

GRAYWATER



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Graywater Can...

- ♦ Save energy used to transport, clean, & treat water.
- ♦ Reduce irrigation demand.
- ♦ Conserve potable (drinkable) water.



March 2014 DRAFT

What is Graywater?

Gray-water {noun}:

Untreated wastewater from bathtubs, showers, bathroom washbasins/sinks, clothes washing machines (no diaper water!) and laundry tubs. It does not include wastewater from kitchen sinks, dishwashers or toilets.

["Graywater" has the same meaning as "gray water", "grey water" and "greywater".]

The City recognizes use of graywater, as long as it is to code and used in a safe and sanitary manner.

Why Graywater Now?

- Graywater accounts for 54% of residential household waste water in Santa Cruz.
- 25% of residential household drinking water in Santa Cruz is used for landscaping.
- Clothes washing machines account for 18% of residential water use in Santa Cruz.

The most common type of graywater system is a clothes washer system called "Laundry to Landscape". A Laundry to Landscape system diverts water from your washing machine to be used as outside irrigation.

*Collection and treatment shall comply with the 2013 California Plumbing Code. These other uses require a permit for construction and a clearance from Environmental Health.

How Can Graywater be Used?

Per the 2013 California Plumbing Code, many types of water conservation methods are recognized.

- Per Chapter 16, Alternate Water Sources for Non Potable Applications are outlined, including but not limited to Laundry to Landscape, *simple and complex Graywater Systems*.



Using graywater from the laundry to irrigate the landscape reduces the demand on the potable (drinkable) water supply.

Other uses of recycling water include:

- Simple and Complex Systems* (which exceed the Laundry to Landscape system).
- The collection and treatment* of rainwater to be used to flush toilets.
- The collection and treatment* of graywater to be used to flush toilets.

- Per Chapter 16A, Non-Potable Water Reuse Systems are outlined, including but not limited to *Recycled Water Systems*. [Intended to supply water to toilets]
- Per Chapter 17, *Non-Potable Rainwater Catchment Systems* are outlined. [Intended to supply water to toilets]

[Click here for the 2013 California Plumbing Code](https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf). Or visit <https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf>. The above water conservation methods begin on page 335 of the PDF document.

Laundry to Landscape {Exterior Use}



[http://www.montereywaterinfo.org/documents/Greywater%20Challenge%202L-workshop%20\(1\)%20\[Compatibility%20Mode\].pdf](http://www.montereywaterinfo.org/documents/Greywater%20Challenge%202L-workshop%20(1)%20[Compatibility%20Mode].pdf)

A Laundry to Landscape clothes washer system does not require a permit for construction as long as the requirements are met as outlined in Chapter 16 of the 2013 California Plumbing Code.

The requirements include, but are not limited to, the following:

1. Notification must be provided to the enforcing agency regarding the proposed location/ installation of a graywater irrigation or disposal system.
2. The design shall allow the user to direct the flow to the irrigation/disposal field or the building sewer. The direction control of the graywater shall be clearly labeled
3. The installation, change, alteration, or repair of the system does not include a potable water connection or a pump and does not affect other building, plumbing, electrical, or mechanical components including structural features, egress, fire-life safety, sanitation, potable water supply piping, or accessibility.
4. The graywater shall be contained on the site where it is generated.
5. Graywater shall be directed to and contained within an irrigation or disposal field. Graywater shall not be used in spray irrigation.
6. Ponding or runoff is prohibited and shall be considered a nuisance.
7. Graywater may be released above the ground surface provided at least two (2) inches (51 mm) of mulch, rock, soil, or a solid shield covers the release point. Other methods which provide equivalent separation are also acceptable.
8. Graywater systems shall be designed to minimize contact with humans and domestic pets.
9. Water used to wash diapers or similarly soiled or infectious garments shall not be used and shall be diverted to the building sewer.
10. Graywater shall not contain hazardous chemicals derived from activities such as cleaning car parts, washing greasy or oily rags, or disposing of waste solutions from home photo labs or similar hobbyist or home occupational activities.
11. Exemption from construction permit requirements of the code shall not be deemed to

grant authorization for any graywater system to be installed in a manner that violates other provisions of the code or any other laws or ordinances of the enforcing agency.

