Raising the bar on home renovations

House 3 – Californian bungalow (1920s)

Typical Californian bungalow style house - single storey, weatherboard, north facing

- Period 1920s
- Existing house energy rating - **2 Stars**
- Floor area - 100m^2
- Allotment area - 200m^2

Design brief for proposed renovation – double storey addition and internal refurbishment

(Refer to Figure 1 – Californian bungalow style, existing floor plan)

- Overall, the design seeks a balance between achieving good passive design and the re-use/ retention of existing structure. Northern access to southern living areas created by new roof form and maximising clerestory windows. Improving Comfort and Liveability while reducing Running Costs Minimise heating/cooling requirement.
- Good thermal comfort, optimal daylight, cross ventilation, good connection with indoors and outdoors.

Demolition works

- Demolish back of house lean-to (kitchen, WC, laundry)
- Front façade to remain intact.

Addition of new floor area and re allocation of existing space - Ground floor

- Add new open plan meals/living/kitchen
- Add new laundry
- Add new bathroom and toilet
- Create an ensuite and robes for an existing bedroom and turn into a master bedroom
- Add outdoor deck area
- Add carport
- Redesign and reallocate internal space as required.

Addition of new floor area - new first floor

- New bedroom
- New study
- New bathroom
- New play/rumpus/lounge/landing area

Indicative Budget

- Project budget around $300,000+ **(note: this is a rough guide only and not based on comprehensive cost estimates)**

Existing floor plan

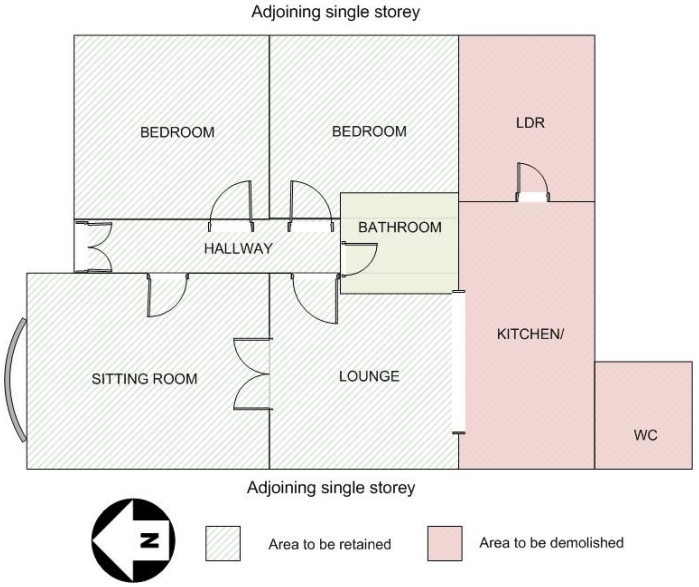

Figure 1: Californian bungalow style, existing floor plan

Proposed floor plan

Figure 2 is the proposed floor plan for the renovation. The numbers correspond to the list design features.

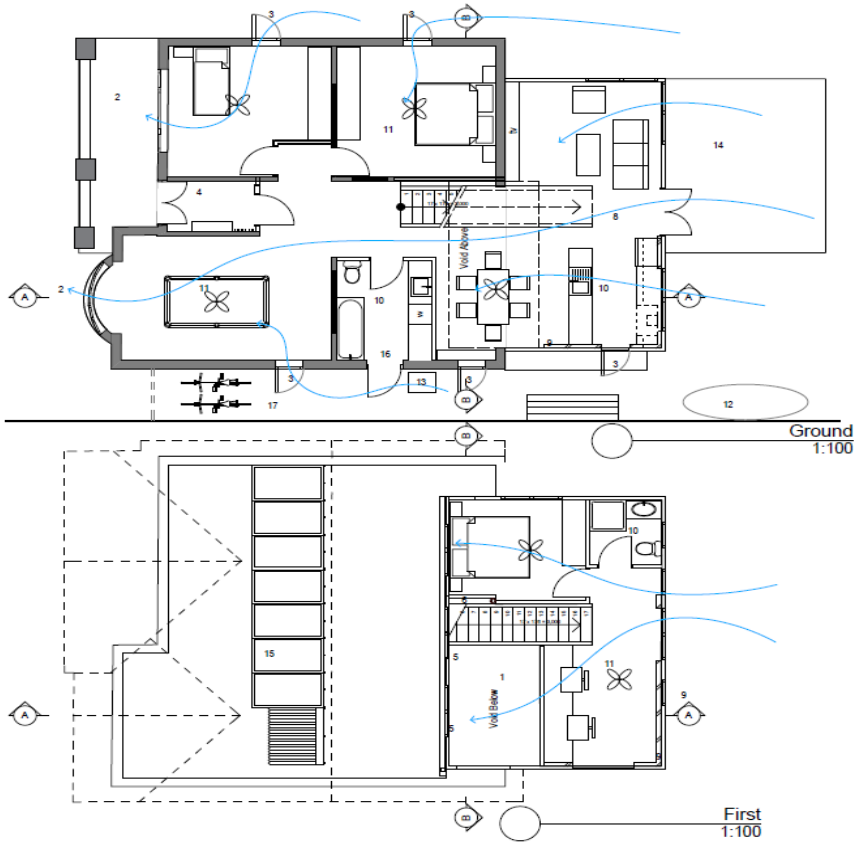

Figure 2: Proposed floor plans (top - ground floor, bottom - first floor)

Design features

1. New extension uses roof form similar to the original house, and is oriented to allow **maximum glazing to the north** by upper storey gable end. The use of a void/atrium with northern windows allows sunlight and solar heat gain to be achievable in belly of the lower floor, deep into the southern rooms. New living areas (living, dining, and kitchen) on the ground level gain heat and light from the solar access. Separate rumpus is allocated to existing front north room.

