

Water

Did you know that your body weight is approximately 60 percent water? Your body uses water in all its cells, organs, and tissues to help regulate its temperature and maintain other bodily functions. Because your body loses water through breathing, sweating, and digestion, it's important to rehydrate by drinking fluids and eating foods that contain water. The amount of water you need depends on a variety of factors, including the climate you live in, how physically active you are, and whether you're experiencing an illness or have any other health problems. Water does more than just quench your thirst and regulate your body's temperature; it also keeps the tissues in your body moist. You know how it feels when your eyes, nose, or mouth gets dry? Keeping your body hydrated helps it retain optimum levels of moisture in these sensitive areas, as well as in the blood, bones, and the brain. In addition, water helps protect the spinal cord, and it acts as a lubricant and cushion for your joints. Adequate water intake enables your body to excrete waste through perspiration, urination, and defecation. The kidneys and liver use it to help flush out waste, as do your intestines. Water can also keep you from getting constipated by softening your stools and helping move the food you've eaten through your intestinal tract. However, it should be noted that there is no evidence to prove that increasing your fluid intake will cure constipation. Digestion starts with saliva, the basis of which is water. Digestion relies on enzymes that are found in saliva to help break down food and liquid and to dissolve minerals and other nutrients. Proper digestion makes minerals and nutrients more accessible to the body. Water is also necessary to help you digest soluble fiber. With the help of water, this fiber dissolves easily and benefits your bowel health by making well-formed, soft stools that are easy to pass. Your body loses fluids when you engage in vigorous exercise, sweat in high heat, or come down with a fever or contract an illness that causes vomiting or diarrhea. If you're losing fluids for any of these reasons, it's important to increase your fluid intake so that you can restore your body's natural hydration levels. Your doctor may also recommend that you drink more fluids to help treat other health conditions, like bladder infections and urinary tract stones.

Studies have shown that poor hydration could be a contributing factor in potentially life-threatening health problems with your heart, lung, kidneys and bladder. Then there's heat exhaustion and heat stroke, which can occur if you don't drink enough water on a hot day, or while exercising. Water also flushes out toxins with the help of your kidneys. In fact, when you don't drink enough water, your kidneys will not have enough fluid to function correctly. If prevention is better than cure, then water is definitely the best medicine.

We've already looked at how dehydration can leave your blood a little thicker than it would normally be. One of the ways it regains some of the water it needs is by drawing moisture from your skin. This can leave it dry and speed up the appearance of wrinkles.

It's important to note that you'd have to be very careless with your hydration for this process to start. Drinking more water than normal won't make your skin firmer, either.

If you're suffering from dry skin and don't think your water intake is to blame, you should investigate other possible causes, such as sun damage. Over half your blood consists of a substance called plasma. It carries blood cells around your body to where they're needed, helps maintain a healthy blood pressure and keeps your body temperature under control.

Every day you lose water through your breath, perspiration, urine and bowel movements. For your body to function properly, you must replenish its water supply by consuming beverages and foods that contain water.

So how much fluid does the average, healthy adult living in a temperate climate need? The U.S. National Academies of Sciences, Engineering, and Medicine determined that an adequate daily fluid intake is:

 About 15.5 cups (3.7 liters) of fluids a day for men

 About 11.5 cups (2.7 liters) of fluids a day for women

These recommendations cover fluids from water, other beverages and food. About 20% of daily fluid intake usually comes from food and the rest from drinks.

Effects in Terai region of Nepal

Globally, Arsenicosis, also referred to as Arsenism, is an important non-communicable diseases resulting from the ingestion of groundwater containing unsafe level of arsenic. As it became clear that contamination of groundwater with arsenic is the cause of mass poisoning in Bangladesh and West Bengal, the Department of Water Supply and Sewerage (DWSS) in cooperation from World Health Organization (WHO) conducted systematic study on possible arsenic contamination in groundwater of Jhapa, Morang and Sunsari districts of Eastern Terai region of Nepal bordering West Bengal in 1999. Out of 268 tube well water samples tested, 9.0% of the samples exceeded 10 ppb, the WHO limit, and 0.7% exceeded 50 ppb (the National Standard of neighboring countries India and Bangladesh) indicating the possibility of arsenic contamination in groundwater in the Terai region of Nepal. Since 1999, various studies were undertaken in the Terai districts of Nepal. These studies provided sufficient evidence of arsenic contamination where nearly half (48.4%) of the total population of the country live with 90% of the inhabitants using groundwater as the major source of drinking water.

