



PDHonline Course C745 (2 PDH)

Rain Barrel: Save the Environment

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Rain Barrel: Save the Environment

Clifford T Johnson, PE, CSE

Intended Audience

Any person interested in the environment should consider this project that is not only environmentally friendly, but goes a long way to saving water for a DRY day. Gardeners should be particularly interested and those that are using well water should absolutely have a need for such a system.

Benefit to Attendees

The average city dweller will benefit by saving on cost of city water which is increasing faster than other utilities. In Charlotte where I live that asks us to ration water 2 years ago because of draught conditions and many of us did, however, the city had to increase the cost because the were not receiving enough funds to support the operation. We were penalized for following the cities request. The person using well water would be able to use the rain water for washing and waste during draught, he can also use for drinking with addition of proper filtration (see page 8) and sanitizing. All gardeners would reap the most benefits because rain water is much better for plants and vegetables.

Course Outline

Rain Barrel: Most plans DO NOT include a pumping system which is required if the barrel is going to be easy to use for watering yards or plants unless it is installed on a frame that puts the bottom at least 8 foot above ground. This plan incorporates a sump pump and hose that allows a person to water a garden or lawn. Not only is it environmentally friendly, it is better for the plants. Water is expensive and may be rationed during the summer months; however, that is when much of the homeowners water is spent outdoors!

"Don't forget to elevate the rain barrel". That's what many of the web sites tell you to do. Using the spigot on a rain barrel requires force to make the water flow. In the absence of a pump, that meant help from gravity. I'm here to tell you, there needs to be a pretty substantial height difference to get the flow of the water going or it'll just trickle out. It really needs a pump to do much watering.

Learning Objective

At the conclusion of this course, the student will:

- Be able to Assemble a complete Rain Barrel system to collect water from roof gutters
- Learn how a rain water flows from a barrel without a pump
- learn why rain water is much better for plants and gardens
- Understand the difference between rain (soft) water and tap water
- Be knowledgeable in and assist other neighbors to install a system
- Understand why a system employing a sump pump is superior to most plans
- Various methods of using rain barrels
- Safe rain water harvesting

Course Introduction

Rain barrels help slow down rain runoff so it can drain naturally into the ground. That helps keep excess water out of sewer systems and keeps rain runoff from collecting pollutants on its trip to nearby waterways. Why is that important? Reduced runoff helps prevent water pollution and flooding. Every time it rains, unabsorbed water rushes to storm drains and directly to local waterways. This water carries with it pollutants such as pet waste, automotive fluids and fertilizer and deposits it directly into our streams, rivers and lakes.

What are the advantages?

Lawn and garden watering make up nearly 40% of total household water use during the summer. A rain barrel collects water and stores it for when you need it most -- during periods of drought -- to water plants, wash your car, or to top a swimming pool. It provides an ample supply of free "soft water" to homeowners, containing no chlorine, lime or calcium making it ideal for gardens, flower pots, and car and window washing.


A rain barrel will save most homeowners about 1,300 gallons of water during the peak summer months. Saving water not only helps protect the environment, it saves you money and energy (decreased demand for treated tap water). Diverting water from storm drains also decreases the impact of runoff to streams. Therefore, a rain barrel is an easy way for you to have a consistent supply of clean, fresh water for outdoor use, FREE.


- Residential water use increases 40 to 50% during summer months - mostly due to outdoor water use.
- Storm water runoff is the leading type of residential non-point source pollution.
- Rain barrels can also be arranged to slowly release the collected rainfall to areas that can soak up the water, reducing storm water runoff and increasing groundwater recharge.


Ready-made rain barrels can be purchased from a number of companies, including hardware stores and garden supply stores. In addition, local governments sometimes offer them for a reduced price as part of their environmental education programs. Below are just a few sources


- Ace Hardware has a couple of models, 866-290-5334
- Gaiam produces the Great American Rain Barrel, 877-989-6321
- Plow & Hearth has several rain barrels including a pop-up barrel that folds flat when not needed, 800-494-7544
- Rain Barrel Source offers an extra large system, 866-912-9719
- Spruce Creek Company produces the Spruce Creek Rainsaver, 800-940-0187
- Urban Garden Center sells the Urban Rain Barrel, 866-923-1992


Utility of Rain Barrels for Irrigating Home Gardens


 Summer evapotranspiration (ET) (loss of water from soil surface through leaves) is .25 inches/day, if sunny day.