12. An operation and maintenance manual shall be provided to the owner. Directions shall indicate that the manual is to remain with the building throughout the life of the system and upon change of ownership or occupancy.

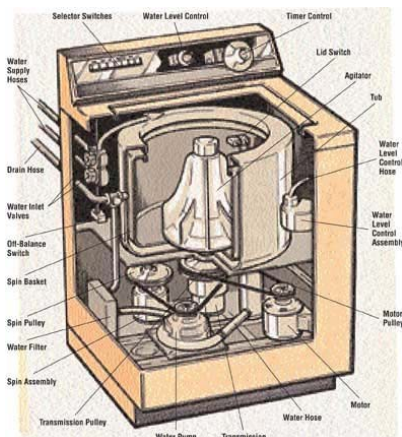
Laundry to Landscape systems must be registered with Public Works, [click here for the form](#). All other graywater systems require a permit.



<http://en.wikipedia.org/wiki/File:P8220094--CroppedImage.jpg>

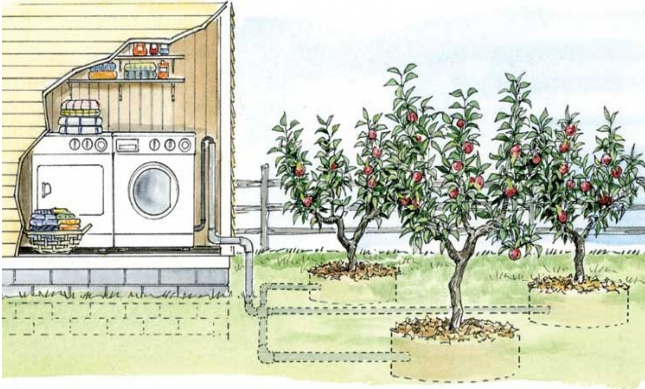
Why Laundry to Landscape?

- Typically the easiest source of graywater to access.
- A building permit is not required if the Laundry to Landscape system follows the 12 guidelines above, however it still needs to be registered with Public Works. [Click here](#) for the registration form. Or visit <http://www.cityofsantacruz.com/Modules/ShowDocument.aspx?documentid=22532>.
- An excellent way to reduce your water bill.



[http://www.montereywaterinfo.org/documents/Greywater%20Challenge%202L-workshop%20\(1\)%20\[Compatibility%20Mode\].pdf](http://www.montereywaterinfo.org/documents/Greywater%20Challenge%202L-workshop%20(1)%20[Compatibility%20Mode].pdf)

Steps to Assist in Moving Forward



Sears, Elayne. "From Laundry to Landscape: Tap into Greywater." Illustration. Mother Earth News August/September 2011.

<http://www.motherearthnews.com/green-homes/greywater-zm0z11zphe.aspx#axzz2wL7K9UMJ>

{STEP 1} Estimate Graywater Production

1. Number of loads of laundry done each week?
2. Number of gallons per load?
 - A. Older top loading machine uses ≈ 40 gallons/load
 - B. Front loading machine uses ≈ 20 gallons/load

(Some EnergyStar machines are top loading. Front loading EnergyStar machines use about 15 gallons/load. Today's current standard load is about 25 gallons/load.)
3. Future changes?
 - A. New machine? An increase or decrease in occupants?? Change in landscape?

Weekly graywater produced = Loads per week x Gallons per load

{STEP 2} Decide What Plants to Irrigate

Plants with larger root zones do better with graywater irrigation. The plants stay happy with consistent laundry water patterns.

<u>Best for Irrigation</u>	<u>Not Appropriate for Irrigation</u>
Trees (especially fruit trees !)	Lawns
Shrubs/bushes	Drought Established (eg. Never irrigated)
Vines	Small Plants, Sensitive Plants (eg. Ferns)
Perennials	No root vegetables
Large annuals	Not For Use in Raised Beds



<http://backyard-homestead.com/how-to-grow-apples>



<http://urbangardenings.blogspot.com/2013/12/backyard-makeover-includes-pathpergola.html#/2013/12/backyard-makeover-includes-pathpergola.html>

{STEP 3} Estimate Plant Irrigation Requirements

Does Graywater Production = Plant Water Requirements?

