

Introduction.

Water, the essence of life. We can't live without it. Our bodies are made of it. To drink, to cook, to keep ourselves clean, it's a building block of life. Here you will learn how to obtain it, and keep it clean.

Usage.

First you need to determine your water usage. This can be found on your water bill if you are on "City" water, or by installing a water meter on your incoming water line. I average 36 gallons per day per user (5 in household). Water Meters can be found at <http://www.water-meters.com>

22 CCF (1 CCF = 748.05 gallons) every 3 months, equals 5485 gallons per month.

CCF

an abbreviation for 100 cubic feet. Local water and sewer utilities often sell water in CCF units; for this purpose one CCF equals about 748.05 gallons (U.S.) or about 2831.7 liters. Utilities sometimes sell natural gas in CCF units; for this purpose the CCF is really a unit of energy roughly equivalent to the therm (1 CCF of natural gas provides about 1.034 therm).

<http://www.unc.edu/~rowlett/units/dictC.html>

Collecting the water.

For determining how much rain you can harvest from your roof, you need a few pieces of information.

Annual Rainfall for your area in inches.

Area of your roof (or other capture area) in Square Feet.

One inch of precipitation falling on one square foot of roof area may yield four-tenths of a gallon of usable water.

Variables:

G = Gallons harvested (yearly)

R= Precipitation in inches (yearly)

A= Area of Roof in Square Feet

Assumptions:

R = 30" Annual Rainfall (Upstate NY, yours will be different) (use 50% to cover drought conditions)

A = 980 Square Foot roof area (70' Length * 14' Width)

Formulas:

$$G = 0.4 * R * A$$

$$G = 0.4 * 30 * 980$$

$$G = 11760$$

Storing the Water.

Now that we have found out how much we can collect, we need to know how much to store. Around

here, it can get mighty dry 6 months of the year. A rule of thumb for normal household water usage is 30 gallons per day per person. We will show you how to cut that in half, in other articles, but lets use that number for now.

Lets say we have 2 adults in this house. At 30 gallons per day, per person, we will use about 22,000 gallons of water per year. OOPS! Better build a bigger collection area. The formula for figuring out collection area, based on gallons needed is as follows:

$$A = 2.5 * G / R$$

$$A = 2.5 * 22000 / 20$$

$$A = 2750$$

Since we know we need 22000 gallons of water, we might want to store 11000 gallons for the dry spell.

$$11000 * 0.1337 = 1470.7 \text{ Cubic Feet}$$

$$1470.7 / 8 \text{ (height of tank in feet)} = 183.8375 \text{ Square Feet}$$

$$183.8375 / 15 \text{ (length of tank in feet)} = 12.256 \text{ Feet Width}$$

So, you might need a tank 8' x 15' x 12.3' to contain 11000 gallons of water. See our [Ferro-Cement](#) article for tips on building your own storage tank or cistern.

Filtering the Water

A 3 stage sand filter is being implemented for water filtration. The slow sand filter works just like it sounds. Water is slowly trickled through a sand bed. The natural formation of a biological layer and the filtering action of sand removes bacteria, silt and iron. Three 55 gallon drums are setup in a gravity feed arrangement. The first barrel receives the output of the rain gutters. It's called a roughing filter, and is filled with coarse gravel. From this barrel the water flows to the slow sand filter. this has 4 layers, the top layer being 2 feet of sand, and then 3 layers of gravel, from fine to coarse, with water being bled off the bottom to the storage tank. The sand should be a fine sand, approximately .15 to .35 mm in diameter. The first gravel layer should be 6" deep, using 2-8 mm gravel. The second gravels layer is also 6", using 8-16 mm gravel. The final 6" layer is 16-32 mm gravel, with a outflow pipe buried at the bottom with many small holes for collection. You will need to stir up the top layer of sand with a small rake while backflushing every 6 months or so. This is good enough for all uses except cooking or drinking. We will be addressing that area shortly.

Keep in mind that 6.2 ft. diameter of surface area may filter 1 gallon per minute. Your roughing filter needs to be large enough to collect all the water in a typical rain storm, with overflow going to the irrigation tank.

A 55 Gallon drum has a radius of about 1ft.

A = area

Π (pi) = 3.14

R = radius

$$A = \Pi r \text{ squared or } \Pi (r^2)$$

$$A = 3.14 \times (1 \times 1)$$

$$A = 3.14 \times 1$$

$$A = 3.14 \text{ square feet, about } .12 \text{ gallons per minute (GPM)}$$

Cooking and Drinking

We filter our drinking water (and water used for cooking) through a Berkey Water Purifier. This removes all contaminants that might be found in rain water, and provides a pure, healthy, source of water.