 Water holding capacity of loam soils is 2 inches of water/foot of soil.

 From a plant management perspective, irrigation is best if no more than 50% of water holding capacity is depleted. For loam soil irrigate when 1 inch of ET.

 So in summer irrigate every 4-5 days, adding one inch of water.

 1 inch of water = .62 gallons over 1 square foot

 50 gallons/.62 = 80.6 square feet of garden rooting area until cistern is refilled.

Course Content

A parts list and an electrical/mechanical drawing are included in this course and are cross-referenced to 2014 costs; a .PDF drawing can be downloaded in addition to the drawing in the course.

Parts are available at a local building supply store and/or on line. The following plan shows exactly how to assemble and wire. It is suggested that a license electrician is employed if a new 115 Vac outlet is required to be installed. This plan assumes that a weatherproof outlet is already installed on the home exterior and adds a connection for the pump switch near the barrel.

The project suggest a rain barrel to be installed on the front of a home and rear of a home with modifications made to the house gutters to capture the rain and direct it into the barrels.

The barrels should be set on a gravel or brick footing and leveled. The rain barrels for the project were obtained from a local contractor at no charge and they may purchased at the local building supply store, however, you may be able to purchase from local firms that actually want to get rid of barrels that have been used in plant processing, like barrels obtained with distilled water. Make sure that the barrels were not used for chemicals.

Most water barrels include two 3 inch bung hole access connections, one would be used for the electrical cable connections for the sump pump and the water hose connection, you can use the other for a manual level pump. The center of the barrel has to be sawed to open a hole large enough for the pump to be installed through. An 8 inch round hole is required for the recommended sump pump used, then make a 10-12 inch concrete cover for it. Once the hose (washing Machine) connection has been attached to the pump after passing it through the bung hole, the pump it is then lowered into the barrel and the cable is brought out through the same bung hole. It is important to cover the barrel or the openings with some fine door screen to prevent Leaves and trash from collecting at the barrel bottom, also mosquitoes from breeding during the summer months.



Standard 50 gal Water Barrel (mine)



Lowe's 40 Gallon Barrel



barrel and hose assembly



Pump control



Shows the power of the pump spraying water
Sump pump provides good pressure, requires 5/8" hose



Sump Pump
Note Hose connection

Parts list.

| Item | Qty | Description | cost @ | Unit total |
|---|-----|---|-----------|------------|
| 1 | 1 | 40-Gallon Khaki Plastic Rain Barrel with Spigot Model #: RW40-KHA | \$ 108.78 | \$ 108.78 |
| 2 | 1 | Utilitech 0.16-HP Thermoplastic Submersible Utility Pump w/3/4" hose adapter Model #: PPU6 | \$ 89.99 | \$ 89.99 |
| 3 | 1 | Cooper Wiring Devices 15-Amp Ivory Combination Light Switch Model #: TR274V-SP-L | \$ 8.97 | \$ 8.97 |
| 4 | 1 | REDDOT 17-cu in 1-Gang Old Work Metal Electrical Box Model #: S100E-RL | \$ 3.59 | \$ 3.59 |
| 5 | 1 | REDDOT 1-Gang Rectangle Metal Electrical Box Cover Model #: S310E-R | \$ 2.94 | \$ 2.94 |
| 6 | 1 | M-D Building Products 2-1/2-in x 4-in White Closed-Cell Foam Specialty Weather-strip, 6 ct Model #: 87916 | \$ 2.16 | \$ 2.16 |
| 7 | 1 | 1/2-in PVC 10-ft Conduit | \$ 1.65 | \$ 1.65 |
| 8 | 1 | Gampak 4-Pack 1/2-in Rigid Strap Model #: 49830 | \$ 0.63 | \$ 0.63 |
| 9 | 1 | LASCO 1/2-in Dia PVC Sch 40 female Adapter Model # 435005RMC | \$ 0.56 | \$ 2.05 |
| 10 | 1 | LASCO 1/2-in Dia PVC Sch 40 male Adapter Model #: 436005RMC | \$ 0.37 | \$ 0.37 |
| 11 | 1 | Gampak 1/2-in NM/SE Connector Model #: 49092 | \$ 2.05 | \$ 2.05 |
| 12 | 1 | Utilitech 8-ft 13-Amp 16-Gauge Replacement cord AWG 16/3 SJT #0070305 | \$ 10.47 | \$ 10.47 |
| 13 | 1 | EASTMAN 4-ft 800-PSI Rubber Washing Machine Connector Model #: 98500 | \$ 6.98 | \$ 6.98 |
| 14 | 1 | NeverKink 5/8-in x 50-ft Premium-Duty Kink Free Garden Hose Model #: 8885-50 | \$ 24.98 | \$ 24.98 |
| Optional Gutter water collection equipment | | | | |
| 15 | 1 | InvisaFlow FlexGrate Downspout Filter Model #: 4400 | \$ 5.97 | \$ 5.97 |
| 16 | 1 | Amerimax White Vinyl Flex-A-Spout Model #: 85010 | \$ 8.88 | \$ 8.88 |
| 17 | 1 | Steel 100-ft Wall-Mount Hose Reel Model #: S214-09A | \$ 9.98 | \$ 9.98 |
| | | | Total | \$ 290.44 |
| 18 | 1 | Optional manual lever pump, Vestil LPD-Poly | \$ 38.18 | |
| 19 | 1 | Bung Plug 2" Coarse to Fine adapter (pump mount) | \$ 29.00 | |

