

Frank Lloyd Wright's
Robie House
 Case Study #2



George Tomisser
 David Shourd
 Jim Herndon



The Robie House, located in Chicago, Illinois, is one of Frank Lloyd Wright's most famous examples of a "prairie house" design.



It was commissioned in 1906 by Frederick C. Robie, a businessman and inventor.

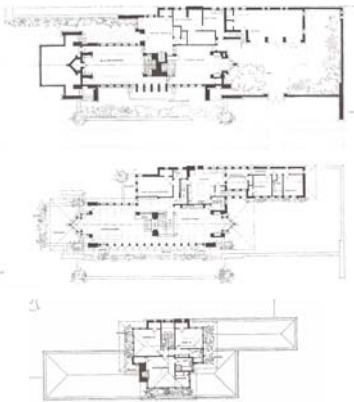


The house was completed in 1910. It was, as the client wanted: a structure with overhanging eaves, open rooms, and abundant daylight.

The Robie house consists of three long narrow floors and wide overhanging eaves that shed rainwater protecting the inhabitants.

The reason we chose the Robie was for Wright's extensive use of gutters and drain systems to deal with stormwater.

We were able to visit the site on a recent field trip where we were able to document the various ways the building's runoff system works.



1 person = 65 G/day x 5 people = 325 G/day

Fixture	#	WSFU: Cold	WSFU: Hot	WSFU: Tot.	GPFU	GPF
Sink	5	0.5	0.5	3.5	13.4	46.9
Kitchen Sink	1	1	1	1.4	13.4	18.76
Toilet	5	2.2	NA	11	13.4	147.4
Shower	1	1	1	1.4	13.4	18.76
Bath	3	1	1	4.2	13.4	55.28
Washer Machine	1	1	1	1.4	13.4	18.76
Dish Washer	1	NA	1.4	1.4	13.4	18.76
Total	17			24.3		325.62



We estimated the gallons per day from MEEB table 9.2, "planning guide for water supply" to determine the number of gallons per day that would be used per person. We then used table 10.15 "water supply fixture units" to determine the gallons used per fixture unit.

These are the conventional amounts of water that we determined the Robie House more than likely consumed when it was being used regularly as a residence and little or no consideration was given to water conservation.

Conserving Water Using Grey Water For Toilet Flushing

Fixture	#	WSFU: Cold	WSFU: Hot	WSFU: Tot.	GPFU	GPF
Sink	5	0.5	0.5	3.5	13.3	46.5
Kitchen Sink	1	1	1	1.4	13.3	18.6
Toilet	5	NA	NA	NA	NA	NA
Shower	1	1	1	1.4	13.3	18.6
Bath	3	1	1	4.2	13.3	55.86
Washer Machine	1	1	1	1.4	13.3	18.6
Dish Washer	1	NA	1.4	1.4	13.3	18.6
Total	17			13.3		174.76

These numbers in gallons per fixture represent the savings gained by reusing grey water in our toilets.

In total we were able to save 147 gallons of potable water per day.

Fixture	#	GPM	GPY	Total	GPM-prop	GPY-prop	Total	Gallons Saved
Faucet	5	2.2	17,760	85,800	0.25	3,900	19,500	66,300
Shower Head	4	2.5	18,250	73,000	1.5	10,950	43,800	29,200
				158,800			63,300	95,500

Furthermore, by utilizing further conservation methods such as low flow faucets and showerheads we were able to determine that we could save almost 100,000 gallons per year.

Stormwater Management

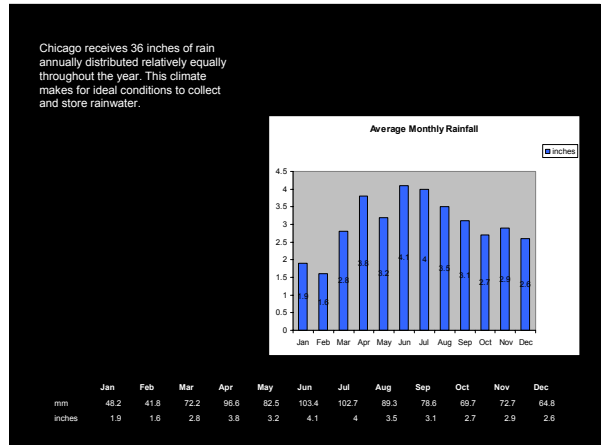
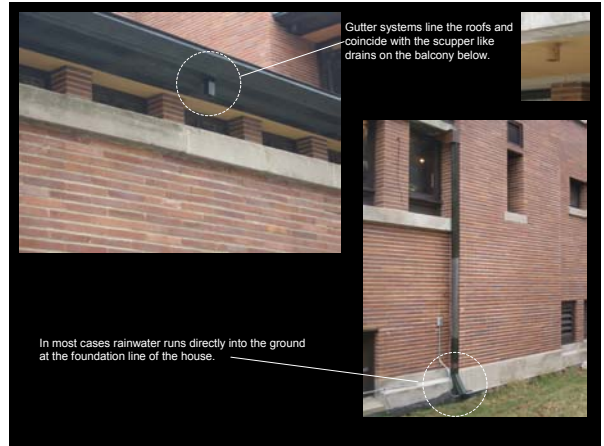
Ol' Frankie was more concerned with moving the water away from the house as opposed to conserving or making good use of the stormwater.



Larger drains allow roof water that runs off the roof and onto the patio areas to drain out into the yard.



These planters collect water and then allow it to drain but make no attempt to reuse it.



Taking into account the wide rooflines we had a very large surface area to collect rainwater as shown below.

36 inches of rain per year x 5778 sq. ft. of roof area = 29,953,152 cu. in. per year
 29,953,152 cu. in = 129,667 gallons per year
 129,667 gallons x 2/3 (evaporation losses) = 86,000 gallons per year
 86,000 gallons per year = 235 gallons per day
 Greywater needed for toilets = 147 gallons per day

5778 sq. ft.

Considering the amount of available rainwater we determined the existing planters and gutter systems illustrated earlier could be adapted to drain to a central cistern allowing us to capture the majority of rainwater falling on the roof area.

In order to size the cistern we took
 36 in. per year x 2/3 = 23.76 usable inches
 150 gallons x 30 days = 4500 gallon
 4500 gallons / 7.48 gallons per cu. ft.
 600 cu. ft. cistern
 Cistern dimensions: 5'x12'x10'

Proposed Cistern Location

Conclusion

In Summary the Robie House was designed to deal with storm water but did not tackle the issue of retention and reusing the rainwater. With a few minor modifications that do not alter the building's historic integrity we are able to divert and retain the water in an underground cistern. This tactic combined with other water conservation measures such as low flow faucets, showerheads and toilets allow us to decrease the amount of city water used making the Robie House a more environmentally friendly building.

