



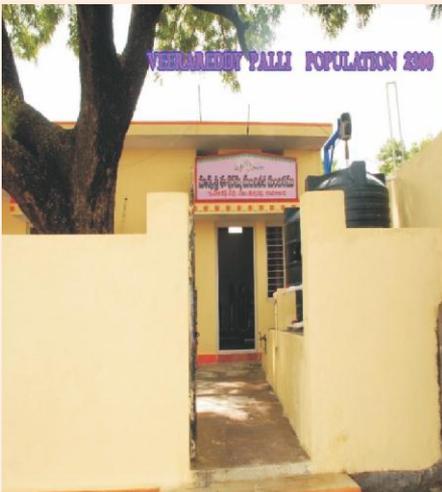
**Sri Sathya Sai Seva Organisation
Technology Group**

**Water Purification Plant
Installation-Management**

**A Technology Group Publication
November 2012**



Various Installations





Water Purification Plants Installation - Management

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FOREWORD

Bhagawan in His infinite mercy, on a number of occasions, in His discourses and private conversations has emphasized the importance of services in the rural area-Grama Seva as Rama Seva.

In His own words He said: “In Villages we find a number of unresolved problems particularly related to health and hygiene, Sanitation and dearth of drinking water-It is our duty and responsibility that we provide permanent solutions to these perennial and unresolved difficulties. Our Organization members of all cadres must go to these places and work towards providing solutions. I direct them, bless them and expect all of them to continue their efforts in this direction and provide joy and happiness to these poor helpless people”.

Obviously this is the best gift of love we can offer at His lotus feet.

Bhagawan Himself has demonstrated His will by establishing a number of gigantic projects in various Districts as in Anantapur-Mehaboob nagar-Medak-East Godavari-West Godavari in Andhra Pradesh and also in Chennai in Tamil nadu.

By His clarion call, inspiration and Blessings, the Sri Sathya Sai Seva Organization has also installed a number of purification plants in different states.

These water purification plants have provided immense joy and good health to all user families since almost 2006 when we commenced the set up. Unlike other shrines, these are places wherein people of different faiths gather to collect SAI JAL every day. Such an approach has created tremendous goodwill and impact in the village.

The Central Trust by Divine Grace, having seen the need, progress, working and impact of the existing installations, came forward to fund the installations in various places in India.

Therefore it is our prime responsibility to stand up to their expectation, and identify the neediest places in each state in the country and then set up water purification systems.

As we are setting up systems in the name of the Organization it is very important that we do a very thorough and professional job. It must have uniformity in appearance, design, installation, operation and management in all places of installation. We must set a high standard in all respects.

In this document, we are providing all aspects of this programme to enable the members to follow the established norms step by step that are based on our experience of our installation in other places.

The Technology group has studied deep into the various aspects of the problems associated with the provision of pure and safe drinking water and has documented the working norms. It continues to upgrade their basic knowledge by being in contact with the professionals and in search of new, affordable solutions in this matter.

Members are requested to contact the Technology group for any clarification and support that they may need in the course of set up and implementation.

We hope and pray by Divine Grace, and blessings this booklet will be of immense use for those who intend to set up water purification plants in their state locations.

V.SRINIVASAN
All India President
Sri Sathya Sai Seva Organisation

OUR INSPIRATION-OPPORTUNITY

We must realize that in our country in most of the places there is no water. If there is—it is not in the proximity of the need. The water that is available is invariably contaminated and unfit for drinking.

It is contaminated with fluorides-dissolved solids-Arsenic-metals-radioactive substances-nitrates-total dissolved solids-high level chlorides-sulphates, on one hand.

On the other, the contamination is on account of bacteria-such as E-Coli-Hepatitis A etc. These are deadly causing typhoid-cholera and a variety of disorders that effect health partially or totally. Some of them effect slowly and some of them, instantly.

We must recognize the fact that contaminated drinking water is the single cause for nearly 80% of the diseases both in rural and urban locations. This is a gigantic problem which the Governments and private organizations are attempting to tackle these issues with huge expenditure.

But still the rural locations that are far-flung have no means to avail these opportunities, struggling with whatever they have and so are exposed to the diseases.

