My rain barrel design

The downspout that supplies this barrel is fed by about 600 square feet of roof, so has the potential of about 300 gallons per inch of rainfall (rule of thumb: 1/2 gallon per sq. ft. per inch of rain). Multiply Atlanta's 30 year average annual rainfall of 50 inches by 300 gallons/inch and this one downspout has a one year potential of 15000 gallons. Similar values apply to the other downspouts where barrels could be installed. Simple arithmetic indicates that the roof could potentially receive more than 25,000 gallons of rain in a typical year. I don't have a place to put a container that large :-(

If your house doesn't have rain gutters, you can place the barrel under a "V" in the roof where the water comes off multiple roof sections. The top of the barrel will need a larger open area (because the runoff from the roof will be close to the house in light rain and away from the house in heavy rain) and the entire top needs to be covered with insect screen. The overall cost per barrel will be a little less: more insect screen used but two fittings eliminated. If the roof sections are large and/or you have heavy rainfall, you may need a splash block to control the water that overshoots the barrel.

My initial installation was was one 55 gallon barrel. That was doubled in a matter of months and the two 55 gallon barrels will be replaced by a single 275 gallon tank later in 2008. The garden plot which this collector will provide water for is about 5 feet by 13 feet. The garden is currently watered by soaker hose, which may be replaced by a drip system. 110 gallons of stored water would be adequate between rainfalls in a typical year (not in 2007, which was the 6th year in a row with less than normal rain). 275 gallons would be adequate even with half normal rainfall, but I must provide an area that can support over 2000lb (250 gallons * 8.3 lb/gallon = 2075 lb, plus the weight of the tank itself, about 100lb).

The barrels are food grade plastic to avoid any chemicals that might

harm the plants (I doubt that the sugar and caffeine in soft drink syrup are harmful to plants). The 275 gallon tank which will replace the two barrels is of unknown origin and has received several flushes with water and bleach.

Intake screens

The house has overhanging trees, so the intake screens consist of hardware cloth at an angle (so the leaves will be washed away and to keep them off the mosquito screen) plus the mosquito screen over the funnel.

The mosquito screen is attached to the top of the funnel by plastic ties and caulk. The caulk ensures an insect-proof connection between the screen and the funnel. The plastic ties keep the screen tight while the caulk sets. The funnel sits in a hole cut into the top of the barrel and is sealed with caulk. Water that runs off the hardware cloth and onto the top of the barrel will drain off through the original holes in the rim.

Hose bibb and base

The base is made of six 12" x 12" pavers and three 6" x 18" pavers which raise the barrel high enough to allow connecting a hose. The hose bibb is

located where the pavers meet to provide "bump" protection for it.

Overflow pipe

The overflow pipe and hose bibb are carefully threaded into just-the-right-size holes drilled and filed in the barrel and are sealed with caulk.

The barrels that are placed against the brick of the house will be painted a similar color. The barrels that will be placed behind existing shrubs will be painted green to be a closer match to the plants.
The white barrels can be painted with Krylon Fusion paint for plastics. Local sources include Hobby Lobby, AutoZone and other auto supply stores - but I've found limited color selection in the stores near me. Aubuchon Hardware has the full spectrum of Fusion colors. If you buy 4 or more cans, the price with shipping is about $1/can more than the local prices and you can get ALL the colors (PDF). I recommend the satin colors, because most surfaces (plants, your house) are not high gloss - glossy colors are more visible than the equivalent satin colors.

The cost breakdown per barrel is something like this:

barrel $25.00 (Dec 2007 Advance Drum Service Mableton, GA - was $18.00 in the spring of 2007)

90 degree tailpiece for downspout $5.00

4" to 3" adapter for intake funnel $4.50

hose bibb (faucet) $3.00 (plastic), $6.00 - $8.00 for brass

fittings for overflow pipe $1.00

2 feet 3/4" pvc pipe (no cost, left from another project, estimated $1.50)

8" x 18" piece of aluminum or galvanized hardware cloth (no cost, left from previous project, estimated $0.25)

caulk (no cost, left from previous project, estimated $0.10)

12" x 12" pavers (no cost, left from previous project, 6 at estimated $1.50 = $9.00)

6" x 18" pavers (no cost, left from previous project, 3 at estimated $1.50 = $4.50)

10" circle of fiberglass window screen estimated $0.15

Total $54.00 (was $47.00 in the spring of 2007)

Krylon Fusion paint is about $5-$6 per can, or $10-$12 per barrel (The coverage of 25 sq. ft. per can is optimistic - the barrel needs a thick enough coat of paint to block light from entering to prevent algae growth.) A 250 gallon tank requires 3 to 4 cans for good coverage; a 55 gallon barrel will need 1.5 to 2 cans - more if you try to paint outside on a windy day.

The standard reference for rainwater harvesting is The Texas Rainwater Harvesting Manual, 3rd Edition, which is provided in PDF form.

Unless you have an incredible screen system on your rain gutters, the rainwater container you use needs a leaf/trash filter at its inlet. The barrels you see with an attached flexible downspout connector may look good, but anything that gets into the rain gutters will get into the container. Any organic matter (leaves, pine needles, etc) in the water will decompose. I think it's much easier to keep these out of the tank than to clean the muck from the tank later.