An average four person household in Santa Cruz produces 150 gallons of laundry graywater/week.

What plants will you irrigate? This depends on...

- Gallons/ week of graywater
- Plant water requirements - water intensive? Drought tolerant? Plants usually have an estimated water demand factor.
- For those with existing irrigation systems, try and find a zone you can shut off and replace with graywater.

{STEP 4} Product Choices



- Avoid using products that can harm soils and plants
 - Salts or sodium compounds
 - Boron, borax or borate
 - Chlorine bleach (hydrogen peroxide bleach okay)
 - Peroxygen, Petroleum Distillate or Alkybenzene
 - Water softeners: potassium chloride OK– not sodium
 - Antibacterials, which alter the biology of natural occurring bacteria in the ground and groundwater
- Do not eat plants or vegetables that have come in direct contact with graywater
- Learn about where to buy graywater compatible products at centralcoastgreywater.org

All images from: https://www.google.com/search?q=green+products&source=lnms&tbm=isch&sa=X&ei=T5QoU42RNaK6yQHxwGQDA&sq=2&ved=0CAcQ_AUoAQ&biw=1920&bih=1054

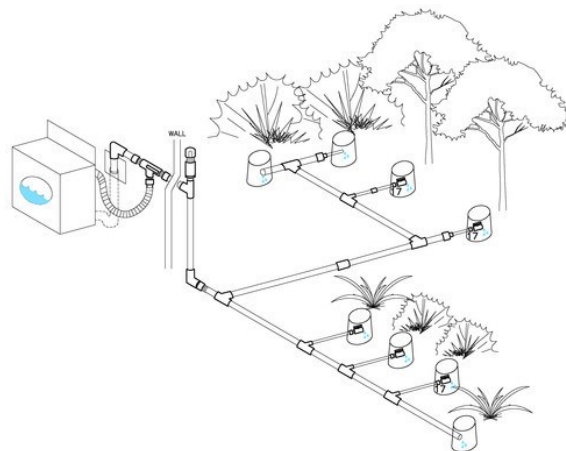
{STEP 5} Plan the Path of Travel

Irrigate the closest area to the washer that is NOT uphill. In a flat yard, distribution should be within 50 feet of the washing machine. If site slopes downward to distribution points, there is no rule on distance. It is recommended to use tubing that curves to slow gray-water flow on downhill slopes.

- Irrigate larger plants (trees, shrubs, perennials)
- Top loading machines - 12 outlets to irrigate are possible
- Front loading machines– 8 outlets to irrigate are possible

Setbacks

- 1.5 feet from buildings for drip & mulch basin irrigation
- 1.5 feet from property lines for drip & mulch basin irrigation
- 100 feet from wells, creeks and storm drains
- Not recommended for properties with high water tables



http://sustainablewatermgmt.wikia.com/wiki/Greywater_Use_in_Santa_Barbara?file=678462da2884370c17018c1156e7308a.jpg

Piping to Landscape

- Pipe around obstacles
- Try to maintain a downward slope whenever possible

Hardscape

- Go under it, around it, remove it, or cut a strip



[http://www.montereywaterinfo.org/documents/Greywater%20Challenge%202L-workshop%20\(1\)%20\[Compatibility%20Mode\].pdf](http://www.montereywaterinfo.org/documents/Greywater%20Challenge%202L-workshop%20(1)%20[Compatibility%20Mode].pdf)

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Informational Handout

March 2014

Graywater in Your Toilet?



<http://www.outreachinc.com/november-2013-beware-toilet/>

Gray-water {noun}:

Untreated wastewater from bathtubs, showers, bathroom washbasins or sinks, clothes washing machines (no diaper water!) and laundry tubs. It does not include wastewater from kitchen sinks, dishwashers or toilets.

[“Graywater” has the same meaning as “gray water”, “grey water” and “greywater”.]

The City recognizes use of graywater, as long as it is to code and used in a safe and sanitary manner.

Why in the Toilet?

