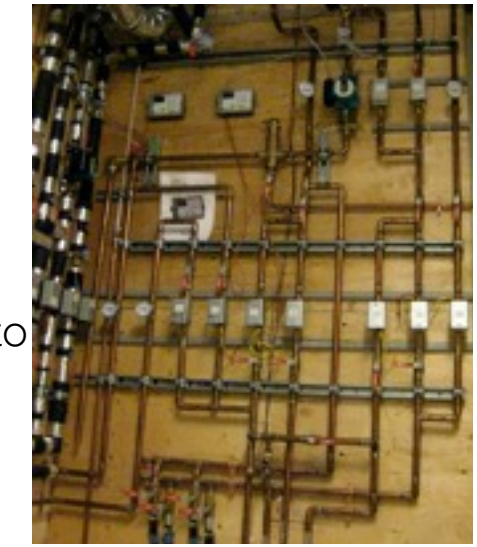
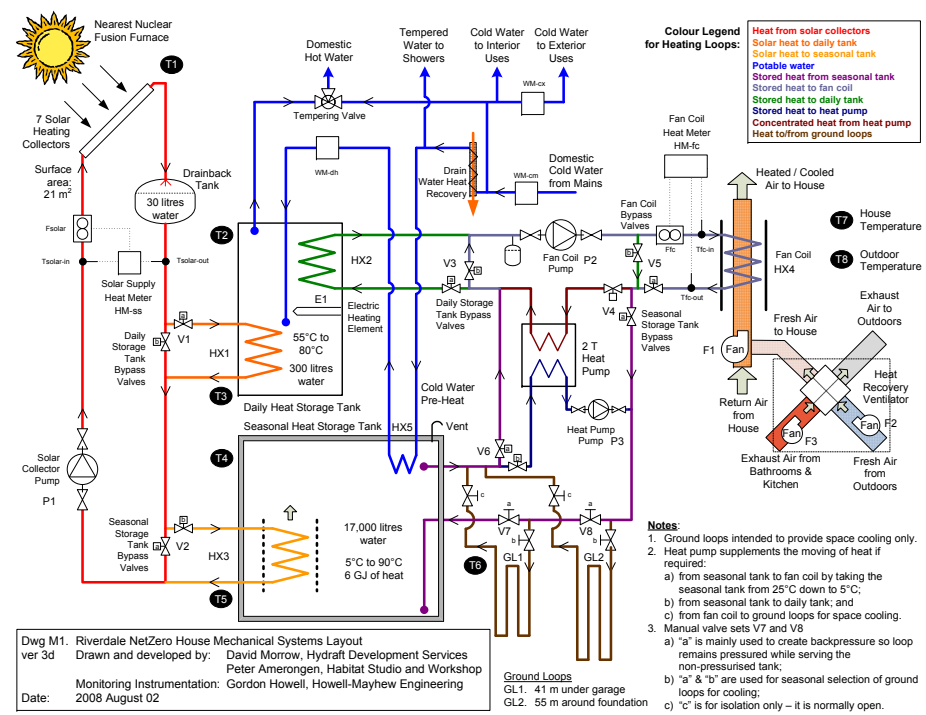
Mechanical Systems