2. Where practicable, existing north eaves to be adjusted according to **45% rule** (45% of height of sill to bottom of eave), to shade out summer sun.

3. Existing window sashes **changed to casement** opening to enable the scooping of passing wind particularly on east and west walls. **Windows placed** to facilitate prevailing southerly breezes (Melbourne) to flow through living spaces in summer. Larger windows **opening on the downwind side** to encourage breeze into the house.

4. Airlock to the frequently used front door, to **minimise air leakage** in winter. Security door would enable ventilation through them on summer night for night purging.

5. **Clerestory windows** bring direct sunlight to ground level southern rooms by way of an "atrium: (void between upper and lower floor), and reflective internal wall. **Eaves sized** to allow in winter sun (29º for Melbourne winter solstice), but to shade out summer sun.

6. Double-storey increases the **thermal stack/chimney effect.** Air/heat transfer by way of an in-line fan taking in air through vent in the uppermost part of the top storey, down to the lower section of the bottom floor. This will combat the thermal stack effect in winter.

7. In summer, **ventilation of hot air** is allowed out of the upper storey by way of motorised clerestory windows. This is critical also for night purging purposes.

8. Concrete (polished or tiled) to the new extension area with 60% replacement content and recycled steel, **provides internal mass** to stabilise temperature. Ventilation to allow night purging is essential for areas with thermal mass. Potential **addition of thermal mass** by way of internal brick walls.

9. If budget allows, the proposed design may fare well with a suspended concrete slab on the upper floor. This will potentially help reduce cooling requirement in summer for the upper storey, as well as **provide temperature stability** to the upstairs.

10. **Utility and wet areas grouped close together** to minimise hot water pipe run. Similarly, the collection of grey water is made easier. Saves energy and water and is more cost effective for plumbing. Where the water points are too far apart, a thermostat-controlled valve, (for example, the Redwater Valve) can be installed direct "cooled" hot water to rainwater tank until the new hot water comes through.

11. **Ceiling fans** for additional cooling in the living and sleeping areas. In winter, it can be used on slow speed to put hot air down from the ceiling.

12. **100% rainwater from roof** can be collected via a charged system and plumbed to flush toilets, and to supply cold laundry tap and garden tap.

13. **Grey water diverter** collecting from washing machine, laundry trough, bathroom shower and vanity is diverted to sub-surface irrigation, ideal for fruit trees, etc.

14. **Recycled decking** for alfresco dining ideal entertaining area with connection to backyard.

15. **Location of solar hot water and photovoltaic panels**.

16. Easy access to the backyard & clotheslines from the laundry facilitates clothesline use, reducing the reliance on tumble-drying.

17. Secure covered bike area with quick and easy access to encourage use.

18. Star rating of the proposed design is 7.4 stars.

General insulation notes

Floor Insulation for Existing Structure:

- If subfloor access is available, consider R2.0 batts stapled between floor joists.
- If no subfloor access & floorboards have a lot of gaps, consider new floor (e.g. bamboo) to overlay existing on underlay or rigid foam.
- If polished floorboards are in good condition, caulk any gaps that may exist between floorboard and skirting board.

Wall insulation

- New walls - R2.5 batts and vapour permeable reflective foil
- Existing walls – consider using blown in foam or other suitable product which gives equivalent to R2.5 insulation

Ceiling insulation

- Existing ceiling - R4.0 in roof space
- New - R1.5 foil-backed blanked under metal roof sheet and R3.5 batts between rafters.

General notes for windows

- New windows - choose double-glazed low emissivity argon-filled 12mm air gap.
- Existing windows - secondary double glazing if in good condition, or replace window when budget allows.

Also note

The reconditioned floor area approx. 30m^2; new extension area approx. 31.5m^2 downstairs; 42 m^2 upstairs. The next step to perfect the energy performance of the house is to interrogate the elements (such as glazing area, wall type/ thermal mass) within NatHERS energy rating software.

Further Improvements:

Further improvement options to the house energy rating were also looked at. Below are the actions trailed and the energy rating improvements.