- Toilet flushing accounts for 18% of residential water use in Santa Cruz... therefore enough household graywater is produced to be recovered for toilet use. If more water is required for flushing the toilets (let's say you have several visitors in your home), the potable water system will be used to make up the difference.
- The least contaminated source of graywater is the shower/bath water. Also, the shower/bath water supplies enough to meet the demand for flushing toilets (approximately 18%).
- Laundry water is the next best option, however laundry water may contain particulates and lint which clog the filters needed to clean the water before it goes into the toilet.

The use of graywater in your toilet requires a permit and must comply with the 2013 California Plumbing Code. (See Next Section)

In short, use of graywater in your toilets from the shower, bathtub, washing machine, or bathroom sink is collected and drained into a holding or storage tank, where it is filtered and disinfected. The treated water is then pumped to supply the toilets with water for flushing.

For the Purposes of this Informational Handout:

- ♦ In this section of the informational handout, all references to a “graywater system” refer to use of graywater in your toilet.
- ♦ Please reference the 2013 California Plumbing Code for the complete set of requirements.



What are the requirements?

Per the 2013 California Plumbing Code, the following requirements apply to graywater systems intended to supply uses such as toilets. *

• Plumbing Plan Submission:

A complete plumbing plan must be submitted and approved in order to obtain a permit for installation.

* [Click here for the 2013 California Plumbing Code](https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf). Or visit <https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf>. The above requirements are explained in full in the 2013 California Plumbing Code, Chapter 16.

• System Changes

No changes or connections shall be made to either the graywater system or the potable water system within a site containing the graywater system without approval from the City and clearance from Environmental Health.



http://www.huffingtonpost.com/dr-reese-halter/how-will-the-golden-state_b_458058.html

What are the requirements? [continued from page 5]



Lamb, Robert. "How Gray Water Reclamation Works" 04 April 2008. HowStuffWorks.com. <<http://science.howstuffworks.com/environmental/green-science/gray-water-reclamation.htm>> 18 March 2014.

- **Connections to Potable or Reclaimed (Recycled) Water Systems**

Graywater systems shall have no unprotected connection to a potable water supply or reclaimed (recycled) water source system. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided the makeup water supply is protected by an air gap of some sort which prevents backflow in accordance with the 2013 California Plumbing Code.

- **Initial Cross-Connection Test**

An initial cross-connection test and inspection shall be performed on both the potable and on-site graywater systems. The potable and onsite graywater systems shall be isolated from each other and independently inspected and tested to ensure there is no cross-connection. Please reference Section 1604.12 of the 2013 California Plumbing Code.

- **Graywater System Materials-** Graywater supply and distribution system materials shall comply with the requirements of the 2013 California Plumbing Code for potable water supply and distribution systems.
- **Graywater Devices and Systems-** Devices and equipment used to treat the graywater system in order to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled by a listing agency and approved for the intended application.
- **Graywater System Color and Marking Information-** Graywater systems shall have a colored background and marking information in accordance with Section 601.2 of the 2013 California Plumbing Code.
- **Valves-** Valves, except fixture supply control valves, shall be equipped with a locking feature.
- **Listing Terms and Installation Instructions-** Graywater systems shall be installed in accordance with the terms of its listing and the manufacturer's installation instructions.
- **Minimum Water Quality-** Graywater supplied to toilets shall be disinfected. Acceptable disinfection methods shall include chlorination, ultraviolet sterilization, ozone, or other methods as approved by the Authority Having Jurisdiction.
- **Deactivation and Drainage-** Graywater systems and the potable water system within the building shall be provided with the required appurtenances (e.g., valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for a cross-connection test in accordance with Section 1604.12.2 of the 2013 California Plumbing Code.
- **Near Underground Potable Water Pipe-** Graywater pipes shall be permitted to be run or laid in the same trench as potable water pipes with a 12 inch minimum vertical and horizontal separation where both pipe materials are approved for use within a building. Where piping materials do not meet this requirement the minimum separation shall be increased to 60 inches. The potable water piping shall be installed at an elevation above the graywater piping.
- **Required Filters-** A filter permitting the passage of particulates no larger than 100 microns shall be provided for on-site treated nonpotable graywater supplied to toilets.
- **Signs-** Signs in buildings using graywater shall be installed in restrooms using graywater in their toilets and shall contain the following text: "TO CONSERVE WATER, THIS BUILDING USES ON-SITE TREATED NONPOTABLE GRAYWATER TO FLUSH TOILETS AND URINALS".
- **Inspection and Testing-** Systems shall be inspected and tested in accordance with the code and/or as required by the Authority Having Jurisdiction.
- **Sizing-** Graywater piping shall be sized in accordance with Section 610.0 of the 2013 California Plumbing Code.



