

## Conheim/Brooks 2006

### **Profile Project:**

3800 Square Ft., Approx. 25-year-old home remodeled in 1992 on a hill in La Jolla overlooking Mission Bay and the Pacific Ocean. Two Residents and a Home Business. Energy efficiency, HVAC, Roof top mounted Solar Photovoltaic

**Property:** High End Hubble Home in La Jolla



**Project Origination:** Saw Mark on The Daily Show with Jon Stewart

**Initial Response:** Performed comprehensive energy analysis

### **Recommended Actions:**

The house is a very beautiful Hubble home that overlooks the Pacific Ocean and Mission Bay. The roof orientation was south and part of the house faces west and south. The worst energy impact on the home is thermal insulation.

The windows were designed for esthetics not for minimizing thermal loads. The house has extreme thermal loading due to the orientation of windows that are south and west facing and lack shading. The overhang is not sufficient to shade the windows. Even during periods when the temperature is 70 to 75 degrees, the upstairs reaches temperatures of 85-90 degrees. It is essential that outdoor electric shades be installed to mitigate the intense thermal loading.

Second item:

There is 6' by 40' skylight east-west that traverses the hallway from the master bedroom to the living room and half of the skylight is south facing. The other north half of the skylight gets sunlight in the spring, summer, fall periods. I measured temperatures of 120 degrees inside the skylight when temperatures were 78-82 degrees outside.

I recommended a shade be placed over the skylight. However, due to code limitations on the height of the roof, the skylight is already at maximum height, so we opted to install 95% UV coating on the skylight instead.

Our recommended remediation for the heat buildup inside the house is to install a Silent Aire™ Horizontal Axis Ventilation System to induce ventilation.

I examined the main attic areas and also the attic area over the garage. When it was 78 degrees outside, the attic areas were over 100 degrees inside the attic (105-110). The living room, dining room, and kitchen are 12' vaulted ceilings.

The clients commented that at night all the rooms inside the house were hot after sunset. There is infiltration in all the upstairs rooms and in the garage. The client also commented that it is unbearable in the spring, fall, and summer. They have to air condition even during the winter when it gets above 75 degrees outside.

I noticed in the attic that tail vents had been plastered over during the remodel. I asked about roof vents as I noted that they were on the original plan, the roof vents were removed by the roofer when the house was re-roofed about 5 years ago. There was essentially no attic ventilation.

I recommended installation of attic vents to remedy this situation. High and low attic vents to replace the tail vents and to replace the ridge vents. I also recommended that power vents be installed to reduce infiltration and to induce air into the attic with power vents to help cool the home.

The garage gets very hot due to the west wall exposure and no venting.

I noted that there is infiltration due to minimal ceiling insulation. Once it gets hot heat infiltrates through the ceiling making the whole house uncomfortable.

### **Actions Taken:**

A Silent Aire™ Horizontal Axis Induced Air System was installed. Additional gable venting was added. A relief vent was installed in the garage ceiling to relieve hot air from the kitchen, living room and dining room vaulted ceilings. We had a roofer add eight roof vents to return passive circulation to the attic.

Simultaneously window shades were installed reducing the thermal loading by up to 100% from the south and west windows. 95% UV coating was installed on the skylight.

We added 6 ceiling fans throughout the house to aid air circulation due to the vaulted ceiling. Due to the lack of insulation and passive ventilation of the vaulted areas there is still considerable thermal loading.

With the Silent Aire™ System attic venting and controlling the thermal loading from the windows and skylight the temperatures are maintained now upstairs in the mid 70's. Downstairs it is very comfortable. This past summer air-conditioning was limited to 10 days during the intense heat wave when outside temperatures were in the 100's. Air conditioning will be cut by another 25% when the attic is re-insulated, the insulation is old and matted, and it needs to be increased from R-19 to R-30.

The energy analysis revealed that all appliances were circa 1992, an extremely inefficient Sub-Zero refrigerator was the worst offender, the washer and dryer had been changed to Energy Star about a year earlier. An older refrigerator in the garage was very inefficient.

Seals were leaking, the refrigerators cycled constantly. The refrigerators were changed to Energy Star, and this cut the refrigerator load by 70%.

### **Parasitic Loads:**

The client has a home office with computer, laser printer, routers and other peripherals. I performed an examination of all electronics in the office, I found that the electronics when thought to be shut off in the idle mode were drawing 120-watts, 24-hours a day, almost 90-kWh per month.