These initial findings sensitized nongovernment agencies working in water and sanitation as well as the government to the possibility of an arsenic related problem. In early 2000, the National Arsenic Steering Committee (NASC), which includes major stakeholders from government and non-government sectors, was created as a first step by the government to address the arsenic issue in the country. The "National Interim Policy on Arsenic" was the first document drafted by NASC to guide stakeholders to work on this issue. All agencies involved in the water and sanitation sector then prioritized arsenic testing in their programme areas. A blanket testing initiative to test all the wells in the Terai was initiated under the auspices of the NASC starting in 2004 with the aim to provide a reliable insight of the arsenic contamination in drinking water and its effects on public health. The blanket testing also aimed to provide reliable and complete information needed for the formulation of a mitigation strategy as well as the implementation of such a strategy at various levels. As of June 2008, the blanket testing of 11,39,891 tube well have completed which shows that about 1.77% (20,243) have exceeded the National Standards of Nepal for drinking (50 ppb) and 5.62% (64,168) have exceeded the WHO Guideline value. Since, 2008 NASC has been unified into National Drinking Water Quality Standard (NDWQS) committee.

WHO Country Office Nepal is supporting NHRC for capacity building to respond the arsenic issue with the aim of human resource development and conducting research 1 INTRODUCTION Proceeding Report of National Consultative Workshop on 2 to provide evidence. NHRC conducted the first study on Detection, Management and Surveillance of Arsenicosis in the Selected Local Communities of two Terai districts Bara and Rautahat of Nepal in 2005. The study revealed that Health Worker's Knowledge and Skills about Arsenic and Arsenicosis was almost nil, and they were not familiar with Preventive Measures, Primary Treatment and Referral Mechanism. The study concluded that Detection,

Management and Surveillance of Arsenicosis cases was not possible without massive trainings to health staffs.

WHO SEARO published Field Guide, Facilitator Guide and Participant Handbook on Detection, Management, and Surveillance of Arsenicosis Cases in South East Asia Region in 2005 for maintaining the uniformity in case detection, management and reporting as well as for training purpose. NHRC translated these WHO Publications in Nepali for the training purposes on detection, management and surveillance of Arsenicosis Cases in Nepal and pre-tested the developed modules in Nepali organizing Training of Trainers on Arsenicosis case Detection, Management and Surveillance in Lalitpur in 2006. During the year 2007 -2008, NHRC conducted four district level trainings in Bharatpur, Birtanagar, Dhangadhi and Hetauda covering eleven districts of terai regions Morang, Sunsari, Saptahari, Siraha, Rautahat, Bara, Parsa, Nawalparasi, Rupendehi, Kailali and Kanchanpur. Total 72 person were trained which consists of Paramedics (Health Assistant, Senior Auxiliary Health Worker, Nurses), Public Health Officers, Medical Officers, Dermatologists, Senior Divisional Engineers of respective district and social worker of Nepal red Cross Society. The recommendation from the training workshop was that there should be referral system and even Dermatologists are not enough aware about the cases of Arsenicosis. The prevalence survey conducted by Nepal Health Research Council in Nawalparasi, Kailali and Bardiya district demonstrated that the prevalence is 2-3 percent. Based on these lessons, NHRC with support of WHO Country Office Nepal organized the Consultative Workshop on Detection, Management and surveillance of Arsenicosis Cases in Nepal at the Hotel Himalaya, Lalitpur from 26-27 July, 2009. There were 42 participants representing various stakeholders segments including representatives from Department of Water Supply and Sewerage, Ministry of Health and Population, Department of Health Services, National Public Health Laboratory, Research Institutes, Academic Institutes including Hospitals and Medical Colleges

People living in towns are subject to drink supply water which is polluted whereas people living in remote village areas their condition is even worse as they have to rely on surface water or rain falling from small brooks running from mountains. The surface water is polluted from industrial garbage and domestic waste. Groundwater is mostly used in Terai region where Physico-chemical parameters are more significant problems than the microbial problem.

