500 ppm) of ground water.
- b) The pond must be large enough to ensure that it will not dry out in the dry season.
- c) The salinity of the pond water must not exceed 600 ppm at any time of the year.
- d) The iron content of the pond water must not exceed 5 ppm at any time of the year.
- e) While the location of the PSF should be closed to a family to ensure its security, it must be freely accessible to the public.
- f) The beneficiaries must complete an Application Form to build a PSF and must be willing to participate and contribute in the construction and take complete responsibility for operation and routine maintenance.

4. IMPLEMENTATION PROCEDURE

- a) The SDE and DPHE/UNICEF R&D Officer will hold an orientation meeting with the SAE and all the Tubewell Mechanics of each Upazila to give them a thorough knowledge of:
- the design and drawing of the PSF;
 - proper construction, operation and maintenance;
 - the respective roles of DPHE and the beneficiaries;
 - the roles of the SAEs and Mechanics;
 - site selection;
 - communication and motivation of the beneficiaries;
 - training of the mason who will construct the PSF;
 - training of the caretakers/maintenance group;
 - supervision of implementation;
 - monitoring performance;
- b) SAE will select the first site in each Upazila, which will be used for demonstration and training.
- c) On receipt of ADP allocation, the Chairman, Upazila Water Supply and Sanitation Committee will convene a meeting of the Committee to which the UP Chairmen of selected Unions, the SDE, DPHE and DPHE/UNICEF R&D Officer should be invited. The SAE DPHE will take the initiative to hold the meeting.
- d) The SDE and DPHE/UNICEF R&D Officer will describe in detail the various aspects of implementation, the responsibilities of different persons and officials, the role of the beneficiaries and the benefits, conditions and limitations of the PSF. All queries of the participants should be answered in order to make it clear to everybody.
- e) After the orientation, the SAE and Tubewell Mechanics will distribute information leaflets and Application Forms (ANNEX - 8) among the prospective beneficiaries. At the time of distribution of application forms a group meeting of male and female prospective beneficiaries should be held at village level. The SAE or TWM should describe in detail the benefits, conditions and limitations of the PSF and the respective roles of beneficiaries and DPHE to construct and operate a PSF successfully. He will also guide them in making an application.
- f) The beneficiaries should be instructed to submit their application to the SAE by a certain date.
- g) The SAE will inspect each site from which an application has been received to check iron and salinity content of the pond, site selection criteria and willingness of beneficiaries to contribute.
- h) During the site inspection visit the SAE will again inform the applicants of the following points on benefits, conditions and limitations of the PSF at a gathering of men and women beneficiaries at site:

Benefits

- The filtered water will be safe to drink.
- There will be considerable reduction in the incidence of diarrhoeal diseases.
- Large platform will provide convenience.

Conditions:

- The beneficiaries must participate by supplying carriage and labour. All beneficiaries should make some contribution.
- The beneficiaries should provide 3 men and 3 women to be trained in maintenance of the PSF from the beginning.
- The beneficiaries must take full responsibility for maintenance and repair of the PSF.

Limitations:

- The PSF will have to be cleaned regularly by the beneficiaries (every 10-25 days depending on the usage and the cleanliness of the pond water).
 - Each collector of water must pump every time he/she draws water.
- i) The SAE will submit all applications received to a meeting of the UWSSC, with findings and priority list in accordance with the site selection criteria (see Section 3 above). The UWSSC will select 15 sites.
 - j) The SAE will inform the successful applicant to collect all materials within two weeks of being informed by the SAE that materials are ready for collections.
 - k) If any group fails to collect the materials after long period, the next priority applicant group should be selected and informed accordingly.

5. DUTIES AND RESPONSIBILITIES FOR CONSTRUCTIONa) The Beneficiaries

The beneficiaries will provide the following:

1. Carriage of all materials from DPHE up to the site. The SAE will advise the beneficiary group where to collect departmental materials.
2. Labour for making 60 cft khoa of specified size.
3. Helper for mason/plumber/carpenter

b) DPHE

The DPHE will provide the following:

From Departmental Stock

1. 21 bags cement
2. 7 CGI sheets 26 SWG x 6 ft.
3. 40 sft. 1/2" galvanised wire mesh
4. 1 no. handpump
5. Requisite 1-1/2" PVC pipe
6. 10 ft. 1-1/2" G.I. pipe
7. 3 ft. 1-1/2" PVC strainer
8. 1/2 tube solvent cement
9. 8 ft. M. S. rod

From Special Procurement

1. 1600 nos. 1st class bricks
2. 25 cft. Local sand
3. 100 cft. Masonry sand
4. 90 cft. Sylhet sand prepared/sieved to required size
5. 2 ft. 1/2" hose pipe
6. 2 nos. 1/2" G.I. cap
7. 1 no. 1/2" dia PVC cap
8. 1 no. 1-1/2" G.I. elbow
9. 2 nos. 1-1/2" PVC elbow
10. 3 ft. 1" G.I. pipe
11. 2 nos. 1" x 1/2" reducer
12. 1 no. Manhole cover
13. 1.4 cft. Timber to size
14. 4 nos. Hooks
15. 0.25 kg Nail
16. 1 no. Plastic container
17. 4 nos. 1-1/2" PVC adapter
18. Contingencies