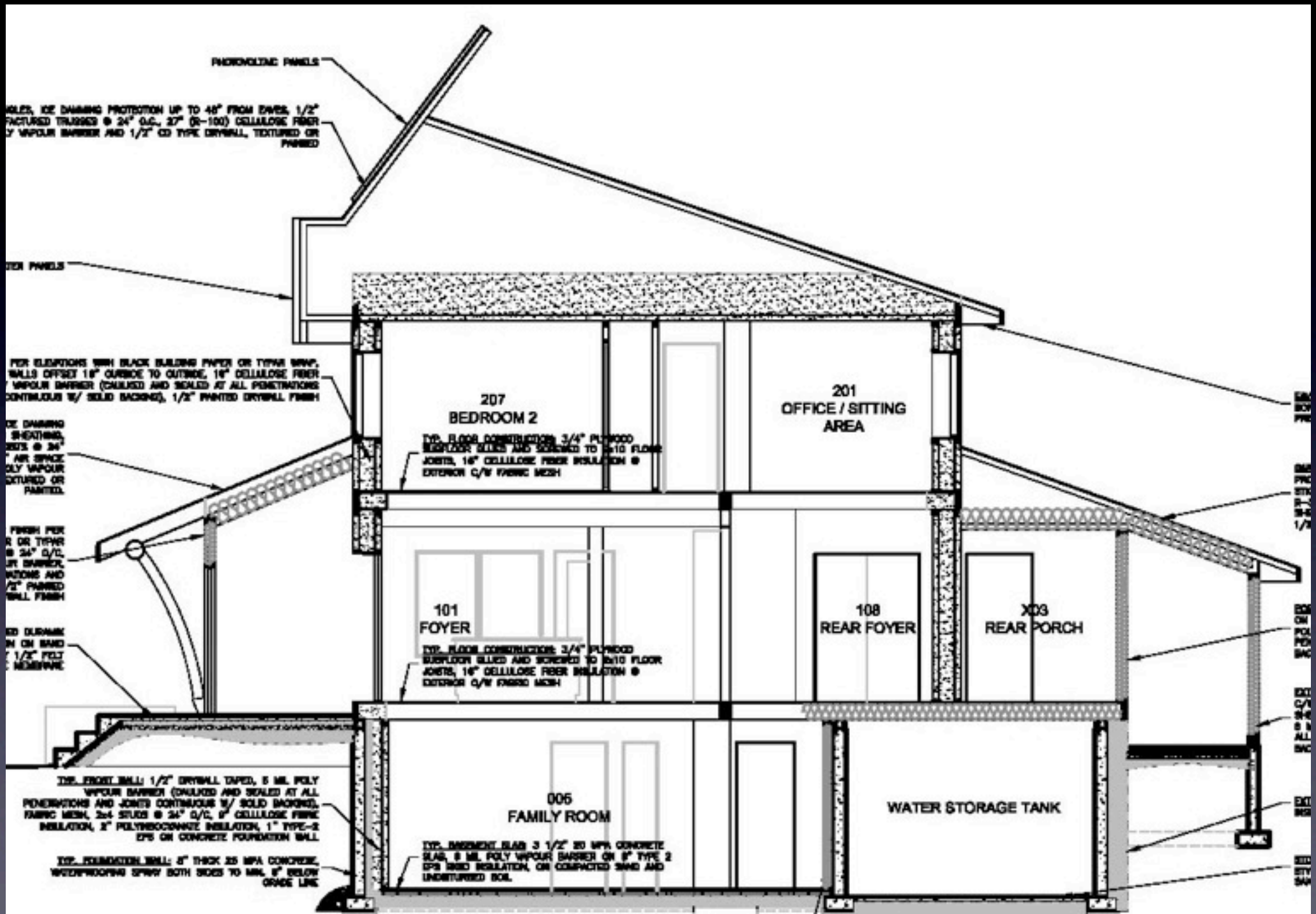
Riverdale Solar Thermal

- designed to provide 75% of space heat
- designed to provide 94% of domestic hot water
- 17000 litre storage tank, thermally isolated and insulated to R50(RSI 8.8)
- Vertical installation for maximum winter collection
- Very complicated
- Incremental cost ~ $50000 per unit