Without a doubt, the local sewage system is one of the vital sources of water pollution which pours into lakes and rivers. In some rural areas tubewells is the only solution of the water source, but recently it has been found that groundwater, especially in the regions of terai is contaminated by arsenic. The Terai region belt consists of sedimentary layers, gravel deposits interlocked with flood plains carried by rivers which are highly vulnerable to arsenic contamination.(a.vaidya 2019). Seasonal factors are also significant from the dry season starting in the month of March to rainy season ending in the month of September is more prone to water diseases. Living in unhygienic environmental situation risk of food and water

contamination is high, children are mostly affected to waterborne, suffering from malnutrition they have a low immune system and are more prone to diseases and an estimated 44000 children die every year in Nepal from waterborne diseases by many surveys conducted by UNICEF report 2009.

here have various districts where the people fit in a pipe directly to the rivers and streams and the water for drinking, washing, cooking and other daily use. The water is being used for drinking purpose, and almost 72% of the particular sources have been found with a specific microbial contamination issue from both the tap and reservoir. This generally can be seen in the area of Myagdi, which is a district within the particular area of mid hill zone. The main reason is they open defecation in the contamination issues where the drinking water has been affected in the reservoir, source and the particular supply system for the specific district of Kaski. The proper management of distribution system, sewage, reservoir and waste can definitely make a solution of the microbial contamination issue which is required along with particular awareness to the people about the sanitation and water quality.

The government of Nepal has been mentioned the improved supply system of water can reduce the contamination issues, and the citizens of Nepal are getting a good quality of the water. Still, the specific researches have been shown that the particular claimed storage system and the supply of water had been contaminated and that is entirely not safe for drinking purpose.

Most of the users are from middle wealth or poor who uses less than considered amount of the water. Although 52% of households use 60 lcd in the season of summer, that reflects a significant variation and a severe inadequacy to the water that has been consumed through the specific households.

The lack of piped water supply access has been increased through a specific financial and economic burden in the household. The particular impact on the economy of the household can be seen because they buy water from private vendors. It has a great impact on the households who are poor because they spend a considerable amount of money on purchasing the water and consuming less as they have a very limited capacity to pay for the water. It has some multiple effects to make the household expenditure and also has some health impacts because the poor households are using the water from unhealthy sources. The unmanageable supply of the water system with the fragmented cluster of the people who are living in the area of topographically challenged places. A specific research has been shown the lack of decent water quality that has been seen in the capital city Kathmandu of the country Nepal. There are some few studies that have been given approval to the Multiple Survey of Indicator in Nepal. The particular study has been focused on the region that has been illustrated a clear picture of the specific area that should be carried out for further research in the future.

Challenges

Nepal is a nation with the current population of 28 million people, and this is the poorest of nations in this world. Only the population of 43% is living under the poverty line, and there has only 28 % with a proper access to sanitation. There are several issues that have been faced by the Nepal, and these challenges relate to the water scarcity and water pollution. The specific environmental contamination for drinking the water from the source, such as through a conveyance system. This can spread various infections and several diseases like dysentery, cholera, hepatitis, typhoid and worm. There are several harmful materials can be seen in the drinking water such as pesticides, heavy metals and poisonous creatures. These can reach the drinking water through several routes, and the quality of the water can be deteriorated.

A rapid growth of the population can be seen in the country like Nepal, so for this particular reason, the human activities like disposal of the wastes can be seen, so maximum sources of the water are being polluted. Unscientific disposal of the wastes from the house and other agricultural sectors in the rural village, open defecation has been increased the particular base in microbiological contamination in particular water sources that can be from a ground source, spring and stream (Iqbal *et al.* 2018). The specific quality of issue in the water can be caused because of chemical and physical parameters, and these have a significant impact on the public health. In the region of Terai, the specific drawdown in the particular water table is another issue because some tubewell has become non functional. The particular issue has been associated with the Tubewell of the Tarain, and that can be correctly attributed to the lack of feasibility that does not include the water quality in the consideration.