Notes:

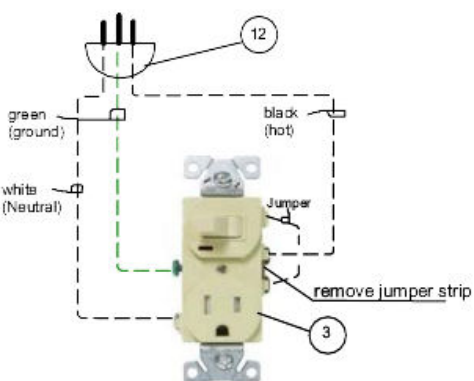
- The Optional items 18 & 19 would give you a pump that is used to fill a watering can for indoor house plants. it could be installed in the 2nd bung hole of the barrel.
- I was able to obtain a water barrel at no charge from a contractor which reduced my cost by \$108.90.
- Item 15 did not work well and I removed it from the gutter.
- I suggest using a licensed electrician to install pump control
- **Operation and Maintenance**
Rain barrels should be drained and removed for the winter months to prevent ice damage. It is recommended that you remove the existing downspout and elbow and leave it intact. Store this section for reinstallation in the late fall.

Safe Rain Water harvesting

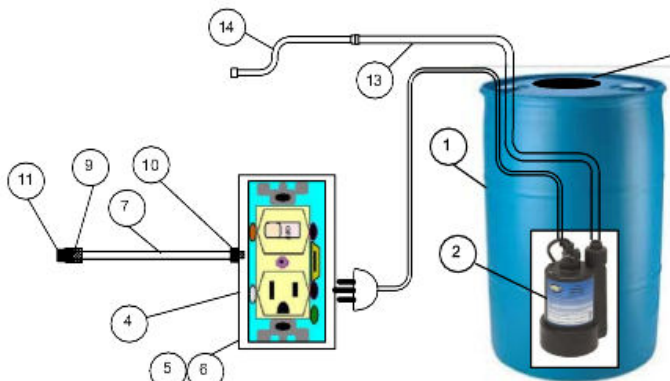
Any catchment's area will pick up some contamination from leaves, bird droppings, dust, and other natural causes. This water is fine for watering your garden, but it will need a good filtering system before you can be sure it is safe to drink. Some roofs, such as old tar and gravel or old asbestos shingle roofs create too much contamination for rainwater harvesting. Treated cedar shakes are also not recommended for water harvesting.

The type of gutter system you have is also important, as many may have lead soldering or lead-based paints. Additionally, if you live in an area that produces heavy industrial pollution, your rainwater itself may contain some undesirable contaminants. Talk to your local municipal government about the issue of environmental contaminants in your area that may affect rainwater quality.