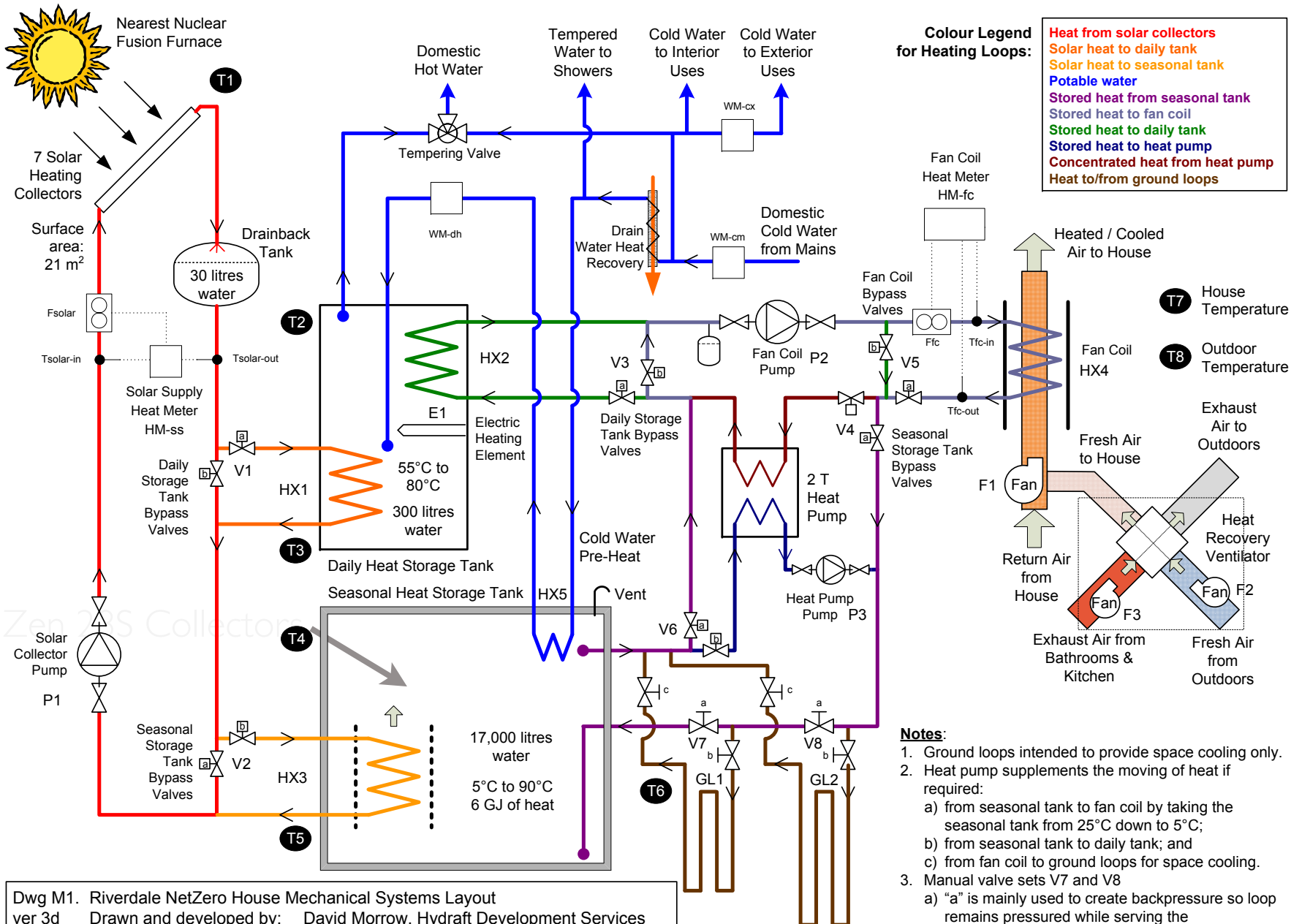




Riverdale NZ Heating Schematic



Saturday, April 16, 2011



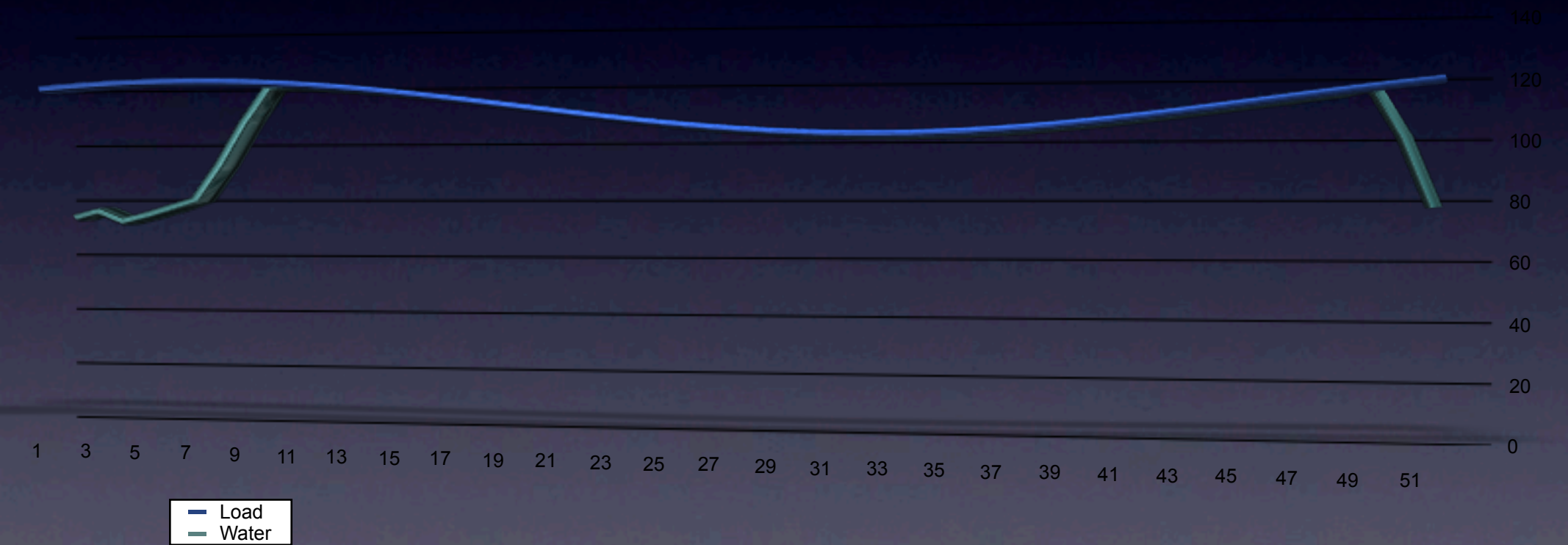
Riverdale NZ Heating Schematic

Problems with the Riverdale Solar Thermal System

- Freezing events- failure to drain back
- Problems with tank leaks
- Too much heat loss from storage tank even though it is insulated to R50. Cannot store enough heat in fall to meet winter load.
- Difficult to program, commission, and trouble shoot.
- Very expensive installation cost, will also be expensive to maintain. More expensive per useful kWh of heat than PV
- Risky- significant risk of water and vapour leakage.
- Oversized- too much capacity in summer, not enough for winter.
- Heat loss from summer collection and tank loss tends to over heat the house