It is here our Organization has an opportunity to do some good work in providing drinking water purification system to some of the neediest villages. This has been our Bhagawan's most cherished wish.



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SRI SATHYA SAI SEVA ORGANISATION

WATER PURIFICATION PLANT INSTALLATION
INSTRUCTIONS AND NORMS

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01. VARIETY OF SOURCES-CONTAMINANTS-ASSOCIATED DISEASES.

In India the source of drinking water is primarily through flowing rivers-traditionally dug wells-lakes and ponds and in the current times, through borewells.

Normally the water from rivers also known as surface water source, has high level of contamination comprising-vegetation-mud-slime-animal refuse-bacteria of all kinds. These are deadly contaminants for human health especially during the monsoon season.

The lakes and ponds too have similar problems and contamination. The wells in villages have contamination of bacteria-dead animals like lizards-rats-snakes and deadly bacteria and their laid eggs. In some parts, there is sulphur, fluorides and arsenic as well. These are again hazardous for health.

Finally in the modern borewells that are very popular these days-the contamination could be metals-Iron-Fluorides-Arsenic-Strontium- and high level toxins besides totally dissolved solids (TDS).

More to these contaminants, there are manmade-introduced contaminants that flow into these sources through the factory effluents- fertilizers and pesticides used in Agro practices.

In all the variety of contaminants outlined-fluoride is a mighty problem that causes dental and skeletal fluorosis that effects bones-cripples and hits the nervous system-brain and so on. This does not happen overnight-but steadily and slowly, by the time one reaches 40 years. Children too get dental fluorosis.

Arsenic and other metal contaminants such as cobalt-nickel and mercury are deadly and poisonous. This is true even for fish and animals.

Currently inspite of all regulations, there is no control or means to arrest this inflow of effluents.

02. WHAT IS OUR ROLE - HOW DO WE IDENTIFY?

In the first place, our primary task is identification of an appropriate and most needy village.

1. Our Grama seva-SSSVIP task force members are the most appropriate persons to locate the need. Normally in a village where our members are on service -will be able to learn and identify the place based on their survey and feed back of the village folks.
2. Every State/District authority has documented evidence categorizing the villages based on contamination levels-But then they may be out dated and sometimes unrelated. But this will be a good guide to study and determine the need.
3. Many times during the Grama seva-SSSVIP medical camps, the doctors can also identify if the disease pattern is on account of contaminated water. In the case of Fluorsis-it is very visible. The stomach disorders and pains of the joints –bow legs-yellow teeth etc indicate the type of possible contaminations.
4. Many a time we come across the village elders and officials narrating to us about the contamination and associated problems as well.

03. WATER SAMPLING PROCEDURES?

1. Based on all the data of information, we can now begin our own survey by drawing water samples from the sources that is being used by the village folks.
2. The samples must be drawn by our organization members-never ever by the village folks-we need two litres of each sample drawn into a clean and washed pet plastic bottle or a glass bottle. The bottle must be closed with a cap and sealed. The bottle must be labeled to indicate the village name-source-date and exact location from where it has been collected with the name of the person who collected.

3. The location of collection is very important as there could be several sources that are being used by the village folks-therefore we should know which one?

04. WHERE DO WE SEND IT FOR ANALYSIS?

1. At times we tend to by-pass all those procedures and then follow a report that has already been done by some one earlier. This could be misleading and disastrous. We should never do that and in fact we should verify and then only accept the genuine sample for analysis.

2. There are a number of government agency laboratories and private labs that conduct the water analysis in district head quarters or state head quarters. But then, it is important that we do a very professional and authentic job. We should enquire and entrust testing to a reputed and authorized lab only. It could cost some amount but then it is very important for us, as it determines the type of equipment that we need to install.

3. The water analysis test must be conducted for all parameters as per the Bureau of Institute of Standards (BIS) annexure that is enclosed in this booklet. Fluorides-Arsenic-hardness-total dissolved solids-Nitrites-Calcium-Chlorides-Iron and other metals are important parameters. We also need to test the presence of bacteria as well.

4. The water analysis must be completed within 36 hours of the sample drawn but never more than 48 hrs as this will be misleading.

