Many farmers in Kentucky, lacking other sources of water, gutter their farm buildings and build a cistern to provide and store the water they need.

Rain water is "soft," and its advantages for washing and laundering are well known. Such water can be quite safe and palatable if properly handled and stored. The purpose of this publication is to provide information on how to protect and treat cistern water to make it clear, free from offensive odors or taste, and safe for household use.

**The Cistern**

Certain features of cistern design and construction are essential to collection and storage of water. These are: (1) water tightness with smooth interior walls; (2) fine screening of inlet and overflow; (3) an effective roof wash or filter to assure that water free of trash and other possible contaminants enters the cistern; (4) manhole with a raised curb around it and a locked cover turned down over the edges of the curb which allows entrance for cleaning the cistern; (5) if possible, a drain and sump area for draining the cistern; (6) sloped finish grading to drain surface water away from the cistern; and (7) capacity to meet the water requirements as planned. (NOTE: Cistern drains or overflows should not be connected to waste or sewer lines from buildings.)

**Protection of Water Entering the Cistern**

To keep the first part of rainfall from entering the cistern and polluting the cistern with dirt, soot, bird droppings or other debris from the roof, a hand-operated valve may be used in the downspouting to direct this water to a drain away from the cistern. The use of an automatic roof washing device is recommended as an alternate for the valve described above. This device described below serves the same purpose as the valve and needs no attention except for cleaning. A sand filter, also described below, may be installed if clearer water is desired, but it requires periodic cleaning. Gutter guards or screens will keep out leaves and twigs, but they should be of the type that can be easily removed for occasional cleaning of the gutters. Screens at the top entrance to downspouts prevent their becoming clogged with leaves or twigs, yet these screens require attention, since they too may become surrounded with materials that prevent the full flow of water to the cistern.

**Automatic Roof Washers**

Roof washers may be of a commercial type or homemade. The simple device shown in Figure 1 consists of a tank or barrel which catches the first part of each rainfall or dirty water from the roof. After the container is filled, water flows through the trough and overflow pipe to the cistern. A small pipe with a faucet cracked slightly open at all times provides an automatic drain for the tank or barrel between rains and prevents freezing. The faucet may be opened wide for flushing the container. A 10 gallon capacity container is usually provided for each 1,000 square feet of horizontal roof area of building guttered, known as the "catchment area."

**Sand Filters**

Filters containing sand and gravel, shown in Figure 2, can be used, provided they are kept clean. The sand and gravel should be changed or removed and washed frequently. If the filter is neglected it may actually become a source of more rather than less pollution. For this reason many health departments do not recommend the use of filters of this type. Keep in mind that the filter, even though it might provide clear water, does not make it pure for drinking purposes.

Since time is required for passage of water through a sand filter, water may be wasted through the overflow pipe during heavy rains. In general, the automatic roof washer shown in Figure 1 is cheaper and requires less attention than the sand filter.
Figure 1.

Automatic Roof Wash for Cistern

- **Gutter**
- **Screen**
- **Downspout from Roof**
- **1/4" HDW. Cloth Screen on end of downspout and top of trough**
- **Opening in bottom 4" x Trough width (Build Trough same width as barrel)**
- **Trough to fit snug on barrel but do not seal**
- **Extend trough over front and back of tank as shown**
- **Tank or barrel, capacity 10 gal.**
  - For each 1000 sq. ft. of catchment area
- **4" C.I. Pipe**
- **Faucet, crack open for trickle drain**
- **Concrete Gutter or splash block**
- **Packing seal**
- **Sleeve**
- **Seal**
- **Cistern**
FIGURE 2.

SAND FILTER FOR CISTERN

NOTE: FILTER MAY ALSO BE BUILT ON TOP OF CISTERN.
Cleaning and Disinfecting the Cistern and Filter

All new cisterns, and old ones which have been repaired by plastering the inside walls, should be thoroughly cleaned after they are cured. To avoid a "lime" taste in the water, the inside wall surfaces may be scrubbed with vinegar, a mixture of 2 pounds of baking soda in 2 gallons of water, a 10 percent muratic acid solution, or a mix of 4 pounds of zinc sulfate in one gallon of water. Allow time for the chemicals to act before flushing. For baking soda, 24 to 36 hours are required. The other two chemicals listed above should require only 3 to 4 hours. Thorough flushing after treatment is essential.