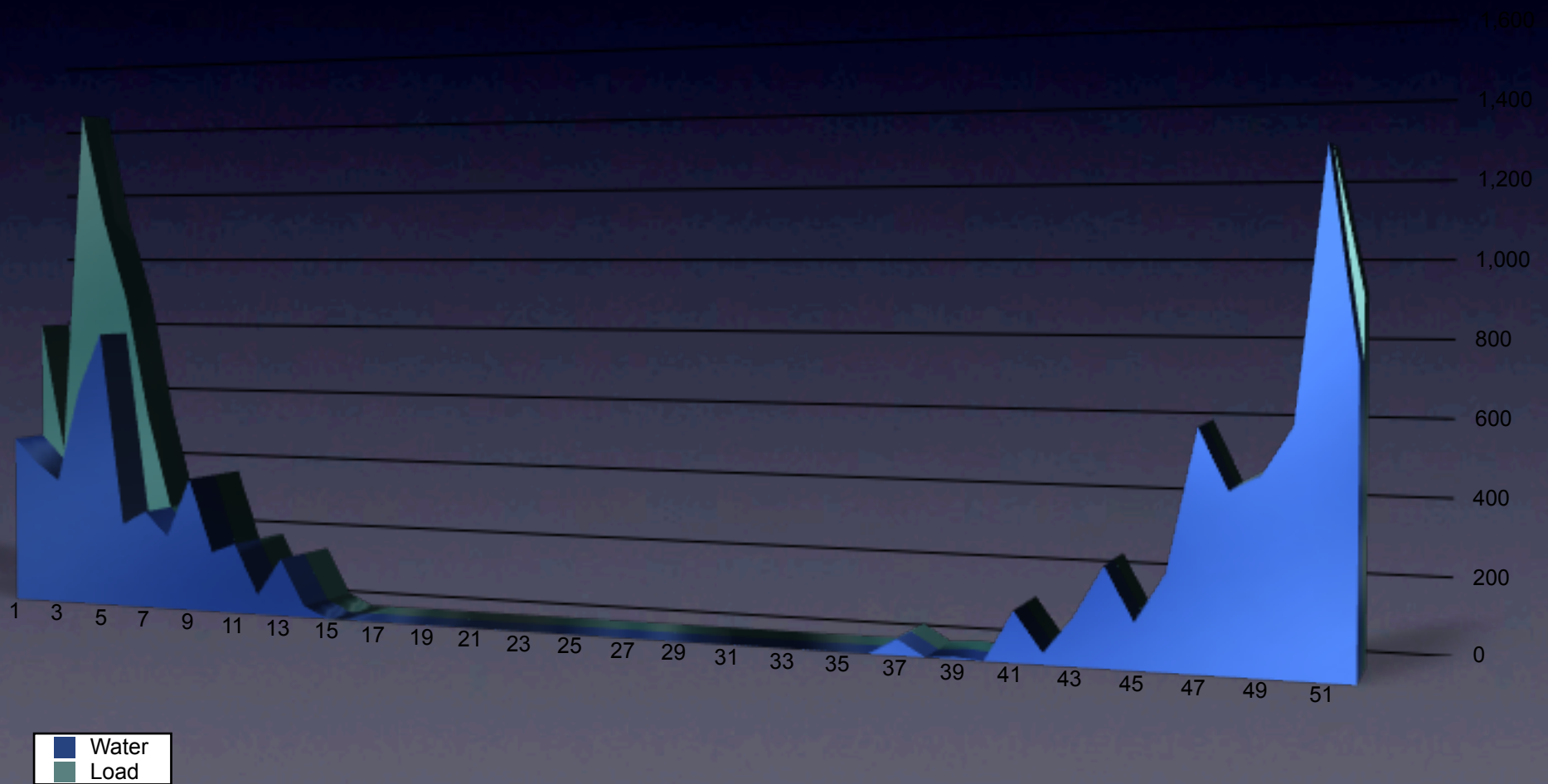
Domestic Hot Water

- 1505 kWh per year
- Solar fraction = 94%