This concept is widely used internationally but there is not yet a tested and approved system like this in California.

<http://sustainability.stackexchange.com/questions/71/switching-to-toilet-sink-combo>

RAINWATER



Informational Handout

March 2014

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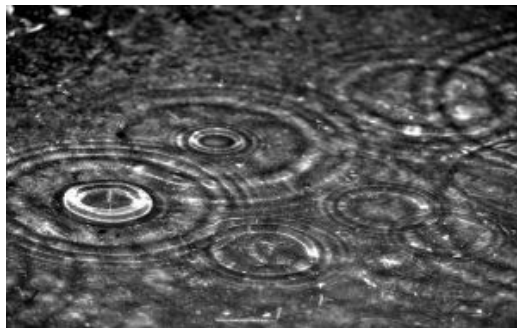
For the Purposes of this Informational Handout:

- ◆ Please reference the 2013 California Plumbing Code for the complete set of requirements.



March 2014 DRAFT

The Uses of Rainwater



<http://sitiluna.wordpress.com/2011/11/23/raindrops/>

Permits are required for all Rainwater Systems, **EXCEPT** if:

- The rainwater harvesting system is used only for *outdoor, non-spray irrigation*; and
- The catchment system has a *maximum storage capacity of 5000* gallons where the tank is supported *directly upon grade*; and
- The ratio of the height to diameter or width does not exceed 2 to 1; and
- The catchment system does not require electrical power or a makeup water supply connection.

A Permit is **REQUIRED** if:

- The harvesting system has a storage capacity greater than 5000 gallons.
- The harvesting system is intended to supply indoor uses such as water closets, urinals or clothes washers.

The Requirements (please reference the 2013 California Plumbing Code* for the full set of requirements):

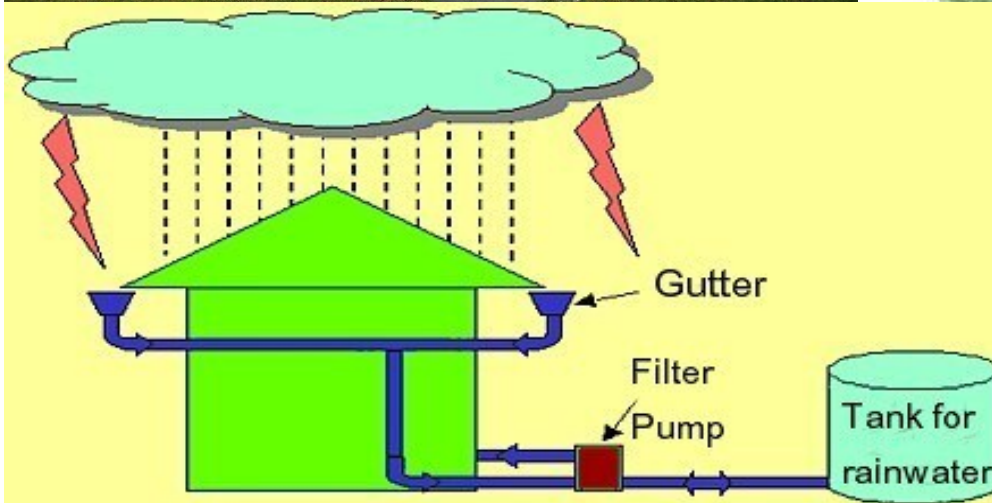
- **Connections to Potable or Reclaimed Water Systems-** Rainwater catchment systems shall have no unprotected connection to an alternate water source system. Potable or reclaimed water is permitted as makeup water provided the connection is protected by an air gap or reduced pressure principle backflow preventer.

