



Rainwater Catchment Installation Guidelines

OVERVIEW: SYSTEM COMPONENTS

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3. Conveyance of Rainwater
4. Tank Elements & Requirements
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1. CATCHMENT SURFACE

Compatible Roof Materials

Metal, concrete, tile, asphalt shingles and solar panels

Not Recommended

Treated wood shingles, roofs with lead flashings or painted with lead-based paints

2. FILTRATION

GUTTER SCREENS



Gutters should be screened to prevent build-up of leaves, debris and to protect against rodent activity. Gutter screens provide higher quality water for the tank and keep gutters clean, thereby eliminating the need to clean out gutters each year.

Resources

Hardware stores carry 3 ft. long plastic or metal based screens that fit any standard sized gutter (hook and snap in place) as well as rolls.

LEAF SCREEN



Leaf screens are a good alternative to gutter screens (see bottom two images). This screening 'funnel' works by shedding debris and leaf with a mesh screen. There are a variety of products available, from the Urban Farmer Store, ACE and other Hardware stores. The images below shows the most popular product. All leaf screens should be installed at the top of the gutter or conveyance line and fit in place by strapping or screwing into the wall. The bottom piece of most products will fit into the conveyance pipe line that continues to the tank.



FIRST FLUSH DIVERTER

First Flush/Rain Diverters redirect the initial flush of stormwater away from the storage tank. This water carries particulate matter, soot, bird droppings and other unwanted contaminants. A first flush diverter will help keep your tank clean and free of debris. The first flush line should be directed to a section of your landscape that can absorb this water or alternatively to the existing storm drain network.

Amount of water to divert

Depending on the roof surface, 1-10 gallons per 1,000 square feet of surface:

- Between 1-5 gallons for roofs with no trees overhead and less exposure to pollution such as freeways
- Between 5-10 gallons for roofs near freeways & industrial sites with more trees and animal activity

The standard size for the first flush pipe is 3" or 4" diameter. To size the pipe for given capacity of water, consider:

- 1 ft. of 4" diameter pipe holds .5 gallons of water;
- 1 ft of 3" diameter pipe holds .25 gallons of water.

Simple and effective first flush devices are installed at the top of the downspout, or conveyance line. Install the chamber below the gutter filter (or rain head), to within 4-6" above the ground to allow easy access to the end cap. The first flush should be strapped to the wall with galvanized tape.

Floating ball valve

This is a type of first flush model can be purchased at the Urban Farmer stores, Rain Harvest (www.rainharvest.com) or custom built with piping, based on the standard commercial model. All parts are available at hardware, plumbing stores as well as the Urban Farmer Store.



3. CONVEYANCE MATERIALS

BASIC GUIDELINES IN CONVEYANCE

A conveyance line is simply the piping that carries the water from the gutter to the tank. The existing downspout will need to be cut and fitted to the opening of the tank. The Bushman tanks all have a 3" inlet, so the conveyance line should be converted to this size diameter. The existing downspout can be cut and replaced with the 3" pipe depending on where the tank is placed. Generally, it's easiest to disconnect the entire existing downspout (from the top where it meet the gutter line) and replace the line with plastic based piping.

NOTE: Only use hard, rigid pipe for your conveyance line - flexible, ribbed drainage pipe is not a durable material, may collect standing water and weaken the conveyance line and deteriorate over time.

INSTALLATION

Cut the downspout from the scupper, or the top of your downspout where the gutter meets the downspout. A hacksaw or sawzall are appropriate tools for cutting aluminum downspouts. If the downspout is cast iron or other thick metals, a grinder or other electrical



tool will be needed. The plastic conveyance line should be mounted to a wall with galvanized tape and screws or other straps. Strap pipe every five feet or so, depending on your layout.

TYPES OF PIPING FOR CONVEYANCE

HDPE

The least toxic, most durable and longest lasting pipe is this 'Triple Wall' pipe: a 3", UV resistant drainage pipe that can also be trenched underground and covered with dirt and gravel. HDPE is a specialized pipe, sold in a 10' section and carried by the Urban Farmer Store and some hardware stores such as Ace Hardware.



PVC

Polyvinyl Chloride piping is considered by many to be a toxic plastic material, and should be avoided if possible as it does leach chemicals in higher atmospheric temperatures. PVC piping is designed for pressurized piping, and is recommended over ABS (which is designed as a drain pipe) because it doesn't leach as much as ABS, and is also more durable and longer lasting. PVC is not UV resistant, and should be painted if used in outdoor applications with exposure to sun light.

