

Marshall and Katrina Jones  
Any Avenue  
Santa Rosa, Ca.  
95404  
8.20.2010



## Basic Overview

This house is located on the south side of Pacific Avenue, is a single story dwelling built post- WWII. The floor plan was originally a 2-1. The house has undergone at least two remodels, one was the addition of a third room off the front of the house, and the second has involved several upgrades overseen by the current owners, drywall, insulation, new flooring, and vinyl double pane windows. The house's footprint is about 1200 sq ft. and has 8 ft ceilings throughout. The foundation is a rim, with post and pier. The floor is uninsulated. The attic is vented with eyebrow vents and insulated with fiberglass batts about 4" thick. The homeowners mentioned no health concerns, and had little to no comfort issues with the home, but were interested in the efficiency of their home's envelope and the ducting systems. The ducting system was redone around 1992, with the installation of a new air handler and A/C unit. Mr. Jones had expressed interest in the level of quality of the installation he had received.

The weather was cool for this test about 67 degrees and overcast. We performed the duct test first in hopes it would warm up considerably outside in lieu of turning on the heating system. Consequently, the infrared spectrometry may have suffered from the low temperature gradient from inside and outside the house.

## Ducting System

The home's heating and air system is an overhead system located in the attic with horizontal draft. The handler had sufficient access to it through the gable, a catwalk was in place and the handler sat on its own platform. The evaporative cooler's drip pan was in good shape, with drain in place and no major rust issues. The system had been sealed with fiber backed duct tape, which showed deterioration of its adhesive qualities, especially nearer to the heat exchanger. The ducts themselves met the plenums and register boots with rigid pipe connectors, and fiber backed duct tape. The output BTU for the furnace is 35,000. and the A/ C is a 3 ton unit. I calculated the ducting output at about 1200 cubic feet/ minute, using the A/ C unit's tonnage x 400 cfm/ton. The actual output is probably less, as factors such as ducting design and the static pressure of the system will greatly affect the flow rates, but for these tests we will assume a perfect flow rate. At 25 pascals, the ducts had a leakage of 144cfm. This projected a leakage rate of 12%. This figure was within the leakage rate for an existing ducting systems HERS rating. Mr Jones and I discussed the prospects for sealing his system and very briefly went over a few of the remediation techniques. After several small examples had been completed, the system tested at 92cfm, bringing his leakage down to about 8%. I am confident that with a thorough sealing these ducts can be brought down to 2% or less. To facilitate this Mr. Jones requested a duct fogging to pinpoint the exact leakage locations. Several areas were revealed, most notably at the return register. This return leak warranted immediate attention, as a system leaking from the return side is pulling in air from the area surrounding the leak into his house. (In this case, the attic which had fiberglass, and showed a small degree of rodent activity.)

## Building Envelope

The house's volume was calculated at approximately 9600 cubic feet. When depressurized to -50 pa, the leakage rate for the home was over 1914cfm. The Building Airflow Standard for a structure of this size and location calculated out to about 1204cfm at -50 pa. This would reflect an Air Changes per Hour (ACH) of 35%/ total volume. This number suggested there was substantial room for improvement and opportunity to seal the house. (Approximately 710cfm) The current leakage rate of this house was .55 ACH. Every hour over half the volume

of conditioned air in the house was exchanged through infiltration and ex-filtration. Mr. Jones was extremely interested in this and requested the infrared spectrometry to again pinpoint exact leakage locations. A walk through of each room detected leakage around the window trim, door trim, baseboards, and through the walls. The bathroom window had yet to be changed out to a new window, and leaked excessively. The kitchen yielded opportunity for sealing the recessed lights, a vent hole below the refrigerator, and the lack of a backdraft damper for the stove's down draft vent.

## **Conclusion**

The tests performed yielded results slightly higher than the national averages for building and duct leakage and subsequent inefficiencies. I am confident the with the knowledge gained through the testing and the pinpointing of leakage, Mr. Jones will be able to bring his house into an even more efficient state