5. The reporting must be in the standard format as given in the Bureau of Institute of Standards (BIS) enclosed in this booklet.

05. WHAT SHOULD A REPORT CONTAIN AND WHERE TO SEND?

1. The report must have the following information and this should be sent to the All India President with a copy to the All India Technology Group Co-ordinator and to the National Regional Vice Presidents.

2. The State/District/Village name/population/current drinking water source/whether it is a surface water/pond water/well water/borewell water/any other source.

3. Whether the place is served by the organization samithi on a regular basis? Is there any devotee resident in this village? Do we have a Bhajan mandali?.Is this village covered by the SSSVIP?
4. If no such situation exists-then do our organization members visit this place for a service such as medical service or any other service? How far is this village from the nearest samithi?
5. In this context we should realize-it is always better and most important that the identified village must have contact with our nearest samithi that could often visit the place.
6. This is particularly important in order to monitor the working of the installation and to manage the facility in the way it is desired and designated. In the absence of periodical supervision the operation is unlikely to be successful.
7. Therefore in places where we have no control or likely to be no control-it is better not to install even though it is a place badly in need of such facility. This particular type of locations need study, and approval from the All India President.
8. While determining the location-it is also important to verify whether or not the village members have capability-interest and enthusiasm-spirit to run and operate the facility as per our norms laid down. If we find or recognize on the contrary-it is better not to do such installation even though the place badly needs an installation. This matter shall be referred to the All India President for approval.
9. It is important that we should never give an impression to the village folks that we will be installing a facility until such time the All India President approves in all respects.
10. We should not solicit and encourage or collect any kind of donation from the village folks for the purpose of installation. Normally in some places someone comes and says that he would like to give some money for the support. We also notice that some individuals in the village attempt to

collect donations giving an impression to the folks that this amount is being given to the organization.

11. Therefore, just before making a decision to implement, we should conduct a grama sabha and detail our philosophy and approach.
12. Individual or community collection of funds will lead to endless trouble and claims of ownership and management issues as the time progresses. In all our existing installations, we maintained our approach that has resulted in clean and trouble free operation.
13. The participation in the project by the village heads and folks could be in organizing certain tasks such as location of site-land-obtaining approvals by the panchayat- resolutions-gather village folks for meetings-shramadhan tasks-providing names and dwellings-assigning masons, carpenters and painters, electricians for the construction works— formation of village water committee-its operation and management of the running facility.

The working details to follow the relevant annexure is enclosed in this booklet.

14. Finally we must make sure that the village in question is not served by any other organization with parallel interests. Also check, whether in the near future the Government is taking up a scheme to providing drinking water facility to this village. In such cases we can skip this village.

06. FUNDING ARRANGEMENTS FOR THE EQUIPMENT-AFTER APPROVAL BY THE AIP

1. After determining the appropriate equipment required for the said identified location based on analysis-the Central trust from Prasanthi Nilayam will provide funds towards the cost of the equipment only. This is based on AIP's approval.
2. The equipment means-The main process plant and its assembly, comprising a feed tank and a processed water PVC food grade storage tank of appropriate capacity. This includes the interconnecting piping-a set of control valves-UV apparatus and associated electrical accessories.

3. All other costs on account of the total set up shall be to the account of the State Organisation

07. SCOPE OF ORGANISATION AT THE INSTALLATION LOCATION END.

1. The State/District Organization must obtain the permission for installation from the District collector concerned. A formal letter must be submitted to them with the supporting consent of the village nominees.
2. We must obtain a letter of resolution from the village to the effect the particular land/building is allotted for the purpose of installation of a water purification plant. See that it is allotted to the village and not to SSSSO.
3. The concerned state organization will fund for all the infrastructural needs at the operation end at the site. This comprises the following:
 - a. Construction of a building as specified in the building details annexure enclosed in this booklet.
 - b. Machine foundation works.
 - c. Storage tanks masonry foundation works inside and outside the building.
 - d. Drainage lines-tiling works inside the plant works-water filling bay and tiling works outside the plant.
 - f. Installation of appropriate electrical switch gear in the room with electrical meter and wiring to the machine-lighting-earthing-wiring to the UV lamp-ducting-plug points etc as specified in the electrical annexure enclosed with this booklet.
 - g. Plant house inside painting-outside painting-signage-black stone tableau outside the building and all other civil works to the installation.
 - h. Procurement of piping material-installation of the same leading from the borewell or any source up the plant feed tank. Most of the times the village folks organize this through the panchayat funds that are available for this kind of need. We also can liaise with the authorities for this kind of facility.