BASICS OF WORKING WITH HDPE AND PVC

HDPE only comes in 3" diameter and can be cut with a pipe saw or an electric sawzall. Each type of pipe has a corresponding fitting or elbows of 22 1/2, 45 and 90 degree turns.

PVC pipe comes in diameter between 2" all the way up to 12", though the standard is 3". PVC is glued with a primer and PVC glue. When 'laying' pipe against the wall, it's best to run the entire line as a 'dry fitting' or mock-up before gluing and strapping pipe to the wall.



4. TANK ELEMENTS / REQUIREMENTS

PLACING TANK

All rain water harvesting tanks must be placed on a prepared foundation.

Foundation Options:

- Reinforced concrete pad that is level and greater than the footprint of the tank
- 'Earth ring' (the easiest product to use is 'Bender board', a plastic liner that is secured with metal stakes driven in the ground, outside the ring.) Size the circular ring in a minimum of 2" greater than the footprint of the tank, so tank does not bear down on the ring, and fill with 2-4 inches of pea-gravel.
- A 4x4 or other dimension of wood can be used as a frame to contain the gravel foundation bed.
- Concrete pavers laid on leveled and tamped ground

NOTE: Earth Rings are more appropriate for the larger tanks of 305 gallons and up, though concrete pavers can also be used for the 620 gallon tank.

Resources

Earth Rings with plastic based 'bender board' can be found at Urban Farmer Store or other hardware store or nursery.

Pea gravel fill is sold at competitive prices at Acapulco Rock & Stone in Richmond: <http://www.acapulcorock.com/>

SECURING TANK

Tanks should be structurally secured from overturning by bolting, strapping, bracing or with poured, concrete piers. A building professional can assist with these securing methods. If the tank will be strapped to the wall, galvanized tape can be used.

BUSHMAN TANK FEATURES

The Bushman Slimline and 205 cylindrical tanks all have the same dimension of a 3" opening for inlets and overflow lines:

- Inlet is located at the center top of the tank.
- The tank has an option of overflow openings on either side of the tank, located towards the top.
- Cap whichever opening that is not used to create a sealed, mosquito and vermin-proof tank.



Outlets are located on either end and in the middle section of the long side of the tank. The outlets at either side of the bottom can be used to drain the tank if a spigot valve is connected to this outlet. The outlet on the long side of the tank (labeled C in the diagram) is the best one to draw from, as it is located about a foot above the bottom of the tank. Water at this level in the tank is a cleaner quality than water at the bottom of the tank as sediment settles at the bottom of the tank.

CONNECTING A FITTING FOR THE OUTLET

The tank outlet should be connected to a ball valve as the method of releasing water. Each Bushman tank has a different diameter size for the outlet. Refer to the Bushman USA website product info section or inquire to the Urban Farmer Store to determine the diameter of your outlet. The outlet is a threaded opening, which can be fitted to a nipple fitting to adapt to the ball valve. Or if the ball valve diameter fits to the tank outlet diameter, it can be directly connected. Any connection to the ball valve should be wrapped in teflon tape to make it water tight.



5. DISTRIBUTION

Rainwater irrigated systems can be gravity fed or connected to a pump. In a gravity fed system, the tank may be connected to a hose for a low pressure flow or directly routed to an irrigation line of corrugated HDPE pipe or Blu-Lock pipe.

Rules of thumb

- For building pressure by elevating tank for a gravity fed system: water gains 1 PSI for every 2.31 feet of lift.
- Tanks should be placed at the highest level in the property to gain pressure of gravity feed.

PUMPS: PRODUCT RECOMMENDATIONS

Grundfos Jet Pumps

Submersible or external, energy efficient, variable speed, quiet & easy to use; 40-100 psi & self priming.

Walrus Pumps

Also highly recommended. The Walrus TQ series are all-in-one units consisting of pump, motor, pressure tank, and electronic controller.