The lack of a proper monitoring system and the particular lack of consumer awareness have been included in the maintenance and repair. A provision in the water treatment that is beyond the affordability for the human resources. Frequent landslides and the process of intensive erosion in the hill area that creates destruction to the distribution and transmission system. Commitment, responsibility, actions and guidelines have not been clearly defined in the particular legislation, policies and institutional framework in either the grass root base or national level (Rai *et al.* 2019). For supplying the quality water , the specialist authorities have some special consideration for the preparation of guidelines of the quality for drinking water and some specific inventories for both the quantity and quality of the water coverage. The particular target of the Nepal government is to supply the water up to the amount of 90 percent water in the rural area and up to the amount of 100 percent water for the urban area. The previous target that has been attributed through the Nepal government that has not been achieved.

Most of the drinking water sources have been contaminated by floodwaters and the water supply channels of drinking water supply are not too reliable due to leaks, which allow the water to mix with sewage. Doctors say one should be more cautious while eating at parties and functions during the monsoon season, as the chances of water contamination are very high during monsoon.

Compared to water from other sources, people in the Kathmandu Valley believe that bottled water is safer. However, the presence of deadly microbes suggests many jar water brands are unsafe to drink, without treatment. A similar study carried out by the Epidemiology and Disease Control Division in the first week of June showed that nearly a third (32.6 percent) of the drinking water being used in Kathmandu was contaminated with faecal coliform. Along with jar water, tests were carried out on tap water supplied by the state utility. Samples of tanker water, tubewell water, water from wells, and Melamchi water too, were tested at the time. Last year, the Kathmandu Valley witnessed a massive cholera outbreak as 70 percent of those who were examined, tested positive for Vibrio cholera 01 Ogawa serotype.

Cholera is a highly infectious disease that causes severe diarrhoea and vomiting, resulting in dehydration and could lead to death within hours if left untreated. A recent study carried out by the Epidemiology and Disease Control Division had shown that nearly a quarter of the drinking water being used in Kathmandu has been found contaminated with faecal coliform. Faecal coliform, a microscopic organism, lives in the intestines of warm-blooded animals or their faeces. The presence of faecal coliform means that the drinking water being used by the residents of Kathmandu is contaminated with sewage, doctors say. Monsoon in Nepal is a season of epidemics wherein thousands of people across the country get infected with food-borne, water-borne and vector-borne diseases.

Doctors say due to poor sanitation and hygiene conditions, the country is highly vulnerable to water-borne diseases, including diarrhoea, dysentery, typhoid, hepatitis, and cholera, with thousands of people falling sick every year. Doctors say initiating awareness drives and ensuring safe drinking water are the only ways to save people from water-borne diseases, including cholera. A combination of careful surveys, provision of safe drinking water, good sanitation and hygiene standards, social mobilisation, and treatment are required to contain the spread of infection, they added.

Solutions

Water treatment systems remove more than 2,100 kinds of toxins, lead, microorganisms, and excessive chlorine from your tap water. These contaminants can have harmful effects on your body. For example, consuming large amounts of chlorine can lead to rectal, colon, and bladder cancers. Drinking lead-contaminated water can cause influenza-like symptoms, intellectual disabilities, and negative prenatal effects. Filtered water also removes bacteria such as giardia and cryptosporidium, which cause major gastrointestinal illness. Some of these potentially harmful additions to your home's drinking water might not affect you dramatically as an adult. However, if you have young children or a baby, these contaminants can suppress their already vulnerable immune systems. A home water treatment system filters out contaminants from your drinking water, but leaves traces of naturally occurring minerals that are healthy for your body. Many people prefer the taste of filtered water over the taste of tap water. That extends to people who love to cook. The food you make with tap water will have some semblance of that water's flavor. If you use filtered water from a water treatment system, your home cooked meals will not only contain fewer contaminants but it will also taste significantly better. Water treatment is the process of making water ready for human use. While there are several critical aspects, sedimentation water treatment is of particular importance. It is essential to understand the whole water treatment process in order to ensure the process is completed safely and efficiently for the general public.

What Is Sedimentation?

Sedimentation is the process of separating small particles and sediments in water. This process happens naturally when water is still because gravity will pull the heavier sediments down to form a sludge layer. However, this action can be artificially stimulated in the water treatment process. This mechanical assistance is called thickening.

Why Is Sedimentation Used?

