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A RAPID WATER FILTER

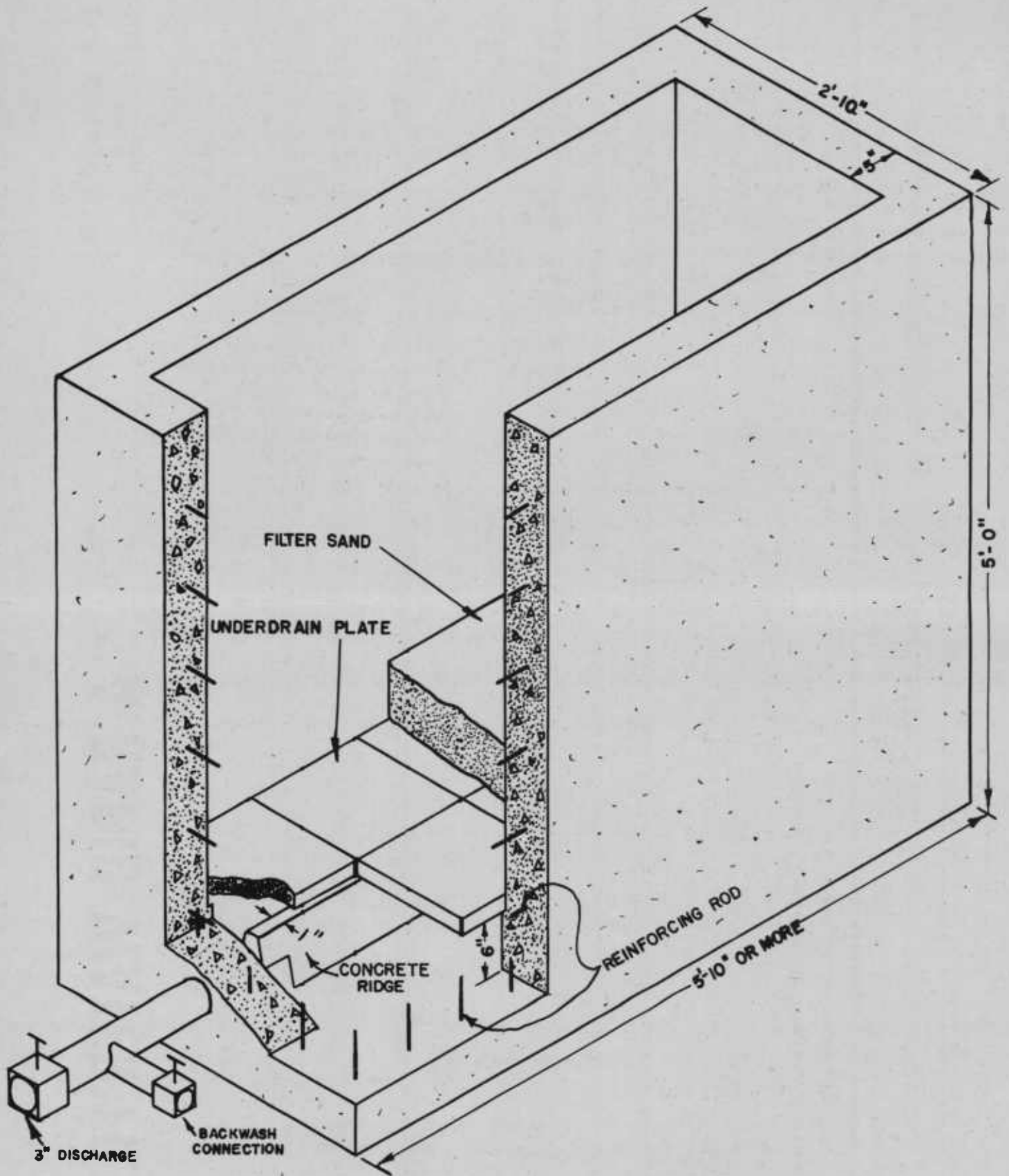
M. G. Huber

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M. G. Huber, Agricultural Engineering Specialist

This water filter or clarifier is designed for the use of porous underdrain plates. The plates are $11 \frac{7}{8}$ " x $11 \frac{7}{8}$ " x $1 \frac{1}{4}$ " and the filter box is designed in even foot dimensions on the inside. The attached plan specifies 2 feet wide and 5 feet long, inside dimensions. The wall and floor are 5 inches thick. Reinforcing rods are placed as indicated in the table below. This filter will take about 2,000 gallons per hour through 6 inches of clean pumice sand. A concrete ridge in the center supports the underdrain plates lengthwise of the tank and a wall offset supports the edges next to the wall.

If backwash is practiced, it is necessary to anchor the plates to prevent uplift and shifting of the plates. This could allow the sand to be washed through any cracks or opening that might develop between the plates. Bolts may be anchored in the concrete at the plate corners, which are rounded and allow space for the anchor. The wall offset may be slightly increased to allow the imbedding of anchor bolts, or a 2-foot angle iron bolted at the center extending crosswise will hold the plates in place.