Leader Pumps

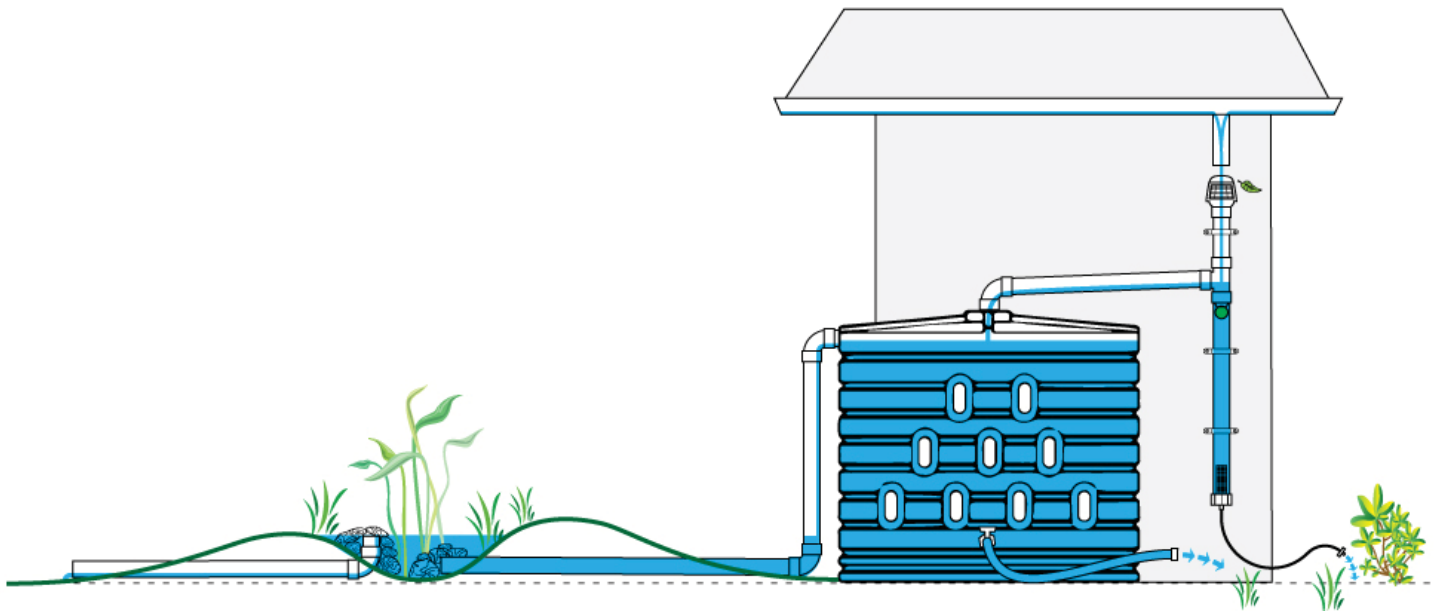
Urban Farmer sells affordable, quality pumps and has knowledgeable staff to help design and select an appropriate pump for your needs as well as answering questions.



6. OVERFLOW

An overflow outlet located at the top of the tank is a standard feature. Typically, a pipe connected to the outlet will run down the side of the tank and then be routed along a trench to a rain garden or the sewer/stormwater drain if the landscape will not accommodate an overflow line. The overflow opening can also be used to connect multiple tanks in a 'daisy-chain'.

Routing the overflow to a rain garden, or a simple swale filled with mulch, is a great way to maximize the capacity of the catchment system, as it helps to recharge the ground water table and enrich the soil. The overflow line can be trenched 4-6" deep with a perforated pipe along the landscape.



A Bushman 620 tank with overflow to a rain garden.

NOTE: Maximize the irrigation capacity of your catchment system by calculating a monthly or annual overflow your tank will generate and routing your pipe-line to accommodate this volume of water.

7. CALCULATING RUNOFF

Calculate your runoff on a monthly or annual basis (or other consumption) so you can plan for your irrigation needs and the volume of water your system will capture.

To calculate collection potential:

Multiply the square foot of collection area x rainfall (in inches) x .6 = gallons.
Measure the footprint of the collection area by calculating the length x width.