- i. The village must approach the concerned Assistant Engineer or Divisional Engineer and obtain permission for installation of electrical meter inside the plant house.
- j. We should never accept a connection direct from the poles to our plant installation under any circumstances. The villagers and heads always recommend and insist on this kind of clandestine arrangement to avoid electrical charges. The SSSSO should never accept this or fall into this trap.

Specific Scope

7A Scope of work

1. The water purification plant set up is limited to installation and operation, where the raw water feed is available in the location and connectable to our installation.
2. Creating a water source and connecting to our plant is out of scope of this proposal.
3. We should only attempt installation where, there is existing water source in some form or the other.
4. Creation of a source through - rivers - wells - ponds - reservoirs and new borewells is a separate project by itself and this is not a part of this proposal.

7B Maintenance of the facility

1. This facility like any other, needs regular and periodical maintenance. This is to keep it working at the best efficiency.
2. Keep the inside and outside the premises, clean and tidy.
3. Replace the filter cartridges, every alternate month or as prescribed by the equipment suppliers. This is based, on the degree of contamination.
4. We need to keep stock of these filter cartridges sufficient to last for a year.

5. Change the main membranes, atleast once in two years. This also depends on the degree of contamination. Your own experience teaches.
6. Keep the appropriate simple tools kit ready to attend to pipe and connection leakages.
7. Must enter into a annual maintenance contract (AMC) with the equipment supplier.
8. Keep the contact details of the maintenance technicians of the suppliers in the plant room.

08. THE EQUIPMENT SELECTION CRITERIA AND COST FACTORS

1. The type and design of the water purification plant selection is based on the feed water analysis parameters-in other words it depends on the contaminants parameters and values...
2. Therefore we need to select equipment based on the feed water-raw water analysis. It is therefore very important that the raw water analysis should be accurately determined.
3. There are a number of manufacturers in India who can supply appropriate equipment to deal with contaminants that we normally come across. But then there are not many who would come to our rescue when it comes to support on the maintenance needs or replacement or supply spares when required.
4. It is important for us to recognize that whenever and wherever we install a system-the users get used to the pure and safe drinking water and so, any stoppage even for a day creates unrest and turmoil in their routine life. We have seen them becoming sick too. This should make us doubly sure that we select equipment that is reliable and dependable in terms of maintenance backup support on a call basis.
5. There are a number of manufacturers in our country who assemble parts, make and supply purification plants but then, they do not stock spares nor do they have maintenance technicians to attend urgent calls. This will be a disaster. Therefore we should avoid such vendors.

6. Our selection should not be based on cost alone but on other factors of support as detailed above.

09. TYPES OF EQUIPMENT-BASED ON RAW WATER ANALYSIS (See annexure enclosed)

1. We can broadly define equipment based on the feed water contaminants - for instance when the feed water is surface water and does not have fluoride/Arsenic and with low total dissolved solids below 500 ppm-we can use membrane filters that can remove-algae-fungi-slime-sediments-E-Coli and Hepatitis A. It improves the color and taste and makes it potable.
2. Same equipment can be installed for well water if the contaminants are as above.
3. If the raw water contains only fluoride and total dissolved solids below 500 ppm-we can install an Activated Alumina plant. This will be in the open and no building is required.
4. If we have high fluoride content (above 2 ppm to 12 ppm) and high TDS (500-2000 ppm) or highly saline-we can use a Reverse Osmosis plant. But we must see that it does not have chloride content in the feed-we may have to use chemical dozers in such case. Remember that RO plants shall have 40% reject that can be used for washing or toilet flushing etc and not fit for consumption. But the 60% output will be of excellent quality.
5. In case the water has Arsenic-we need to chemically treat and then use a reverse osmosis system.
6. We can also install solar distillation plants-if the capacities are below 500 liters per day for most of the contaminated feed waters.
7. We should avoid domestic water purification systems whenever we are catering to a large village population. Although the equipment is technically sound and efficient-we are not sure whether or not the users change the candles/cartridges periodically-we are also not sure whether the quality of the output is ever tested.

