



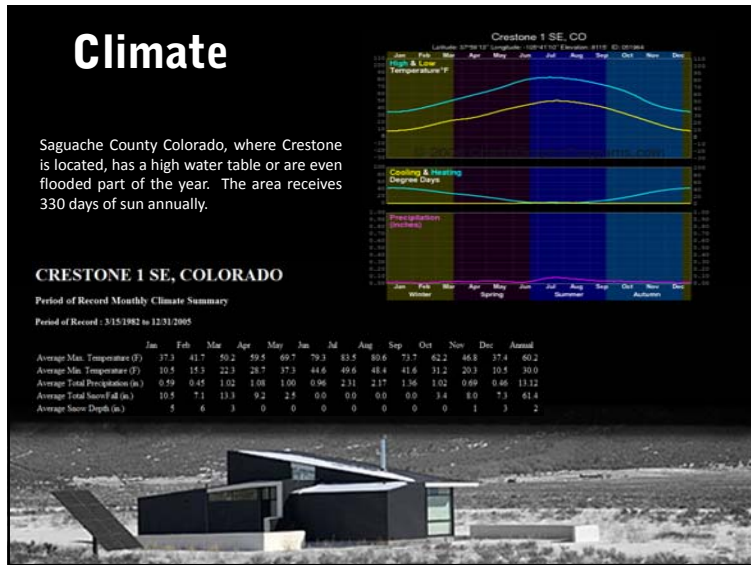
Site & Building: Water Use

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The San Luis Valley is an extensive alpine valley in the states of Colorado and New Mexico covering approximately 8,000 square miles (21,000 km²) and sitting at an average elevation of 7,500 feet (2,300 m) above sea level. The valley sits atop the Rio Grande Rift and is drained to the south by the Rio Grande River, which rises in the San Juan Mountains to the west of the valley and flows south into New Mexico.

Location



The Zen Garden House, built in 2007, is located in Crestone, CO and is a 1,600 sq/ft home designed by David Jay Weiner (Architect). Designed with Japanese architecture in mind and for a Japanese client, the home uses an open floor plan and connections and transitions from indoor to outdoor and vice versa.

Zen Garden House

Plans: Fixture Location

1. Entry Courtyard
2. Entry
3. Kitchen
4. Master Bedroom
5. Living Room
6. Dining/Study
7. Meditation Tatami Area
8. Zen Rock Garden
9. Terrace

Water Usage

Conventional Supply Fixture	Conventional Supply Fixture Unit		Total FU	Units WSFU
	Hot	Cold		
(1) Dishwasher	1.4	0	1.4	12
(2) Shower	3	3	4	25
(3) Sinks	1	1	1.4	36
(2) Toilets	0	2.2	2.2	19
(1) Washer	1	1	1.4	180

$GPFU = (WU)/(FU) = (300 \text{ gal/day})/(19.4) = 15.46$
 $GPF = (GPFU)(FU) = (15.46)(WSFU) = (15.46)(1.4)\text{Dishwasher} = 21.64$
 $= (15.46)(8)\text{Shower} = 123.68$
 $= (15.46)(4.2)\text{Sinks} = 64.93$
 $= (15.46)(4.4)\text{Toilets} = 68.02$
 $= (15.46)(1.4)\text{Washer} = 21.64$
Total = 299.91 gal/day

*WU – MEEB Pg 862, FU – MEEB Pg 974

Storm Water Management

Currently the natural landscape surrounding the site serves as a storm water management system in itself and with no hardscape the runoff is easily managed.

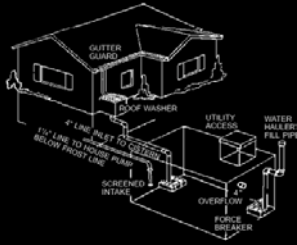
Redesign

Flat Panel Collector

Mounted on the roof, it consists of a thin, flat, rectangular box with a transparent cover that faces the sun. Small tubes run through the box and carry the fluid — either water or other fluid, such as an antifreeze solution — to be heated.

Cost : \$4,000 - \$6,000
 Payback: 4 – 10 years depending on climate and utility costs.
 Usage: 40 to 80 gallons per day.
 (Note: All figures for residential buildings.)

Water Storage: Cistern



Current Toilet usage: 68 gal/day
 (68gal) x (365days) = 24,820 gal/year
 Reduce Flow fixtures can decrease water usage 25 – 50%.
 (24,820gal) x (0.33) = 8,190.6 gallons less per year.

Rainfall: Avg. 12.97 in/year, 1.1 in/month
 *(1.1in) x (2/3) = 0.726 in/month

Dry season estimated at around 60 days.
 Cistern Capacity = (68gal) x (60days) = 4080 gallons

Cistern Volume = (4080gal) / (7.48gal/ft³) = 545.5 ft³

*For rainfall collection purposes, assume that a "dry" year will produce 2/3 the precipitation of an average year.



Paving the dirt drive and parking area with pervious paving will help filter the fluids left from cars. The pervious paving will help prevent erosion.

Pervious Paving



Fixtures: Replacements



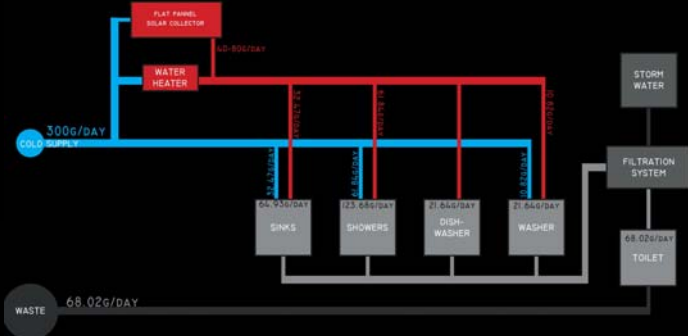
These can save you up to 70% in water usage from your shower a showerhead with an on/off valve or lather-up valve. This allows you to almost completely stop the flow to soap-up and then continue rinsing.

Ultra Low Flow Toilet – 1.6 gallons per flush.

Low-Flow Sink Aerator boosting pressure while reducing flow to 0.33 gallons per minute—significantly less than the 2.5 gallon-per-minute federal standard for lavatory faucets. Aerator can be installed for a fraction of the cost of replacing faucets, providing a cost-effective way to save both water and energy.



Redesign Water Usage



The Zen Garden House is a very small secluded home in the San Luis Valley. After finishing the assessment of the home with the current fixtures and storm water management the home has been redesigned for more efficiency of water use. The fixtures were replaced with less water consuming ones, the water heater is now assisted by a solar collector, a cistern was added to manage runoff from the roof and pervious paving was used to better filter the parking area on the site. As a result of the changes the amount of black water was reduced from 300 gallons/day to roughly 68 gallons/day. The diagrams of the current water flow and the redesigned water flow show how each of the changes effects the water system as a whole and make it more effective and efficient.

Conclusion