The sedimentation process is used to reduce particle concentration in the water. The advantage of sedimentation is that it minimizes the need for coagulation and flocculation. Typically, chemicals are needed for coagulation and flocculation, but improved sedimentation controls the need for additional chemicals. Additionally, sedimentation can be used after coagulation to increase the effectiveness of ongoing filtration in the process.

What Are Technical Aspects of Sedimentation?

Although sedimentation is an accepted process within the water treatment industry, it is still theoretical. The process can be varied depending on the concentration of particles. For example, small concentrations often settle unhindered or without mechanical assistance. As concentrations increase, there are more hindrances to settling and additional support will be needed to aid the process.

Types of Sedimentation Tanks

Sedimentation water treatment requires the use of specialized tanks. A sedimentation tank provides the necessary support to make sure that the particles settle. Sedimentation will happen naturally over time, but water treatment requires a tank to streamline the process.

Horizontal Flow Tank

Horizontal flow tanks are the simplest option. These rectangular tanks allow water to flow horizontally, ensuring that particles are separated from the water during the movement through the tank. This way, the sediment has been collected before the water leaves the far end of the tank. The tank is equipped to clean the sediment out periodically in order to allow the process to continue.

Multi-Layer Tank

A variation of the horizontal flow tank is the multi-layer tank. The process is still the same in a multi-layer tank. However, multiple decks have been built in the tank. Water is passed from one layer to the next until the sediment is properly separated.

Radial Flow Tank

Radial flow tanks approach this process differently. These tanks are circular, and sediment is moved centrally to be collected and discharged. Radial tanks can be enhanced for flocculation and recirculation in some cases.

Settling Tank

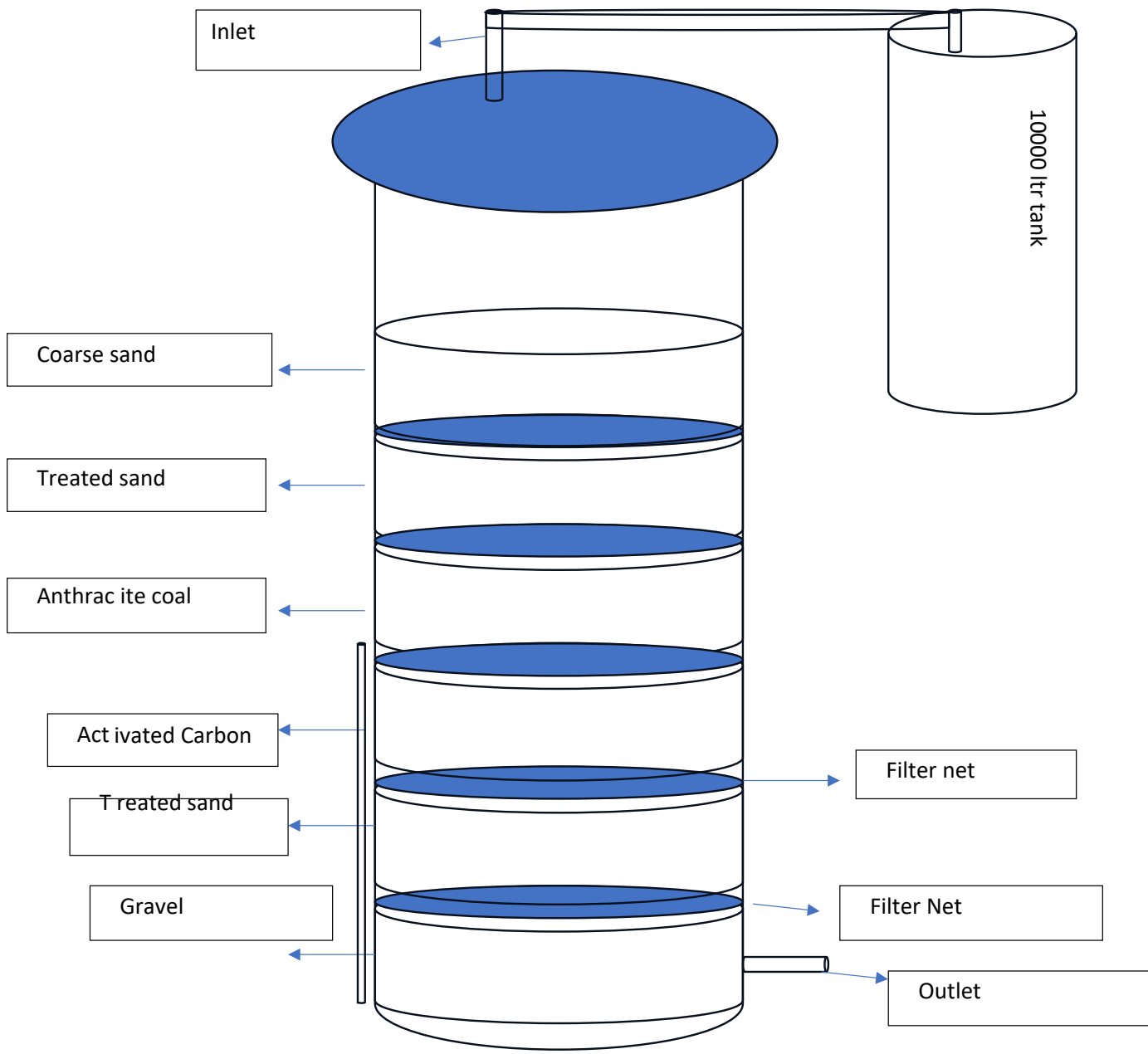
Another tool used for sedimentation is a settling tank. A settling tank is inclined to assist with the collection of sediment. Inclined settling tanks can be unhindered, which means they may work without additional mechanical stimulation. Instead, the process is facilitated by the size of the tank, the depth of the water and the placement of the inclined plates at the bottom. The flow of the water can move in multiple directions depending on the sedimentation needs.