- **Initial Cross- Connection Test-** Where a portion of a rainwater catchment system is installed within a building, a cross-connection test is required.
- **Sizing-** Rainwater catchment system distribution piping for indoor applications shall be sized as outlined in the Code*.
- **Rainwater Catchment System Materials-** Rainwater catchment water supply and distribution materials, drainage systems including gutters, downspouts, conductors and leaders, and storage tanks shall comply with the Code*.
- **Rainwater Catchment System Color and Marking-** Rainwater catchment systems shall have a colored background and shall be marked "CAUTION: NONPOTABLE RAINWATER WATER, DO NOT DRINK." as outlined in the Code*.
- **Deactivation and Drainage for Cross- Connection Test-** The rainwater catchment system and the potable water system within the building shall allow for deactivation or drainage as required for a cross-connection test.
- **Collection Surfaces-** Rainwater shall be collected from roof surfaces, or other manmade, above ground impervious collection surfaces. Other sources of water shall comply with the water quality requirements for on-site treated nonpotable graywater as outlined in Section 1604.0 of the Code*.
- **Minimum Water Quality-** The minimum water quality for harvested rainwater shall meet the applicable water quality requirements for the intended applications.
- **Rainwater Storage Tanks-** Shall be constructed and installed in accordance with Section 1702.9.5.1 through Section 1702.9.5.8 of the Code*.

* [Click here for the 2013 California Plumbing Code](#). Or visit <https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf>. The above requirements are explained in full in the 2013 California Plumbing Code, Chapter 17.

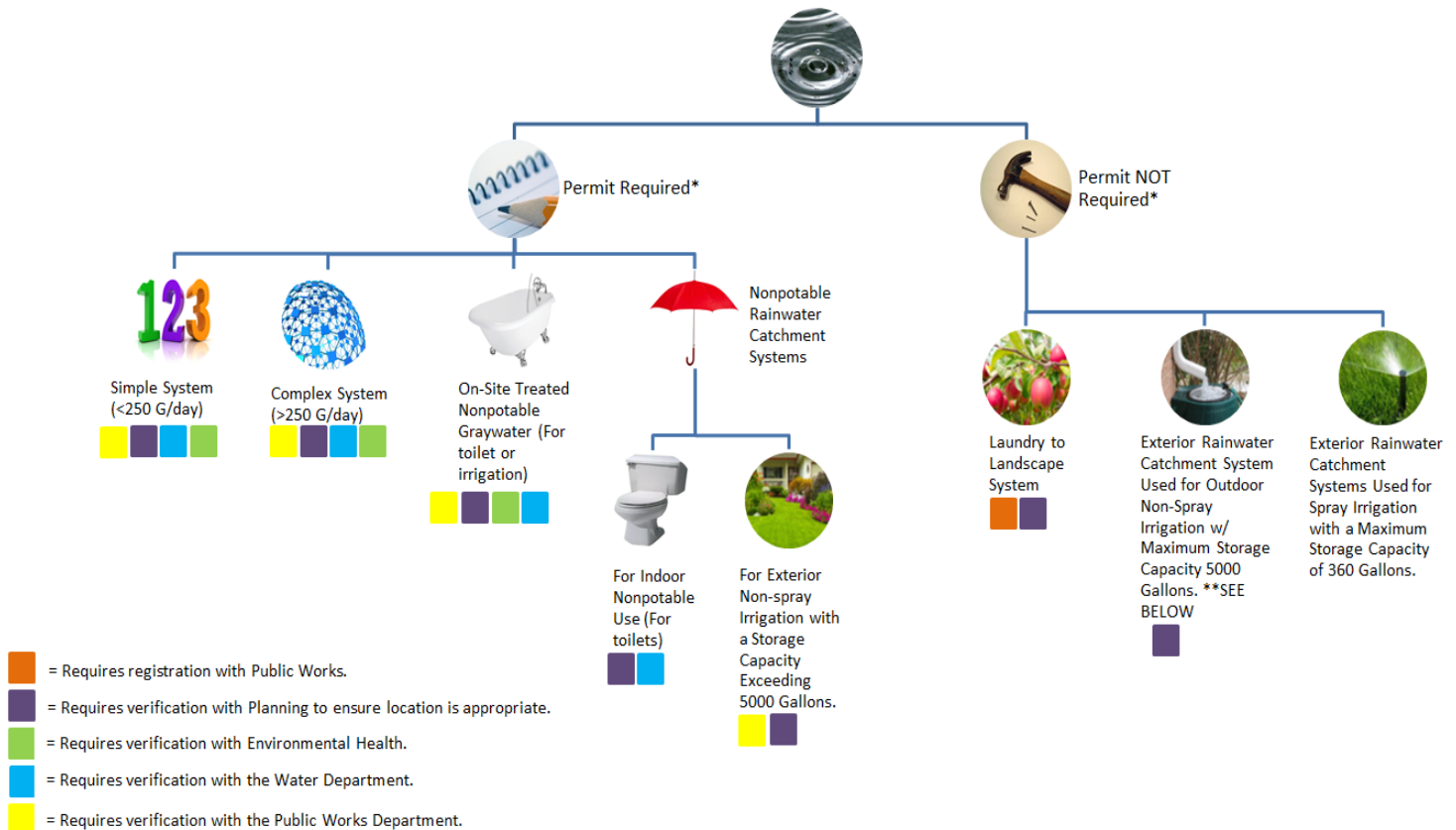
What are the requirements? [continued from page 7]