Example formula:

Roof area = 1,000 square feet

Annual rainfall (for the bay area) = 22 inches

Apply formula: $1,000 \times 22 \times .6 = 13,200$ gallons/year

IRRIGATION DEMAND

The amount of water required for irrigation is site specific and varies depending on soil conditions, the microclimate and types of plant in the landscape. One average that can be applied to many gardens: 1/2 gallon per square foot per week

A NOTE ON PERMITTING REQUIREMENTS

Rainwater catchment projects (for any of the Bushman tanks between 60-620 gallons) used for irrigation with no pump will not require a permit. A rainwater catchment system will generally require a permit if:

- It includes an electrical pump – electrical permit will be required
- The system is 5,000 gallons or larger
- The system will be used for indoor plumbing

If you have any concern or doubt, the easiest and fastest way to determine permitting requirements is to call the building or planning department and inquire. The planner will ask for the specs of your system, and where you will place the tank. The city website has the following information on rainwater permitting requirements:

- The City of Oakland can approve a system for indoor rainwater reuse (flushing of toilets and urinals) with an application of an “Alternate Methods and Materials Request” from the Building Services Division.
- There are no special requirements for using rainwater for irrigation unless potable water is used as makeup water to a rainwater storage tank. Contact Building Services for Cross Connection Prevention requirements.



GENERAL TOOLS USED FOR RAINWATER CATCHMENT INSTALLATION

- Measuring Tape
- Hack Saw or Pipe (PVC) Saw
- Electric drill
- Screw driver
- Level
- Crescent Wrench / Monkey Wrench / Channel Lock Pliers
- Tin Snips
- Safety Glasses
- Gloves

RAIN GARDEN PLANT LIST



SHRUBS

Kangaroo paw
 Dogwood
 Digger's speedwell
 Oceanspray
 Holly
 Virginia sweetspire
 Cushion bush
 Spicebush
 Wax mertle
 Common Riceflower
 Azelea
 Rhododendron
 Sumac
 Currant
 Thimbleberry
 Lilac

TALL SEDGES

Bottlebrush Sedge
 Slough Sedge
 Tussock Sedge
 Spike Rush
 Common Cottongrass
 Knobby club-rush
 Land Quillwort
 Tapertip rush
 Corkscrew rush

GRASSES

Big bluestem
 Purple three awn
 Meadow pinegrass
 Reedgrass
 River oats
 Tufted hair grass
 Meadow barley
 Basket grass
 Japanese silver grass
 Moor grass
 Gulf muhly grass
 Witch grass
 Fountain grass
 Esparto grass
 Yellow rush
 Torreys rush
 Green bulrush
 Small fruited bulrush
 Softstem bulrush
 Dwarf cattail

FERNS

Giant leather fern
 Giant Chain fern
 Southern maidenhair fern
 Hart's tongue fern
 Lady fern
 Fishbone water fern
 Sensitive fern
 California polypody fern
 Sword fern
 Marsh fern

HERBACIOUS PERENNIALS

Yarrow
 Swamp Milkweed
 New England Aster
 Blue grass lilly
 Common everlasting
 Flax lilly
 Western Bleeding heart
 Purple coneflower
 Yellow flag iris
 Lavendar
 Prairie blazing star
 Great blue lobelia
 Bistort
 Black eyed Susan
 Stiff goldenrod
 Grass triggerplant
 Tufted bluebell

WHERE TO OBTAIN SUPPLIES

Polyethylene tanks are best purchased locally because of high shipping costs. Search online for local suppliers. Listed below are some websites that sell tanks; the first two companies are based in California.

<http://www.watertanks.com>
<http://www.loomistank.com>
<http://www.liquidlogictanks.com>
<http://www.tank-depot.com>
<http://www.rainbarrelsource.com>
<http://www.rainbarrelsandmore.com>
<http://www.aquabarrel.com>

Downspout filters and a variety of other specialized parts for systems can be purchased from:

<http://www.starkenvironmental.com/a-1-filtration.html>
<http://www.braewater.com>
<http://downspoutfilter.com>
<http://rainharvest.com>

Hardware, PVC pieces and other specialty items can be purchased at the Urban Farmer Store or your local hardware stores. Lowes or Home Depot also sells these items.

EDUCATIONAL RESOURCES

ONLINE LINKS

ARCSA: www.arcsa.org
Wholly H2O: www.whollyh2o.org
Harvesth2O: www.harvesth2o.com
Rainwater Harvesting for Drylands and Beyond by Brad Lancaster:
www.harvestingrainwater.com/rainwater-harvesting-inforesources

BOOKS

Rainwater Harvesting for Drylands and Beyond - Brad Lancaster
Rainwater Collection for the Mechanically Challenged - Suzy Banks with Richard Heinichen
Creating Rain Gardens: Capturing the Rain for Your Own Water-Efficient Garden - Cleo Woelfle-Erskine and Apryl Uncapher
Water Storage; Tanks, Cisterns, Aquifers, and Ponds - Art Ludwig