Space Heating

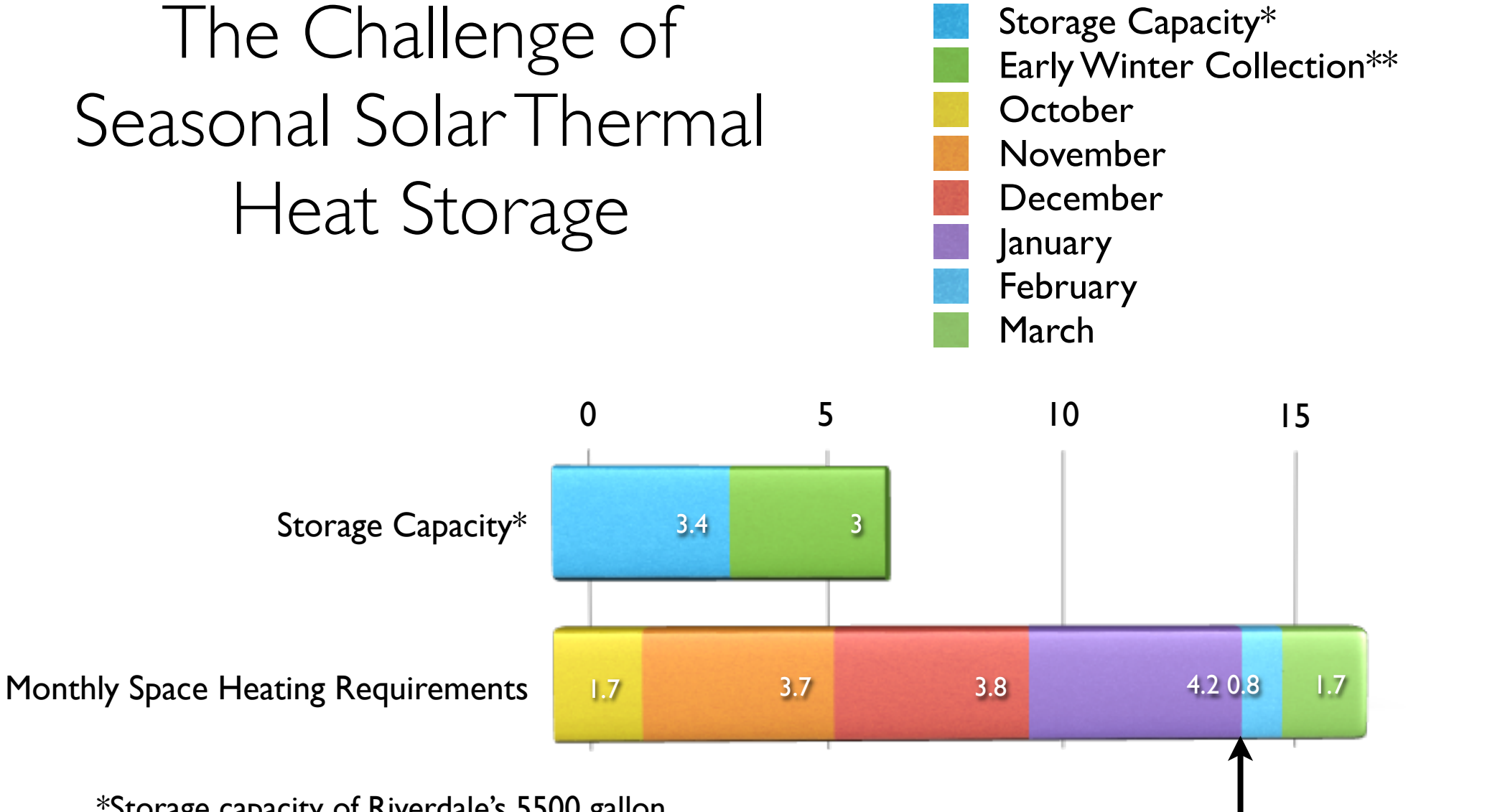
- 2627 kWh per year
- Solar fraction = 75%