Additionally the older laser printer in standby mode went through a very strange re-heat mode for three minutes every hour drawing 750-watts during this period and 30-watts on standby mode. When I left my Kill-A-Watt watt/hour meter overnight it was found that the laser printer was drawing another 3-kWh per day or 90-kWh per month. This was more than the new Energy Star refrigerator. All the office equipment is now shut off at the plug strips.

There were six televisions and three cable boxes. Each television had a parasitic load of 20 to 45-watts. The worst was the smallest television in the guest room at 45-watts.

All the televisions were shut off and the televisions that were used daily are now on timers during the hours they are needed. The cable boxes were drawing over 50-watts each, they were placed on timers as well.

A 20-year old under counter Insta-hot water heater was discovered in the kitchen under the sink it was using 4-kWh per day. This unit was unplugged.

The client complained that there dimming florescent lights in the living room, kitchen and master bedroom valances a total of 28 4-foot T-40 T-12 fixtures made a low humming noise all the time, I checked and found that all the lights were constantly on drawing about 4-watts each 24-hours a day, even when they were off, over 3-kWh per day and 90-kWh per month.

These fixtures were changed to energy efficient T-8 dimming fluorescents and the parasitic load was eliminated. The use load was also dropped by 40%.

### **Lighting:**

There were 30 additional T-12 florescent fixtures in the bathrooms, storeroom and the garage. All these fixtures were changed out to the T-8 fixtures cutting the load by 40%.

There were R-30 and r-40 incandescent lamps in recessed lights, wall sconces and other lights indoors and outdoors. These were all changed to compact florescent, the loads were reduced by 75 to 80% throughout the house.

There were 12 low voltage light fixtures found which were changed from 50-watt to 32-watt to reduce the load.

### **Art Studio:**

The client has about a ½ acre lot with an art studio. The studio was examined and an inefficient small refrigerator was changed to an Energy Star and all the lighting that could be changed was changed to compact florescent.

### **Pool and Therapy Pool:**

The client has a pool and a therapy pool. Both pool motors were 20-years plus old; they were extremely inefficient and were oversized. The pool motor was 2-HP and was changed out to a Flotech 1-HP high E Motor. The spa was a 1-HP it was changed out to a ½-HP Flotech high E Motor. These pump loads were both dropped by 70%.

The pool circulation timer could have been reduced by 30% if the pool had a pool cover; due to its irregular form this was not possible. More regular forms are best for efficiency.

### **Water Feature:**

The client has a hillside ½ acre lot and entertains frequently, she has an artificial stream water feature that has a small pond at the bottom that holds about two thousand gallons of water and must be circulated daily to prevent algae build up. It has a 3-Hsp Flotech High E Motor that had been installed when the old pump burned out a year ago. The original installer had installed

a timer that the minimum time set was 2 hours the motor load was 12-Amps @ 240 Volts, approx. 2.8 kWh per hour, 5.6-kWh per day.

I had my water feature expert come out and meet with me. He calculated that the minimum safe circulation time to prevent algae was 15 minutes per day timed at 3-5 minute intervals to provide oxygenation and keep the water plants in the stream environment healthy.

We removed the timer and installed an electronic four event per day maximum timer. This load was dropped by 88%.

### **Main Service and Sub Panel:**

Due to the age of the home and the presence of aluminum wiring, we checked the main service and sub panel and found loose aluminum wire, several of which were showing signs of arcing.

Pulling the circuit breakers we found signs of arcing and wear. We cleaned all the bussing and replaced several circuit breakers. We find that these types of conditions are wasting 2 to 3-kWh per day, due to the resistance heating, 90-kWh per month, enough to run a large refrigerator.

### **Water:**

The Client has done a great job with water. She has almost all California native plantings and is very conscientious with their water usage.

### **Summary:**

We had dropped the overall load for the home from 3800 kWh to 1200 kWh annual average. We were ready for Solar PV; we installed a 6-kWh PV system.

The customer still can save by insulating, which she is planning on doing and she can save by changing some of her lighting to LED. She has a hybrid Toyota Highlander that she wants to convert to a plug-in. She will add another 1-kWh of Solar if needed to accommodate the plug-in Hybrid.

Presently she is at Net Zero or very close annually.