The following is the installation for the system I designed. You can download a .pdf version that is easier to read the parts list; however, it is the same as the parts price list. The sump pump was purchased with a standard hose connection adapter. The adapter was connected to a standard washing machine hose in order to make it easier to install and change hoses outside the rain barrel. If you are able to obtain a water barrel, as I did, from a local firm, you will save almost have the cost of the system



| Item | Qty | Description |
|------|-----|--|
| 1 | 1 | 55 Gallon water drum (Baytec.com) |
| 2 | 1 | Utilitech 0.16-HP Thermoplastic Submersible Utility Pump with 3/4" hose adapter Model #: PPU6 |
| 3 | 1 | Cooper Wiring Devices 15-Amp Ivory Combination Light Switch Model #: TR274V-SP-L |
| 4 | 1 | REDDOT 17-cu in 1-Gang Old Work Metal Electrical Box Model #: S100E-RL |
| 5 | 1 | REDDOT 1-Gang Rectangle Metal Electrical Box Cover Model #: S310E-R |
| 6 | 1 | M-D Building Products 2-1/2-in x 4-in White Closed-Cell Foam Specialty Weatherstrip, 6 ct Model #: 87916 |
| 7 | 1 | 1/2-in PVC 10-ft Conduit |
| 8 | 1 | Gampak 4-Pack 1/2-in Rigid Strap Model #: 49830 (Not Shown) |
| 9 | 1 | LASCO 1/2-in Dia PVC Sch 40 female Adapter Model #: 435005RMC |
| 10 | 1 | LASCO 1/2-in Dia PVC Sch 40 male Adapter Model #: 436005RMC |
| 11 | 1 | Gampak 1/2-in NM/SE Connector Model #: 49092 |
| 12 | 1 | Utilitech 8-ft 13-Amp 16-Gauge SJT replacement Cord Model #: 0070305 |
| 13 | 1 | Eastman 4-ft 800-PSI Rubber Washing Machine Connector Model #: 98500 |
| 14 | 1 | NeverKink 5/8-in x 50-ft Premium-Duty Kink Free Garden Hose Model #: 8885-50 |



Cut hole in barrel top as needed to install pump

Sump Pump is dropped through hole after running electrical cable and hose through hole and out one of the bung hole. One bung hole is for collecting water from gutter. Cover 8 in hole with plate or screen.

| Date | Qty | Description | Revision |
|---------|-----|-------------|----------|
| 5/18/14 | 1 | For Review | A |

Title: Rain Barrel installation with sump pump

Client: [Blank]

Proj. Eng: Cliff Johnson, PE

Client Job PO: [Blank]

Drawing No: ELEC SP-01

Cliff Johnson

For a better drawing go to: <http://www.ctjohnson.com/PDF/Rain%20Barrel%20System.pdf>

Web Sites used to gather parts for this project were:

- <http://www.Lowes.com> (most of the parts)
- <http://www.amazon.com>
- www.bayteccontainers.com

Other methods of installing barrels:

Double Barrels rack mounted

This is a creative way to use the existing threaded openings in these plastic barrels. Note that hoses loop from one barrel to the other. You do have to cut a hole for the downspout in the top barrel, and this setup requires a platform to stack the barrels. The homeowner has nicely hidden the barrels with a wood fence on one side, and surrounding plantings. However, the water can only be used as a ground soaker since there is no pump. A pump could be attached externally to the bottom bung connection.



Platform mounted

The method used in most installation is shown here, However the pressure to force the water from the barrel is very low, about 4 foot of head and that would be at the nozzle being no higher from the ground then the platform that the barrel sets on, so it would only be a trickle of flow. A pump could be installed under the platform, put installing a sump pump in the barrel would probable make more sense.



Filter Water for cooking the old fashion way

"Take a new vinegar barrel or an oak tub that has never been used, either a full cask or half size. Stand it on end raised on brick or stone from the ground. Insert a faucet near the bottom. Make a tight false bottom 3 or 4 inches from the bottom of the cask. Perforate this with small gimlet holes, and cover it with a piece of clean white canvas. [CLICK HERE](#) for rest



Rainwater Harvesting Specialists

Need more water? Have we "wet" your appetite? I hope so, and for the average homeowner the "Rain Barrel" system we have presented will do the job. But what if you want more? How about



Did you know? With every 1" of rain on 1,000 square feet of roof area you can collect around 600 gallons! [CLICK HERE](#) for more information on tanks that hold up to 5,000 gallons of water

Summation

Because I am a controls engineer I was able to purchase and install the complete system including the electrical. This, of course, saved a good bit of money, however, you may need to have a Electrician install the electrical sump pump. The manual lever pump is what my wife uses a good bit of the time for house plants. She tells me the Orchids do much better with the rain water. There is little doubt that the sump pump makes the rain water more useful and convenient and allows the barrels to be placed on the ground for better maintenance. I do plan on replacing the large corrugated plastic gutter piping with a more pleasing to the eye type soon.

One last thought, the water is not fit for human consumption without filtering and adding **Potable Aqua water purification tablets**.