What we learned

- Small Solar Domestic Hot water preheat systems are a good investment
- When we need it most solar heat is least available.
- Keep it simple
- The a good building envelope allows you to simplify the mechanical systems so that the savings in the mechanical system helps to pay for the envelope upgrades
- Electricity is easier to manage than water

The Challenge of Seasonal Solar Thermal Heat Storage



*Storage capacity of Riverdale's 5500 gallon (equivalent) tank with a temperature difference of 90 degrees F

** A rough and somewhat optimistic prediction of Solar thermal collection between early October and the end of January

Monthly Heating Energy

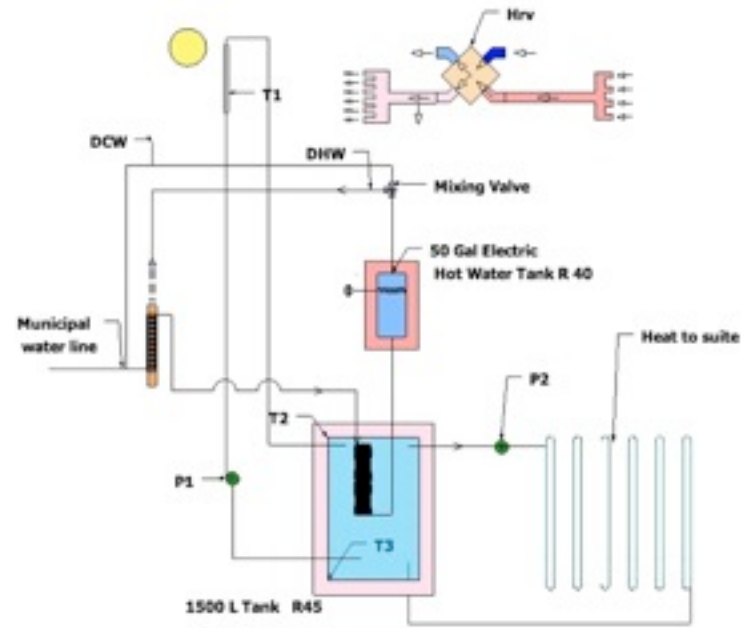
MONTHLY ENERGY PROFILE

Month	Energy Load (/m3)	Internal Gains (/m3)	Solar Gains (/m3)	Aux. Energy (/m3)
Jan	7.7	0.9	2.5	4.2
Feb	6.1	0.8	4.5	0.8
Mar	6.0	0.9	3.4	1.7
Apr	4.3	0.9	2.9	0.5
May	3.0	0.9	1.6	0.4
Jun	2.0	0.9	0.8	0.3
Jul	1.7	0.8	0.6	0.3
Aug	1.9	0.9	0.8	0.2
Sep	2.7	0.9	1.5	0.3
Oct	4.6	1.0	2.2	1.4
Nov	6.2	0.9	1.5	3.8
Dec	7.5	0.9	2.9	3.7
Ann	53.7	10.9	25.1	17.7

Net heating required from Solar Thermal or PV

Mill Creek Solar Thermal

- Very simple control system
- Site built 1500 litre R40 storage
- Small amount of shoulder season space heat for basement suite
- 2 Collector DWH systems make good sense



