Case Study

Family Room Renovation
3br family home, Melbourne

In a Nutshell

With time and budget constraints we often renovate just one room at a time. This case study looks at a family room renovation where the key changes were upgrading the windows, installing insulation and adding an outdoor area.

The property is a brick veneer single story home; the family room is oriented south west and looks over a lovely large garden. This case study shows that even with inappropriate orientation, home improvements can be cost efficient, thermally efficient and offer significant comfort level improvements. The case study is detailed in the following pages; this 1st page provides a brief overview.

The Renovation in Brief

The primary problems with the family room were that the windows were old, rotted and drafty, ceiling insulation was patchy and inefficient and there was no outdoor living area. Gas bills for heating the home were also high. The key changes made during this family room renovation were:

- Replacement of windows with efficient double glazed windows that were low maintenance. Window heights were raised to give more natural light.
- Removing one old window, a brick pillar (obstructing views to the rear yard) and an old sliding door and replacing them with one large (7.5 meter) double glazed sliding door. Door height was also raised for increasing natural light
- Upgrading insulation in the ceiling to R3.5 level throughout.
- Sealing gaps in the ceiling, around doors and windows to stop air leakage.
- Installed a door to close off other areas of the home from the family area.
- Removing the old collapsing pergola outside the family room door, replacing it with a 9m x 7m paved and roofed area.

The Findings

The family room is now full of natural light and is the most consistently comfortable room in the house all year round; cost savings on gas heating bills are detailed below. Figures taken from gas bills, costs and savings calculated.

	Cost before reno	Cost after reno	Difference
Gas bill per day	**404 MJ** **$7.07**	**183 MJ** **$3.20**	221 MJ $3.87 per day
Gas bill for winter (covers 5 months)	**60,600 MJ** **$1,060.50**	**27,450 MJ** **$ 480.00**	33,150 MJ **$ 580.5 pa**
Winter cost savings over 5 years	**$ 5,302.50**	**$ 2,400.00**	Saving of **$ 2,902.50**

Read the following pages for further information on this renovation.

Case Study
Continued…

Family room upgrade
Case study from 2012 – impacts remain relevant, just cost savings that change.

The home owner had previously renovated the rear of the home into a family room which incorporates the kitchen, dining and a TV/lounge area. Although insulation had been installed into the family room walls and part of the ceiling during earlier works in 2005, cost constraints prevented the final changes being completed until 20010/20011. This case study examines the difference window changes, insulation and the addition of an outdoor living area have made.

The orientation of the home meant that passive heating and cooling opportunities were minimal. The owners have made the best of the homes other attributes.

Overview:
The home is a single storey, 3 bedroom, brick veneer home, approximately 40 years old, in Bayside, South East Melbourne. The living areas are oriented to the rear which is south west facing, with the bedrooms and office to the front (north east facing). The roof is tiled, there was old 'blow in' insulation in the ceiling. Windows and doors were single glazed, wooden framed and did not seal well against the door frames. In the family room the external walls and 1 internal shared wall has been previously insulated. There were no window coverings as the owner wanted to see the garden and get natural light into the room.

There was an old pergola full of wood rot outside the family room door and window area (about 1.5m wide) with no shading and dark bricks on the ground. The sun streamed in during summer making the family room very hot and uncomfortable to live in, it was very cold and drafty during winter. The floor ducted heating system is an internal gas fired system approximately 40 years old (and is serviced every 2 years).

The owners commented "This is the room the family spends the most time in. We wanted it to be comfortable without having to have the heating on all winter to keep warm. The gas bills were also high and we wanted to reduce the costs". The other issue was summer. During the summer months the room was almost un-bearable due to excessive heat. The home is not air conditioned and did not have ceiling fans.

The gas bills from winter:
- The gas usage for heating (before changes) 404 MJ per day (2007 winter)
- Cost for winter heating was $7.07 per day or $1060.50 over the 5 months.

Case Study

Continued…

The Renovation:
The focus was on making the family room more comfortable in winter, increasing the views to the rear garden and building an outdoor entertainment area off the family room. This would not only provide an outdoor space for summer but would also protect the family room from the sun while allowing natural light in all year round.

The key changes were:

- Replacement of family room windows with efficient double glazed windows that were low maintenance. Window heights were raised at the same time.
- Removing one old window, a brick pillar (obstructing views to the rear yard) and an old sliding door and replacing with one large double glazed sliding door. Door height raised at the same time
- Installing insulation in the ceiling to R3.5 level throughout
- Sealing gaps in the ceiling, around doors and windows to stop air leakage.
- Adding an internal door to close off the room from hall and other areas.
- Removing the old pergola outside the family room door, replacing it with a 9m x 7m paved and roofed area with additional shading for summer months from drop down blinds.

The windows are powder coated aluminum framed, double glazed and sourced from Rylock Windows. The large double glazed sliding door (7.5m) was too large for domestic suppliers so it was sourced from a commercial provider. Window coverings are internal roller blinds and are for privacy, there is no thermal benefit from roller blinds. External block out blinds have been installed on the 2 east facing windows to keep sun off the glass on the hotter summer mornings.

Due to down lights in the family room, the insulation was not as effective as it should have been because it had to be at least 200mm away from the fitting. This meant that there were lots of ‘holes’ in the ceiling where the down lights were. Instead of removing and replacing the down lights, they were downgraded from 50w to 35w halogens. The change in light levels was unnoticeable. This removed the high fire risk of the 50w globes, which get to around 300 degrees C in the ceiling and are a major cause of house fires. The 35w globes only get hot to 80 degrees C and are much safer. If this was done after 2015 LED would have been used instead of halogen (do not use halogens now).