- **Pumps**— Pumps serving rainwater catchment systems shall be listed and in compliance with the Section 1702.9.6 of the Code*.
- **Water Quality Devices and Equipment**- Devices and equipment used to treat rainwater to maintain the minimum water quality requirements shall be listed.
- **Freeze Protection**— Tanks and piping installed in locations subject to freezing shall be provided with an approved means of freeze protection.
- **Debris Removal**— The rainwater catchment conveyance system shall be equipped with a debris excluder or other approved means to prevent the accumulation of leaves, needles, or other debris & sediment from entering the storage tank.
- **Required Filters**— A filter permitting the passage of particulates not larger than 100 microns shall be provided for rainwater supplied to water closets, urinals, trap primers, and drip irrigation systems.
- **Signs**— Signs in buildings using rainwater water shall be labeled in accordance with the Code*.
- **Inspection and Testing**— Rainwater catchment systems shall be inspected and tested in accordance with the Code*.
- **Vector Control**— sealing the water off from rodents and mosquitos.



* [Click here for the 2013 California Plumbing Code](https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf). Or visit <https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf>. The above requirements are explained in full in the 2013 California Plumbing Code, Chapter 17.

The Process



* Please reference the 2013 California Plumbing Code for the full requirements of the Code.

**Where the tank is supported directly upon grade and the ratio of height to diameter or width does not exceed 2 to 1 and it does not require electrical power or a makeup water supply connection.

Steps...

1. A clearance from Environmental Health is required for exterior graywater irrigation. If this is a system you are installing, visit Environmental Health before coming to the Planning or Building Department. If a clearance from Environmental Health is not required, proceed to step 2.
2. Once clearance has been granted from Environmental Health (or if it is not required), meet with Planning to make sure that setbacks/ location are acceptable.
3. Once Planning requirements are met, you are ready to apply for a Building permit for construction. If Environmental Health clearance is required, bring in three sets of *approved Environmental Health plans* (if Environmental Health is not required, three sets are still required to apply for a building permit).

Contact Information

Department	Phone Number	Email
Public Works	(831) 420-5160 (831) 420-5248	swolfman@cityofsantacruz.com
Building	(831) 420-5120 (831) 420-5124	jgervasoni@cityofsantacruz.com kamoore@cityofsantacruz.com
Environmental Health	(831) 454-2022	env.hlth@co.santa-cruz.ca.us
Planning	(831) 420-5416	planningcounter@cityofsantacruz.com
Water	(831) 420-5173	jsegal@cityofsantacruz.com

City of Santa Cruz

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Public Counter Hours: Monday– Thursday,
7:30 AM– Noon.

www.cityofsantacruz.com