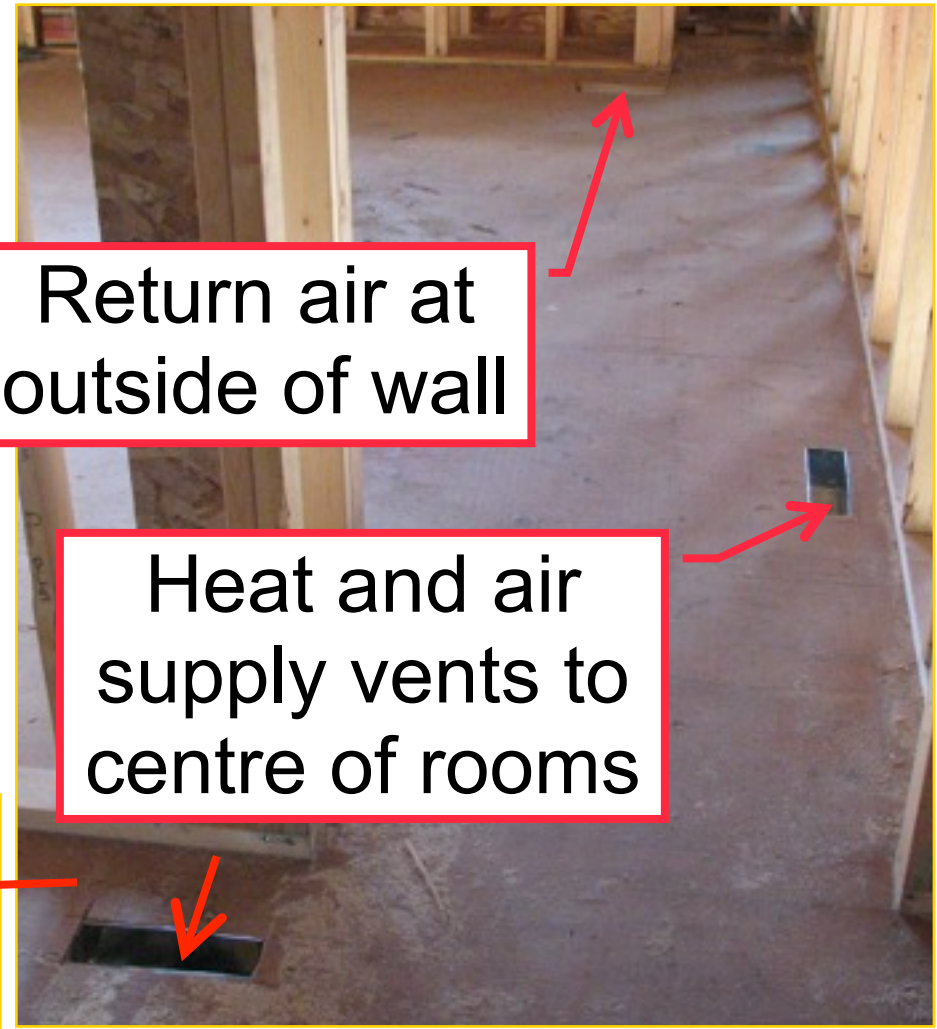
Mill Creek NZ heating Schematic

Mill Creek Heating, Ventilation and Domestic Hot Water

- Electric baseboard heat
- Electric hot water tank in R40 enclosure
- Fully ducted HRV

Riverdale Space Heat

- Forced air - BLDC powered fan coil
- "Gravity" ducting
- Return air uses framing cavities



- Can do this because the walls and windows have high R-values and minimal heat is required

Parkland Space Heat

- Infloor tubing fired by and electric boiler
- Will attempt to move heat from the sunny south area to the colder north areas of the house
- 2 Lifebreath HRVs

Windsor Park Space Heat

Geothermal Collection and Distribution

- 4 - 200' deep bored holes
- 3 ton (36000BTU) water to water heat pump with a COP of 3 or better.
- Installed cost of $28000.
- Net energy yield of 6700 kWh/ year

- Forced air fan coil and ducting sized to deliver design the heat load at 95°F
- In floor heating in the basement, the kitchen and the bathrooms
-

HRV s

- Locate unit as close as possible to intake and exhaust hoods. Heat loss from these ducts reduces efficiency.
- Ductwork should be carefully designed and installed for efficient air flow
- ECM motors allow allow educe fan speed and better efficiency

- Select for highest heat recovery efficiency and lowest electrical use.
- Control module is important too

Better HRV s

- Efficient Heat recovery combined with Brushless DC motors is best.
- Preheating incoming air stream to avoid the defrost cycle is possible in warmer climates.

riverdalenetzero.ca

greenedmonton.ca/MillCreekNetZeroHome

habitat-studio.com