- c) The EE will procure special materials required for the Division and have them delivered to the respective Upazila store according to the requirement.
- d) The SAE in consultation with the SDE will engage a mason for 10 days.
- e) The mason will be responsible for engaging and paying a carpenter and a plumber to do necessary carpentry and plumbing works.
- f) The mason will be paid Tk. 200 at commencement of work, Tk. 400 on completion of physical work and Tk. 200 upon acceptance of the PSF, one month after the completion of physical work, making a total of Tk. 800. The SDE will draw cash from the GE and will make it available to the SAE to make payment to the mason. The SAE will submit the vouchers to the SDE who will adjust the advance with the EE.
- g) The SAE and/or Tubewell Mechanic must inspect the progress at least twice during construction.
- h) The SAE will inspect the work upon completion of construction and commission the plant. He will fill a completion report form.

- i) A representative of UNICEF will inspect each PSF and certify completion to the desired standard and specifications.
- j) The SDE and DPHE/UNICEF R&D Officer will check the completion report and authorize final payment, depending on final inspection one month after physical completion of work.

6. RESPONSIBILITY FOR OPERATION, CLEANING AND MAINTENANCE

- a) The beneficiaries must take full responsibility for operation and cleaning of the PSF from the date of completion.
- b) After 1 month from the date of completion the beneficiaries will also take full responsibility for repair of the PSF as and when required.
- c) The beneficiaries should select a caretaker family for overall upkeep of the PSF; the caretaker family should be involved in the construction from the very beginning. Two men and two women of the caretaker's family will be selected for training.
- d) The caretaker family will be trained at the PSF site by the Tubewell Mechanic and the SAE at the time of completion of the PSF. Training will include explanation and demonstration of the operation, cleaning and maintenance of the PSF and handpump. Other beneficiaries should be invited to participate in the training of the caretaker family.

7. OPERATION OF PSF

At the time of caretaker training, the following points should be explained carefully to the beneficiaries, with a practical demonstration:

- a) Keep the lid closed at all times unless cleaning the PSF.
- b) Pump an equivalent amount into the tank, as water is drawn from the outlet.
- c) Always replace the wooden bung to prevent loss of water.
- d) Never block the overflow.
- e) Do not allow any one to put their hands in the water or to get inside the tank, unless they are clean and have a good reason to. Especially do not allow any one to stand on the filter bed.
- f) Always shut the PSF lid gently to avoid damage to the lid, tank and hinges or to any children in the way !
- g) Use the PSF water for all purposes.

A simple explanation of the operating principles of the PSF should be given, e.g.:

- a) Pond water is full of impurities like mud and bacteria.
- b) When it is allowed to pass through a filter bed the impurities are strained out and the water becomes clean.
- c) The clean water is then stored in the storage tank from where it can be collected for consumption.
- d) Filtration takes place very slowly and depends upon the water level over the filter bed.
- e) Due to clogging of the top layer of sand by the impurities the filtration rate will gradually drop when the rate is too low, the top sand layer must be cleaned.

8. CLEANING OF PSF

It is essential that the Caretaker Family is trained to clean the PSF. Both men and women should be trained. The PSF should be cleaned whenever filtration rate falls below the tolerable limit.

The cleaning procedure is as follows:

- a) Stop pumping.
- b) Open the washout pipe and let water level drop below sand level.
- c) Open the lid and scrape 3" of sand off the top of the filter bed.
- d) Wash this sand on the platform and place the clean sand back into filter.
- e) Close the washout pipe.
- f) Wash the platform and platform drain.
- g) Clean dust and insects from inside the tank and lid.
- h) Close the lid and start pumping.
- i) Clean the clear water reservoir as and when required.
- k) Clean the intake screen as and when needed.

It is quite possible for 2 persons to clean the PSF in under 3/4 hours. Periodically it may be necessary to add new sand to replenish the lost sand in order to maintain the sand level. This should be done with additional Sylhet sand left with the caretakers by DPHE.

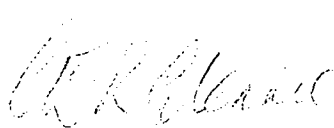
9. MAINTENANCE OF PSF

If the PSF has been properly constructed, the only items likely to need replacement and repair are the movable parts, i.e. the lid and hose pipe. The repair of the lid should be within the competence of any local carpenter.

The pump handle fulcrum pins should be oiled regularly with any type of oil (mustard oil works well). This will prevent the handle from wearing out so fast and make pumping very easy.

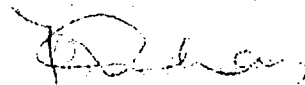
10. MONITORING PERFORMANCE OF PSF

- a) The SAE will record the following on the date of completion:
- (1) Flow of the PSF, (2) raw water iron and chloride content, (3) treated water chloride and iron content, (4) raw water turbidity, (5) treated water turbidity, (6) raw water and treated water pH and coliform count and (7) approximate no. of beneficiaries.
- b) The SAE will then make bi-weekly visits to each PSF and record the findings as per proforma attached in ANNEX - C.
- c) The SAE will prepare quarterly reports based on the above data as per following proforma attached in ANNEX - D and send it to SDE, EE, DPHE, UNICEF Zone office concerned, the EE VS II DPHE, Dhaka and WES Section, UNICEF - Dhaka.