8. Although a number of websites on this subject suggest a variety of technologies in theory and in experimental stage, they have never come up for commercial manufacture and tested and certified on usage scale.

10. HOW DO WE DETERMINE THE CAPACITY OF THE PLANT FOR A VILLAGE?

1. The plant we are attempting to install is only for serving the drinking and cooking needs of a house hold-but not for washing and bathing needs.

2. A rough estimate usage per person per house hold is 3 litres. This means for a house hold of 4 persons on an average needs 12 litres per day.

3. Therefore for a village of 500 homes-we need to supply: $12 \text{ litres} \times 500 = 6000 \text{ litres per day}$.

4. This translates into a plant capacity of 1000 litres per hour. This is based on working of the plant, four hours in the morning and four hours in the evening. This is again based and dependant on the power supply release in a particular village. Normally they supply power in the morning and then again in the evening in most of the villages.

What we need is single phase at 220 volts steady supply.

5. In case the village has only 250 homes-we can install 500 litres per plant to supply 3000 litres per day. Working hours being the same as above.

6. We can actually increase the output by simply operating the equipment for longer periods as well, if the need and demand arises.

11. EQUIPMENT COST AND INFRASTRUCTURE COST-BASIS (See the annexure enclosed)

1. This is based on the capacity-population factor as well as the provision of facilities such as a building and nearity of the water source.

2. The cost of a simple membrane type of filter as described in item 09.1.2 will be under 1.25 lakhs to supply 1500 people or say 400 homes. The infrastructure cost would be Rs 1.75 lakhs.

3. In case of contaminants as described in item 09.3, the plant cost will be about 2.2 lakhs plus infrastructure cost of Rs 0.70 lakhs.
4. In case of contaminants as in item 9.4, the plant cost will be Rs 2.85 lakhs to 3.25 lakhs based on water analysis report demand. Cost of the infrastructure could be around Rs 2.2 Lakhs.

12. DEFINITION OF INFRASTRUCTURE-CIVIL WORKS-VARIABLES

1. This portion of the expenditure shall be totally to the account of the State/District or donors account only. The cost of such amount is indicated.
2. In most of the locations in villages-we may have to construct a plant house for installing the equipment. The preferred size is 12X14X10 Feet. The walls to be in brick or stone masonry and the roof must be RCC only. Do not fix asbestos or zinc sheet roofing-very soon it gets rusted or broken.
3. Apart from the entire floor tiling, the walls should also be tiled to a height of 3 feet by a designated color. This is very important and essential to maintain it clean and hygienic. The inside and outside must be painted with oilbound distempers. The building must have the Organization Logo painted and written as "SRI SATHYA SAI-SUJAL MANDIR" in bold letters. The outside colors must be in Blue and Pink as in all Swami's building designs. The title should as well, be in regional language.
4. Outside the plant house abetting the plant- there must be a filling area provision for four taps-the brick masonry enclosure also should be tiled with drainage.
5. The raw water tank must be kept outside the building at an elevation of 4 feet from the ground level so as to provide positive feed to the plant suction pump. The foundation should be of stone masonry but not concrete. The size of the foundation shall be according to the drawing supplied.
6. The processed water tank should be installed inside the building at an elevation of one foot from the plant ground level on a masonry foundation. The size must follow the drawing provided.

7. The plant house shall have two light points-with CFL fittings-a 15 amps plug and socket-a 5 amp plug and socket-a 30 amps MCB-with concealed wiring. These conduits must be placed during construction as per the drawings provided. The signage and name plates shall be provided with adequate light fixtures as well.
8. The plant must have an approved lighting connection with power meter installed. The gram panchayat must apply and obtain permission for operating the electrical equipment. The Organization will support liaison with the village committee in this matter of application.