Base Design: 7.4stars 81.2Mj/m^2

Action Trailed	New Score
Increase insulation to subfloor from R2.0 to R3.0	7.4stars 79.0Mj/m^2
Increase insulation to Roof from R4.0 batts to R6.0 batts (Note, purlins may need to be upsided to fit R6.0 in flat framed construction.)	7.6stars 74.4Mj/m^2
Increase wall insulation to new walls from R2.5 batts to R2.7	7.7stars 72.8Mj/m^2
Change all non-Reverse Brick Veneer new external Kitchen/Living walls to Reverse Brick Veneer	7.7stars 71.5Mj/m^2
Make tiles on slab extension to the Kitchen/Living area dark	7.9stars 66.2Mj/m^2
Remove the front veranda in front of northernmost bedroom and replace with a 900 wide eave (though this has obvious aesthetic effects there is some thermal benefit)	7.9stars 63.8Mj/m^2

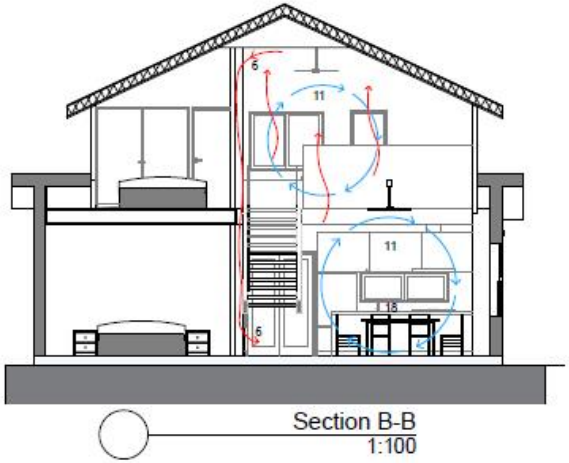

Figure 3: Section shows ventilation flow and thermal stack effect

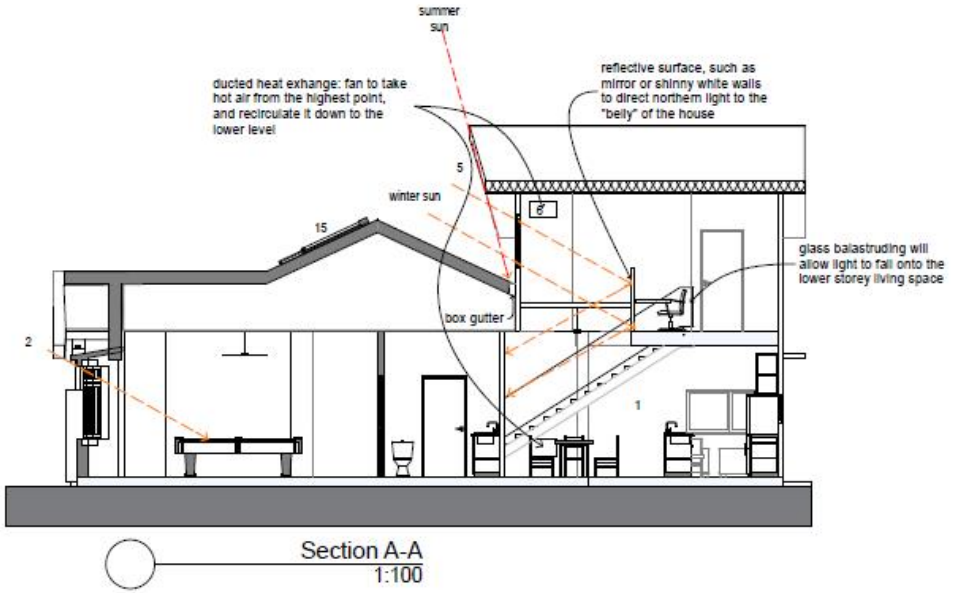

Figure 4: Section daylighting and shading

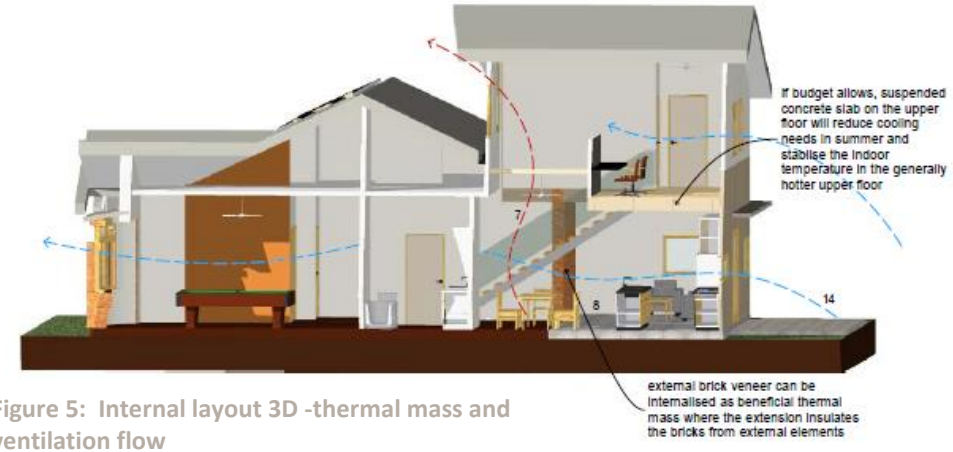

Figure 5: Internal layout 3D -thermal mass and ventilation flow

Figure 6: Elevations