Colin Glennie
Chief, WES Section
UNICEF, Dhaka

10/12/87



13.12.87

M H Khan
Chief Engineer
Department of Public Health Engg.
Dhaka, Bangladesh

POND SAND FILTER
PERFORMANCE RECORD

ANNEX - C

Particular and location	Date first put into opera- tion	Date of visit	Raw water turbid- ity	Treated water turbid- ity	% turbid- ity remo- val	Raw water coli- form	Trea- ted water coli- form	% coli- remo- val	Dis* charge gom	Dates of cleaning done since last visit	Approx. no. of benefi- ciaries	Remarks, if any, particular- ly on maintenance
-------------------------------	---	------------------	--------------------------------	------------------------------------	----------------------------------	-------------------------------	--	-------------------------	-----------------------	--	---	---

* Discharge can be measured directly from the clean water reservoir after draining the top water above the tap.

One sheet should be kept for each PSF so that findings of all visits to a particular PSF can be recorded chronologically in the same sheet.

A parallel sheet should be kept with caretaker family and filled in after each inspection.

POND SAND FILTER
QUARTERLY SUMMARY OF PERFORMANCE

REPORTS OF THE QUARTER ENDING

<u>Location/ Particulars of the PSF</u>	<u>Average raw water turbidity</u>	<u>Average treated water turbidity</u>	<u>% turbidity removal (average)</u>	<u>Av. raw water coli- form count</u>	<u>Av. treated water coli- form count</u>	<u>% coli- form removal</u>	<u>Average filter run (days)</u>	<u>Approx. no. of benefi- ciaries</u>	<u>Any other useful information (merits and demerits) and on maintenance</u>
---	--	--	--	---	---	-------------------------------------	--	---	--

Copy to: EE, PHE,
SDE, PHE,
UZO, Khulna/Barisal
EE VS-II, Dhaka
UNICEF, WES, Dhaka

খ' বিভাগ

আমি _____ চেয়ারম্যান _____ ইউনিয়ন পরিষদ
উপজেলা _____ উক্ত দরখাস্ত প্রকৃতির করার জন্য সুপারিশ করিতেছি। আমি এই ঘরো
নিশ্চয়তা প্রদান করিতেছি যে তথ্যবাহ্যক ও উপকারভোগীগণ উল্লেখিত শর্তাবলী মানিয়া চলিব এবং তাহারা
যদি কখনও উক্ত নিয়মাবলী হইতে বিচ্যুত হন কিংবা জনস্বাস্থ্য প্রকৌশল বিভাগের কোন খালাসালের ক্ষতি সাধন
করেন তাহা হইলে জনস্বাস্থ্য প্রকৌশল বিভাগের সিদ্ধান্ত মানিয়া লইতে তাহাদিগকে বাধ্য করিব।

দসুখত _____

তারিখ _____

সীল _____

গ' বিভাগ

পুকুরের বর্তমান অবস্থা সরেজমিনে পরিদর্শন করার পর নিম্নলিখিত বিষয় লিপিবদ্ধ করিতে হইবে।

- ১। পুকুরের অবস্থান, আকার ইত্যাদির বিবরণ।
- ২। সবচাইতে নুস্ক ঘোসুমে পুকুরে যথেষ্ট পরিমাণ পানি থাকে কিনা। _____
- ৩। পানির টার্নকিউটি বা ঘোলাটের পরিমাণ। _____
- ৪। পানির লবনাওতা। _____
- ৫। পানির লৌহ পরিমাণ _____
- ৬। উপকারভোগীদের আনুমানিক সংখ্যা _____

আমি সরেজমিনে তদনু/পরীক্ষা করিয়াছি এবং প্রযুক্তির দিক দিয়া প্রস্তুত পুকুরটির জন্য
স্যান্ড ফিল্টার তৈরীর উপযুক্ত।

উপসহকারী প্রকৌশলী
জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
উপজেলা _____

ঘ' বিভাগ

আবেদন পত্রটি অনুমোদন করা হইল/অনুমোদন করা হইল না।

চেয়ারম্যান
উপজেলা পরিষদ

উপজেলা পানি সরবরাহ ও স্যানিটেশন
কমিটি।

উপজেলা।

জেলা।

109
109
109
129
199
109
19
19
16
19
10
18
10
12
19

ଉତ୍କଳ ବିଶ୍ୱବିଦ୍ୟାଳୟ ପାଠ୍ୟପୁସ୍ତକ ବିଭାଗ, କଟକ ।

ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-

14	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	19
16	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	16
19	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	19
10	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	10
18	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	18
10	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	10
12	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	12
19	ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-	19

ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-

ଉପରୋକ୍ତ ପୁସ୍ତକମାନଙ୍କର ମୂଲ୍ୟ :-