Ballasted Sedimentation

Ballasted sedimentation is another option. This is preferred when additional flocculation is needed to help with coagulation. Ballasted sedimentation relies on the application of high molecular weight polymers. These polyelectrolytes are used to increase particle density, which promotes separation. In particular, ballasting agents are used. In most cases, this is a fine sand or Bentonite.

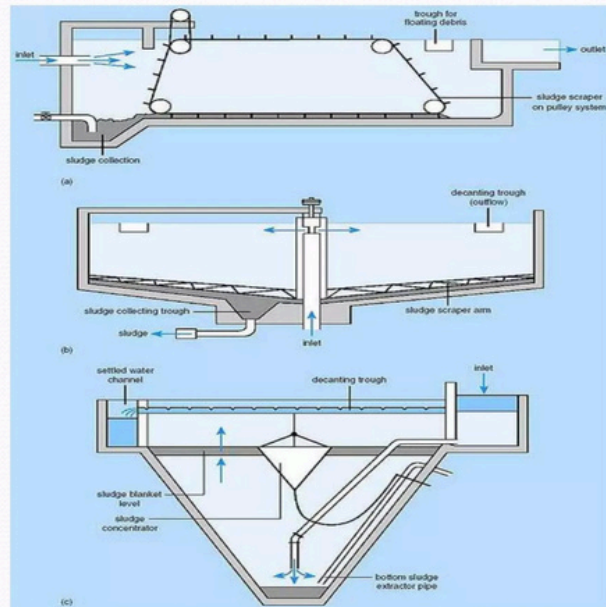
Floc Blanket Sedimentation

Another option is floc blanket sedimentation. These tanks look like inverted pyramids and feature a short vertical section. Floc is circulated in the tank, attracting particles. Eventually, the floc and sediment turn into sludge on the floor. Because of the shape of these tanks, the suspension is moved downward into the pyramid and eventually discharged



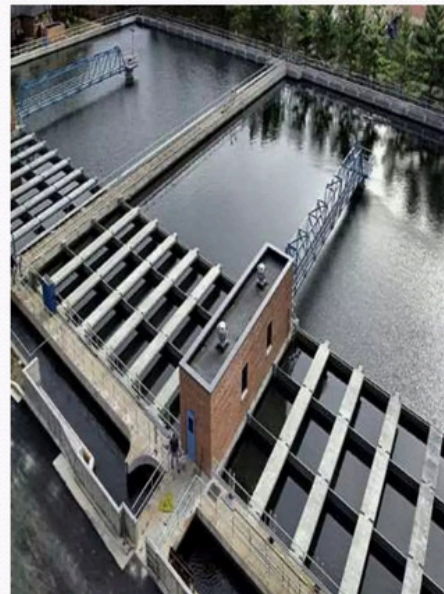
Design of water Treatment plan(community based) :

1. Rectangular tank with horizontal flow.
2. Circular tank with radial or spiral flow.
3. Hopper bottom tank with vertical flow.

