

SolarRoofs.com's Yuba City, California Solar Water Heating Installation for 80 Apartment Mercy Housing Rehabilitation Project

January 2002

This system consisted of 40 "Fireball 2001" Solar collectors for a total of 800 square feet and 10 Rheem 80 gallon tanks for a total of 800 gallons of solar preheat storage. The complex consisted of five two story buildings (A, B, C, D and E) with 16 apartments each and two utility buildings (1 and 2). Two systems were installed with 16 collectors feeding Utility building 1 which services buildings A and B as well as Utility building 2 which services buildings C, D and E as well as the attached laundry room. The backup consists of two dedicated Natural Gas boilers with 140 gallons of storage (Utility 1) and 280 gallons of storage (Utility 2). The solar system will significantly reduce the over \$3,000 per month gas bill the complex has been paying to heat water for all the apartments and laundry.



The picture to the left show the 16 collectors installed as 2 sets of 8 collector arrays on building A. Each set of 8 collectors is divided into two sets of 4 collectors fed by a common feed line. The Dove Gray trim color blended in beautifully with the gray roof resulting in an unobtrusive, attractive appearance. The collector installation on the two story roof was the easiest part of the job.

The picture to the right show the 24 collectors installed as 3 sets of 8 collector arrays on building D in the same way as building A. A unique feature of this installation is that the system balanced itself out with a common one inch feed and return line. This eliminated the need for extensive reverse flow plumbing in the attic to balance the flow.

Each collector should have a minimum flow of 1/3 gallon for a total minimum flow of 2.5 gallons per array. Each system had a 1/6 hp Grundfos pump with the 16 collector array producing a flow of 5.5 gallons per minute and the 24 collector array producing a flow of 9 gallons per minute.



From ground level each set of four collectors give the attractive appearance of being one sheet of glass. The unbreakable feature of the Lexan glazing was valued as a very important feature by the owners.

The solar loop was charged with food grade Propylene Glycol for complete freeze protection of the system.

Six 80 gallon tanks with wrap around heat exchangers installed in Utility 2 provided outstanding energy collection. On first startup, in just a couple of hours of operation in the afternoon, after the heavy fog cleared, the system showed a 20 degree heat exchange and raised 480 gallons of water 20 degrees on a cold winter day.

The storage tank plumbing was the most time consuming part of the job due to the need to reverse flow both the plumbing and the solar on 10 tanks. The value is the excellent heat exchange as well as availability and ease of installing the tanks. A six point digital readout was supplied and labeled to monitor operation.



Mercy Housing Solar Energy Saving Report for Park Terrace, Yuba City

Park Terrace is an 80 Apartment complex. 40 Skyline 20-01 collectors and 800 gallons of solar storage was added.

The system could be considered undersized as generally one collector per apartment would be recommended. The results are very cost effective.

Year	Total Gas Av Month	Low	High	Costs before Solar Project			Costs after Solar Installed							
				2001	2001	2001	2002	2002	2003	2003	2004	2004		
					Corrected	Corrected	Corrected	Corrected	Corrected	Corrected	Corrected	Corrected		
2001	\$ 19,272	\$ 1,606	\$ 1,607	\$ 1,607										
2002	\$ 8,908	\$ 742	\$ 363	\$ 1,500	1,707	1,606	1,501	1,400	1,400	1,317	1,217			
2003	\$ 9,652	\$ 804	\$ 367	\$ 1,400	3,092	1,606	1,333	1,233	1,233	1,517	1,417			
2004	\$ 9,501	\$ 792	\$ 422	\$ 1,417	6,669	1,606	1,310	1,210	1,210	1,242	1,142			
					3,038	1,606	1,173	1,073	1,073	788	688			
					2,265	1,606	974	874	874	680	580			
Note:	The High and Low difference averages over													
	\$1,000 demonstrating the significant													
	contribution of the solar system. Even in													
	the coldest winter days, any sun will													
	result in a reduction of the Gas bill so the													
	Highs are probably lower than they													
	would have been without solar.													
					1,842	1,606	900	817	717	922	822			
					\$23,778		\$10,843			\$10,701				
							\$8,908			\$9,652				\$9,501

This analysis is based on the following assumptions: In 2001 a dramatic gas price spike took place causing Feb, Mar and Apr to be several times higher than they would have been. Construction started taking place and apartments vacated starting in July 2001 further skewing the average. June's bill was extended through the year as it seemed to be the most average month. Se the assumption is that the gas bill was about \$20,000 year.

In Jan 2002 the apartments were still partially occupied. Gas prices saw a steady increase in prices in 2003 and 2004 which may account for some of the increase in the average yearly cost of gas. 2003 is the only year with a full 12 months of bills. Nov and Dec 2004 were extended from Oct 2004. The PG & E bill records for 2003 and 2004 were for Gas and Electric so we may assume that they are higher by about \$100 per month than 2002. With the assumed corrections, the post solar numbers track quite well. Obviously savings were greatest in the summer months and worst in Winter.

With the Rehab also came insulated hot water pipes and similar but new gas water heaters with storage tanks. Roughly, the Post Solar reduction is 50% or \$9,000. Assuming the insulation, new heaters and storage accounted for 10% or \$1,800 of this, we perhaps can safely attribute 40% or \$7,200 to solar.

This is an excellent example of the Prime contractor and the Solar contractor working together to keep costs down and the project cost effective for the Owner. For example, Brown Construction provided the permits and underground pipes during their construction process.

Conclusion: The "undersized" system is providing an excellent return on investment and perhaps part of the reason is that an undersized system works at high efficiency. Overall the system is proving to be a cost effective and attractive commercial application of solar thermal energy.