Expect to find a layer of the granular material from your asphalt shingles at the bottom of the barrel. A finer filter screen would keep most of this out of the barrel, but would require regular cleaning to keep the screen from getting clogged and blocking water flow into the barrel. I just drain and flush the barrels once a year, usually in January to ensure that there will be water in the barrel when needed for spring gardening.

Beware claims that white/translucent barrels "make it easy to see the water level". White barrels/tanks allow enough sunlight in to promote the growth of algae; I did my own testing of this claim over a period of several months and the algae took over the barrel. This will be the case with almost any white/translucent container, unless you regularly add a small amount of chlorine bleach to the container (think you'll remember

to do this every time it rains?) I paint all barrels and tanks, even if the color choice is white, to avoid this problem.

I added the second barrel using a 3/4" male pipe thread to hose adapter near the bottom of each barrel.

The connection between barrels is made with a washing machine hose (yet another leftover, about $6 if you buy new) because it has the needed female hose fittings on each end. You can add inline shutoff valves to allow isolating each barrel (great if the hose springs a leak).

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Feeding another container from the overflow line works - the water is noticeably cleaner. Just be sure the next container has an overflow port at the proper level (at or no more than 1 inch above the overflow port on the first barrel). The filter intended for use with a pressure washer (see below) also does a good job of cleaning particulates from the water flowing between barrels.

The barrels do provide enough pressure/volume to allow using a soaker hose (approximately 0.433psi/vertical foot of water height). I need to do some tests to determine how many gallons/hour are delivered via the soaker hose (a project for a PICAXE microcontroller and a washing machine flowmeter - I'll post details when it's completed). When the flow rate is known, I can set up a timer to water the garden as needed. You can find drip irrigation supplies,

including some designed for use with very low pressure (gravity flow rain water tanks) at DripWorks.

Gilmour has a battery operated timer (9100NGF) that works well with a rain barrel or tank. It uses a small motor to turn a ball valve, thus it does not need any water pressure to open/close the valve. Lowe's lists this timer for $28.98

A 2/3 full barrel has enough water pressure (about one psi) to provide adequate flow to a small pressure washer (1.5 gpm, 1650psi). A lower water level is marginal for providing the 1.5gpm flow. The granular matter from asphalt shingles is very abrasive to finely machined surfaces such as the pump on the pressure washer, so you need a particulate filter in the line before the pressure washer. I found one in the pressure washer accessories area at the local home center (about $20, also online). The filter uses fine mesh to block particulates and can be disassembled for cleaning when needed (I try not to use disposable filters because the last one you have will clog in the middle of a project).

Some pictures during the configuration of a 250 gallon tank.

The original tank after cleaning. With over 200 gallons collected, it's obvious the support cage is needed. With 8 feet of 3/4 inch hose connected, the flow rate from the tank (at greater than half full) is over 4 gallons/minute (measured by the time needed to drain 50 gallons from the tank). If you're curious about the flow rate from the 2 inch valve, just be sure to stand to the side when you open the valve...

A two inch threaded to 2 inch PVC pipe adapter screws on the valve, then a 2 inch slip to 3/4 inch threaded pipe adapter is glued in to provide a place to screw in a 3/4 inch pipe to male hose thread adapter.

The tank after a coat of Krylon Fusion Satin Khaki paint.

What the embossed volume markings look like after painting.

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The pictures show an extra paver in each stack under the original barrel.. The additional pavers were need because of the heavy duty hose I tested with. Since there is very low water pressure from the barrel (less than 4psi), a flexible, lightweight hose is more than adequate. The barrel only needs to be 3 pavers above the ground.

The low pressure from a ground-based barrel makes using rainwater with electrically controlled valves (typical sprinkler system) difficult to impossible, as most valves require a minimum of 5 to 10 psi to operate (as do the sprinkler heads). Drip irrigation systems and soaker hoses work well with low pressure water sources (rain barrels). You do have to adjust the watering times because the drip and soaker systems deliver less water than their advertised values when operation at typical rainwater harvesting pressures (under 4 psi). There are some exceptions, but they generally are found at industrial suppliers, not irrigation suppliers. A couple of examples are 24 volt dc solenoid valve (max 2 psi) and 120 volt ac solenoid valve (max 5 psi). Another alternative is the water inlet valve from a clothes washer. These typically run on mains voltage (120 or 240 volts, depending on where you are in the world) and can sometimes be had for the asking (or a couple of dollars) at an appliance repair shop. When working with water outdoors, I prefer low voltage control for safety and simplified wiring (in-ground sprinkler systems use 24 volt valves for the same reasons).

I chose concrete pavers instead of building a support of pressure treated wood for several reasons:
1. strength - a 55 gallon drum of water weighs about 450 pounds
2. durability - they don't need to be replaced because of weathering
3. cost - pressure treated 2x4x8 is $3 (need 3 or 4), 4x4x6 is $6.50 (need 2), 80 lb bag of concrete mix is $4.70
4. convenience - I can move the pavers to another location relatively easily. Something with its feet in concrete is MUCH harder to move.

Note that there are a number of "left from previous project" items. This house is over 30 years old and ALWAYS needs some type of maintenance.

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