Joints can be sealed with "lumnite" cement and sand grout. This can be mixed to a consistency that will permit "buttering" of plate edges as they are set, leaving the joints tight. Additional cement is trowelled into the top of the joints as they are finished.

Portland cement has also been used successfully for joint sealing.

Emulsified asphalt has also been used for joint sealing.

Operation

About 6 inches of clean, washed sand should be used for the filter. Provision must be made where the water enters the filter tank to prevent the stream from gouging and washing the sand. This can be prevented by providing a splash board or placing a shallow box under the stream where it enters the filter. During heavy use, the filter sand may be raked on the surface periodically to increase the flow following the gradual decrease in flow. Filtering does not purify the water; it removes the sediment and debris.

Constructing the Filter

A good quality of concrete using a 6-gallon water cement ratio is desirable (that is, 6 gallons of water are used for each bag of cement) and 6 sacks of cement per cubic yard of concrete.

Your County Extension Agent can advise you where underdrain plates can be obtained or you may obtain this information from the Agricultural Engineering Specialist, Oregon State College.

To use a backwash, a tee connection and valve must be placed on the outlet pipe so that water may be pumped back through the underdrain plates and filter sand.

Spacing of 3/8-inch Reinforcing Rods for Rapid Water Filters

Type of rod	Walls	Floors
Vertical rods.....	6 inches	---
Horizontal rods.....	8 inches	6 inches

Rate of Flow

The rate of flow will vary with the type of sand and material to be removed from the water. As a general rule, 1 square foot of filter at 2 1/2 to 3 foot head will have a capacity of about 250 gallons per hour.

Additional filter area would be desirable if the water is carrying considerable sediment.

Purifying the Water

Water passing through populated communities in open ditches always stands a chance of becoming contaminated by human and animal wastes and may become the means for transmitting agents which cause diseases (such as typhoid fever). Filtering of ditch water for domestic use does not result in removing or killing these bacteria. It is not to be understood that filtering is a substitute for purification. Pure water prepared from ditch water may result from following three recognized practices. Water to be used for household purposes, when taken from open ditches, should be treated as follows:

1. Clarification or filtering.
2. Purification (chlorination).
3. Protected clean storage free from exterior contamination.

Preparation of Chlorine Solution for Purifying the Water

There are several forms of chlorine on the market, some powdered and some already in solution. The solution form usually is simpler to prepare but the powdered forms are satisfactory if freshly opened and handled properly. Below are listed some of the common sources of chlorine and the amount of each type necessary to make one gallon of 1 per cent stock chlorine solution.

Product	Form	Amount required to make a 1 per cent solution when diluted to one gallon
Purex.....	Solution	
Clorox.....	Solution	If 3 per cent, 5 cups plus 6 tablespoons
White Magic.....	Solution	If 5 per cent, 3 cups plus 4 tablespoons
Diversol.....	Powder	If 3 per cent, 3 pounds
Chlorinated Lime.....	Powder	If 25 per cent, 6 ounces (fresh powder)
B-K.....	Powder	If 50 per cent, 3 ounces

If the water is not filtered and is muddy or contains a large amount of suspended materials, three times the amount of chlorine solution shown in the above table should be added.

Do not use a silver spoon for measuring the chlorine solution.

Volume of water to be treated	Amount of 1 per cent chlorine solution needed
10 gallons.....	50 drops
50 gallons.....	3 teaspoons
100 gallons.....	6 teaspoons
500 gallons.....	9 teaspoons
1000 gallons.....	1/2 pint (one 8-ounce cup)
2000 gallons.....	1 pint (2 cups)

Thorough mixing is the most satisfactory and the chlorine solution should be added gradually as the cistern is being filled. A steady drip from a small opening of the container into the discharge to the cistern is the most effective.

If the chlorine solution is not added at the time of filling the reservoir but later dumped in the reservoir, the amount of solution should be about doubled.

In due time, most of the chlorine taste and odor will disappear from the water, but if one is desirous of removing the odor and taste, a tablespoon of sodium thio-sulphate added about two days after treating to each 10,000 gallons of water will be effective.

Some Do's

- Be sure to build the filter area to adequately take care of the maximum requirements.
- Keep chlorine stock solutions in dark storages tightly covered.
It is better to use a fresh stock each time.
- Bolt down underdrain plates if backwashing is practiced.
- Use clean washed sand.

Experience will determine how often the filter sand should be replaced or taken out and rewashed.

In purifying your water supply, two steps are suggested. First, a 1 per cent chlorine solution is prepared, generally in 1-gallon amounts. Second, the 1 per cent solution is added to the cistern in the amount required, according to the capacity of the cistern. See the last table for amount required.