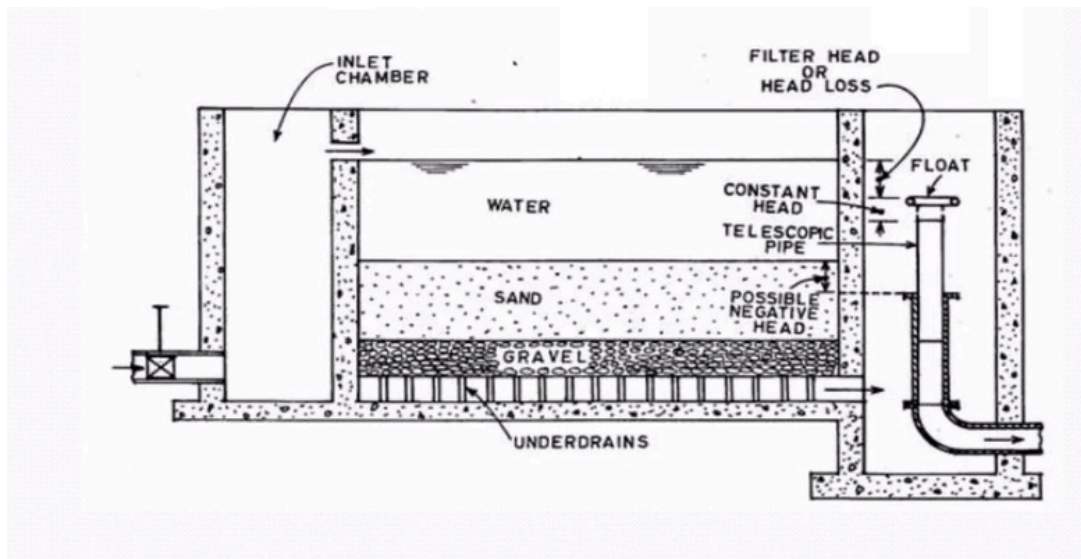


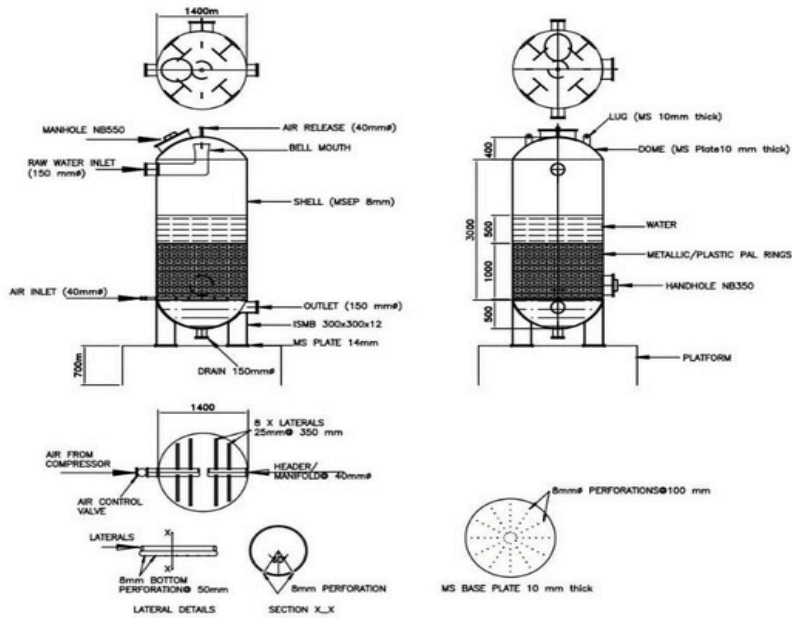
Community based Water Treatment plant

- Water flows to a tank called a sedimentation basin
- Gravity causes the flocs to settle to the bottom
- It would take a very long time for all particles to settle out and that would mean we would need a very large sedimentation basin.



Domestic Water Treatment Plant :





**Domestic water treatment plant (sediment Process)
Up to 100000 ltr per day**