The ceiling was then insulated to R3.5 levels and down light mitts installed over the down lights in the ceiling space. This removed the ‘chimneys’ in the ceiling and reduced the loss of heat in winter while giving better protection from heat gain in summer.

Draft proofing was applied to the older doors and windows throughout remaining areas of the house. This has helped to reduce drafts and heating requirements.

Case Study
Continued…

An energy efficient reverse cycle air-conditioner/heater was installed in the family room for extreme weather conditions. The same 40 year old gas central heating unit remains unchanged and continues to be serviced every two years.

Remote control stand by power cutoff switches have also been installed on entertainment equipment and are actively used.

Outside the immediate family room area an outdoor living area was created. A 9m x 7m area was paved and a roof structure erected to provide shade and protection from the elements. The paving selected was light in color to help reflect heat in summer. Drop down shade blinds have also been installed to the west facing side of the external roof and can be dropped down during summer to provide additional shade to both the family room and the external living area when the sun gets low in the afternoons.

The Results:
The family room is now the most consistently comfortable room in the house all year round. The large amount of natural light minimizes the need for artificial lighting and the outlook onto the outdoor entertaining area and garden is lovely.

In winter the family has the gas central heating on for 3 hours in the morning and 6 hours in the evening. Once the house is up to temperature the heater does not cut in as often as it used to which has reduced the load on the system. During the day the heating does not need to be turned back on, even in the coldest of winter days (to date), when the family room is closed off from the rest of the house (via the hallway door) it remains up to 6 degrees warmer than the rest of the home. The only difference is the insulation and double glazing!

In summer the family room remains significantly cooler as it is not getting the direct sun on to the glass, or absorbing heat reflecting off dark paving back into the room. Shading has controlled the heat problem very effectively. On those really hot days of 35 degrees upwards, the room is closed up and the blinds dropped. The room generally maintains a temperature of at least 6 degrees cooler than the outside. A pedestal fan is used for additional cooling and air flow on the rare occasion it's needed.

The reverse cycle unit that was installed has been used 3 times in 2 years, and then only for an hour each time. Probably not worth the cost of putting it in but the room has proven to be so efficient it has not been required.

The additional cost of the extra 'green' items (things that would not otherwise have been done) were:

Case Study

Continued…

- Double glazing of windows and doors in family room. This added 1/3 extra to the cost, so windows/doors combined were an additional $5000 than if basic single glazed windows (which were $10,000) had been installed.
- Insulation was obtained via the rebate program so cost only $790 and included the insulation, draft stoppers on vents, down light mitt covers and installation.
- Draft proofing was a DIY job and the seals cost about $80 in total.

In total the 'energy efficiency' upgrades added $5,870 to the total cost. Given the whole renovation cost was in the region of $95,000 (mostly being the build of the outdoor entertainment area), this was a minor increase of approximately 5%.

The gas bills from winter 2010:

- Gas usage for heating after renovation 183 MJ per day (2010 winter)
- Cost for winter heating is $3.20 per day or $480 over the 5 months
- **Total savings of $580.50 per year on the gas bills from 2006 (before the renovation).** This does not take into account the opportunity costs saved by not having to run heating during winter days because the room remains comfortable and warm. Given the owners work from home most of the time this is a significant but unquantifiable saving.

Since 2006 the owner has saved over $2902.50 in gas bill charges. Not to mention the additional benefit of the consistent comfort of the home remaining several degrees warmer inside in winter, and cooler in summer.

Comparison table

	In 2006	In 2010	Difference
Gas bill per day	**404 MJ** **$7.07**	**183 MJ** **$3.20**	221 MJ $3.87 per day
Gas bill each winter	**60,600 MJ** **$1,060.50**	**27,450 MJ** **$ 480.00**	33,150 MJ **$ 580.5 pa**
Greenhouse gas (GHG)	**162.05 kg per day** **24,307.5 per winter**	**73.35 kg per day** **11,002.50 per winter**	88.7 kg ghg 13,305 kg ghg per winter
Electricity charges	**11.5 kWh per day**	**9 kWh per day**	2.5kWh
Winter cost savings over 5 years	**$ 5,302.50**	**$ 2,400.00**	Saving of **$ 2,902.50**

Figures for gas usage are from actual readings off the Gas bills for the period May to September 2006 and 2010. Due to bill estimations, usage was averaged out over the 5 months to provide an average daily usage figure. Costs based on current pricing of 0.0175 cents per MJ.

Case Study

Continued…

To recoup the additional $5,870 in additional costs would take about 7 year's of gas bill savings, taking into account the expected annual increase in gas pricing, but not taking into account the opportunity cost savings.

The owners have made their home more cost efficient, significantly reduced the greenhouse gasses it produces and made the home more comfortable.

The heating costs have reduced by more than 55% per year.

This case study goes to show that even with inappropriate orientation; a home can be cost efficient, thermally efficient and offer significant comfort levels without breaking the bank.

If you would like further information on this case study please contact us at contact@greenmoves.com.au

Abbreviations used:
GHG = Green House Gas
pa = per annum
pd = per day
pp = per person
mj = mega joules (gas measurement)
kw = kilo watt (electricity measurement)