Caution: Provide positive ventilation with a fan directed into the manhole while working in a cistern, because of the danger of toxic fumes or the lack of oxygen.

After the cistern and filter (if used) are cleaned they should be disinfected. Working through the manhole from above, spray the interior walls with a chlorine solution, applying it with a garden type hose sprayer with nozzle removed. The spray solution should consist of 1/4 cup of 5.25% chlorine laundry bleach diluted in 6 to 10 gallons of water. Hose sprayer containers are usually calibrated to show the amount of water used to empty the container. For the above application pour 1/4 cup of bleach into the container and add enough water to bring the solution to the 6 to 10 gallon mark on the container.

Do not enter the cistern again after it is disinfected. In disinfecting a new sand filter with the cistern unfilled, plug the drain into the cistern and fill the filter with pure water to about 6 inches above the sand. Using the equivalent of 1/2 gallon of 5.25% chlorine laundry bleach for a 5' x 5' filter, pour the bleach into the water above the sand and stir gently. Unplug the filter drain, allowing the solution to drain through the filter into a tub or other container below. After 30 minutes flush the filter with pure water to remove the excess chlorine.

Making Sure that Cistern Water Is Pure

All water supplies from any source are apt to become contaminated. Thus, some type of purification should be considered even for cistern water that has been filtered. The cheapest and surest method of purification is chlorination.

A positive type chlorinator is best. Several commercial companies can give advice on selection and installation.

Odors, Tastes and Colors in Cistern Water

Cistern water that is off-color or has an offensive odor or taste is very likely contaminated. Rather than drain and waste a cistern full of water, the following treatment is suggested.

Odors or Tastes:

1. The first step is purification. Determine the gallonage of water in the cistern (7.5 gallons per cubic foot). Pour one cupful of 5.25% chlorine laundry bleach, mixed with 10 gallons of water, into the cistern for each 1500 gallons to be treated. Stir the cistern water as much as possible as the chlorine is added. If a distinct chlorine taste or odor is not imparted to the water, repeat the application in a week or 10 days. The taste of chlorine after treatment should disappear in 24 to 36 hours.

2. If the taste of lime is not removed by the chemicals used in cleaning the cistern as directed above, repeat the use of baking soda. Apply at the rate of 2 pounds of soda in 2 gallons of water for each 1500 gallons of water in the cistern.

3. If water to the household is provided by a pressure pump, a commercial type filter using activated carbon or charcoal may be installed past the pressure pump. This filter will remove bad tastes and odors but it will not purify the water.

Color:

Rainwater collected from sooty roofs and gutters or downspouts containing decayed leaves or twigs may have an undesirable dark color. Water from new roofs, especially those of wood shingles, may also have "off" colors. These colors can usually be removed by adding soda and alum to the water. These chemicals will form a sludge (precipitate) which will settle to the bottom in about 24 hours and carry the color with it. The solutions should be prepared as follows:

Solution 1. Dissolve 3/4 pound of ordinary baking soda (sodium Bicarbonate) in one gallon of water.

Solution 2. Dissolve 1 pound of alum (Potassium Aluminum Sulfate Crystals) in 1/2 gallon water. If available, 1/2 pound of "filter alum" (aluminum sulfate), which is cheaper than alum, may be used at 1/2 gallon of water. Do not use "Burnt Alum".

The number of gallons of water in a cistern may be calculated by multiplying the area in square feet by the depth of the water, in feet, and then multiplying the result by 7 1/2. For each 30 gallons of water in the cistern, add 1/2 pint of solution No. 1 and stir, then add 1/4 pint of solution No. 2 and stir again. The amount of precipitate is relatively small and can be removed from the bottom of the cistern when it is emptied and cleaned.