

Alabama Cooperative Extension System

Auburn University

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Introduction

Students at the Auburn University College of Architecture, Design, and Construction's Rural Studio complete a senior design project before graduating. One of the current projects is for students to design and build a home for \$20,000 (20K). The 20K Project, along with the Front Porch Initiative, is a long-term Auburn University project to develop a prototype for rural affordable housing. One of the design options is to lower monthly utility bills that include water use. An Auburn University Architecture senior design group, the 20Kv22 team, first contacted, Dr. Eve Brantley, State Water Resources Specialists, for guidance. She directed the team to Home Grounds Regional Extension Agent, Rhonda Britton, who has extensive experience with rainwater harvesting for in-home use.

Rhonda provided help with designing a working rainwater harvesting system used to flush toilets in the home. Design considerations include sizing the tank, a first flush diverter, float switch, pressure switch, shallow well jet pump, solenoid, check valve, and gutters (figure 1). The design process started in the summer of 2018 and the students finished the rainwater harvesting installation at the prototype 20K house in the fall of 2019. Lessons learned in this project include the importance of extension collaboration with the university they represent and the experience as the students begin their careers.

Purpose and Description

The Rural Studio is a unique project based in Newbern in Hale County, Alabama. The purpose of the 20K homes is to make affordable housing with a beautiful design while making the homes energy efficient and allowing the home owner to save money on monthly utility bills. The concept of 20K was started in 2004 and continues to build affordable housing with the help of Auburn University Architecture students.

The first goal was to design a home that a contractor could build for \$20,000. The group developed this number based on a 30-year mortgage that was based on a person living on social security or limited income. The monthly utilities cost to live in a 20K was assumed to be \$100 per month. Their hope: an affordable house for everyone.

Auburn Architecture students design and construct the 20K home and come up with innovative ways to cut monthly cost. The 20Kv22 team (Sarah Curry, Chelsea Elcott, Kenny Fallon, and Michael Kelly) contacted Dr. Eve Brantley on June 19, 2018 inquiring about using a residential greywater system for their design. Dr. Brantley directed the students to Rhonda Britton to help the students with their design. After looking over the design, Rhonda suggested installing a rain catchment system to flush the toilet in the new home. A budget of \$800 was given and Rhonda designed the system to be installed in the home (figure 2).



Figure 1 - Completed home with rainwater harvesting system installed.

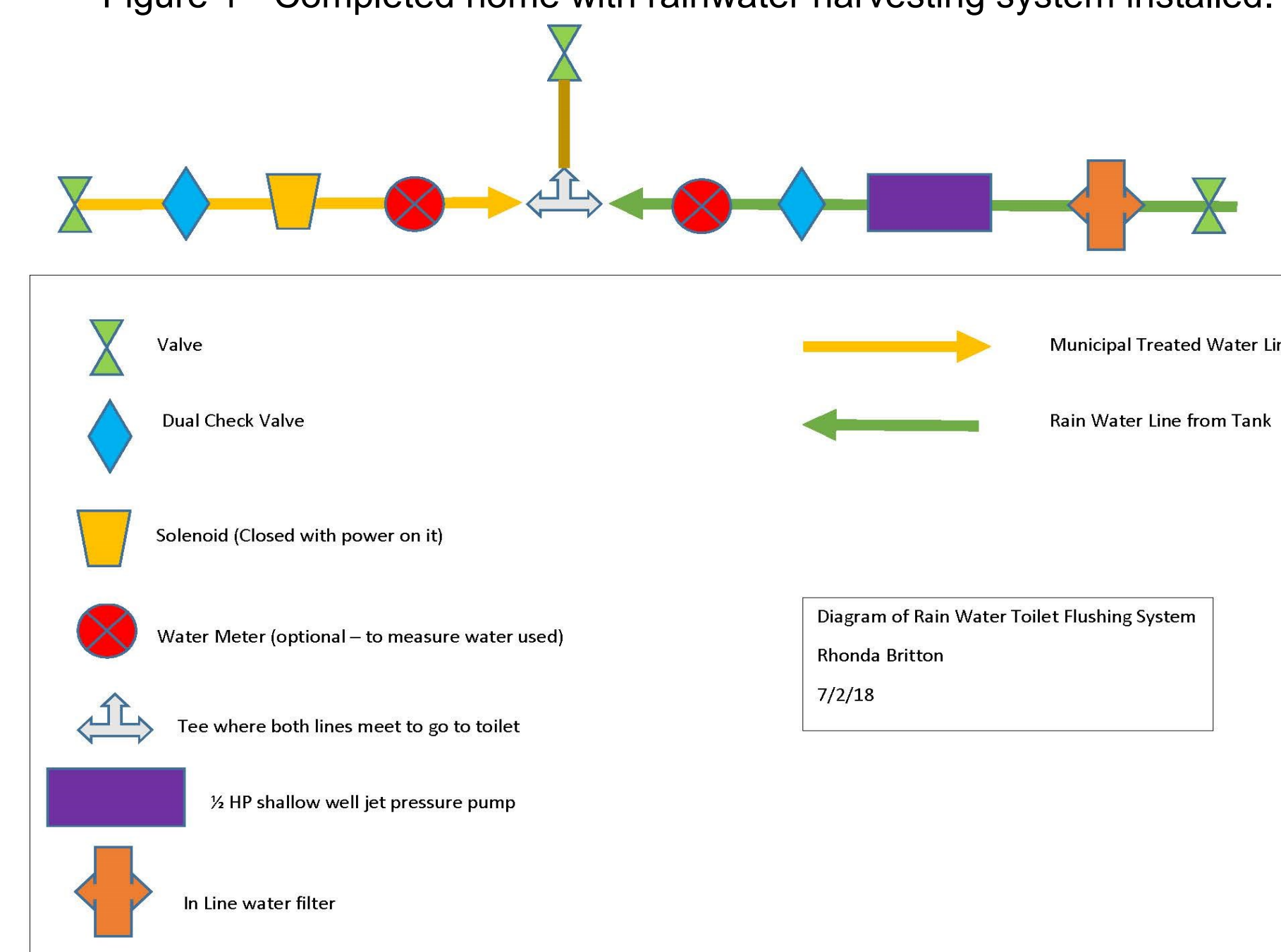


Figure 2- Design of rainwater harvesting system used to flush the toilet in the home.



Figure 3 - Completed pump and filter system.

Results

A 600 gallon rain catchment tank/cistern was installed on half of the total roof area equaling 460 square feet in the winter on 2019 and completed during the spring of 2019. Construction of the home was delayed because of weather. The students moved into the home for four months from April to the end of July. Based on rainfall from the Auburn University Mesonet located in neighboring Perry County. The rain catchment system was able to harvest approximately 3633 gallons of water based on 12.74 inches of total rainfall from April through July, 2019.

The average municipal water cost for Hale County is \$31.68 for 0 - 2000 gallons and the additional cost of \$8 per additional 1000 gallons used.

The household on average will house 2 people. Based on the use of a 1.5 gallon toilet. An estimated 12 gallons per day will be saved using rain water to flush the toilets. Water will only cost the homeowner \$380.16 per year because they will be using approximately 360 gallons of rainwater to offset their 2000 gallons of municipal water (figure 3). The rainwater can also be used to supplement water use outdoors for a garden and other outdoor uses (figure 4).



Figure 4 - Installed rain catchment tank.

References

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<http://www.halecountywater.com/rates/>
<http://ruralstudio.org/project/20k-daves-revised-home/>
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