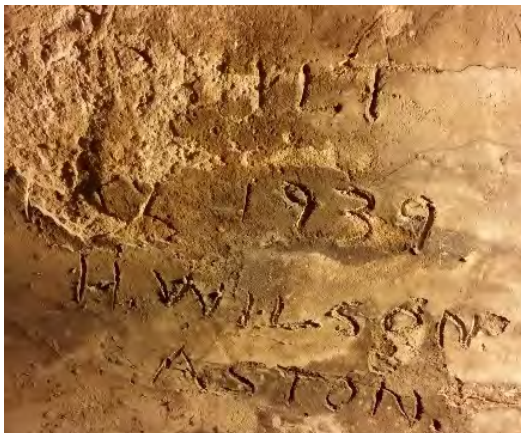
Middle Ollerbrook Cottage



Middle Ollerbrook Cottage is the end terrace of a row of farmworkers cottages. There was a major re work around the 1930s and the structure is very sound and well built. The walls are solid gritstone about 600mm thick and the roof is tiled with gritstone. The upper rooms extend into the pitched roof by about 500mm and there is a crawl space beneath the ground floors – one half of which is easily accessible, the other is very limited and hard to access without removing floorboards. The only insulation was glass wool in the loft and hessian pipe wrap.

Air Source Heat Pump (ASHP)

To take advantage of the government's renewable heat incentive (RHI) we looked into a couple of options for an ASHP to replace the oil fired Stanley range. Greener Living in Sheffield offered a complete service including application for the RHI for £14,000. Grant, for which my mate Jim is an approved installer allowed me to save by doing a lot of the jobs around the installation myself (pump mount and ducting, electrical, airing cupboard, pipe lagging and pump installation). With the addition of an underfloor heating manifold the bill came to £10,500.

Renewable Heat Incentive

It fell rather well for us as we had the energy performance certificate (EPC) that was required for the sale to us in 2019 and that gave the property a poor rating (F). The RHI payments are based the latest EPC rating within the last 2 years and so we were eligible for the maximum amount – about £400 per quarter for 7 years (increasing in line with the CPI). Because the RHI payback value is assessed using the latest EPC figures, it's advantageous to get an EPC done before any insulation works (except for cavity wall or loft which are required to be up to standard on the EPC). The flip side of that is that an ASHP runs significantly cooler than a conventional boiler and so requires the insulation to be pretty good – just do it after your EPC.

Does it work?

We are more than happy. Bearing in mind that we are still in the process of insulating and blocking up the draughts we've got through our first full Edale winter pretty well. Since installation at the beginning of October, we've used 2600KwH of electricity through the heat pump over the first 12 months – £510. That's provided all of our hot water and the basic central heating, augmented by our new Esse wood burner, though we've not burned a huge amount of wood. The unit itself is about the size of a large fridge and doesn't make enough noise to drown out the sound of the stream next to it. When Stephen Snow brought around the IR camera last year it was surprisingly hot at one end and so I've wrapped it in PIR insulation, clad with shiplap boards and given it a little roof to protect and keep it mostly dry.

Additional Heat - Woodburners

In order to provide a booster heat source, additional to the air source heat pump and a focal point for the living room, we've installed an Esse Warm Heart wood burning stove. It was essential to find an Ecodesign ready 2022 stove so that we can be confident it is a part of the solution rather than being part of the problem! This one also allows us to cook on the hot plate and inside the fire box. We also intend to replace the open fire in the parlour with another, smaller Ecodesign ready wood burner in due course.

Fuel moisture content

Because of the stipulation for fuel log moisture content between 10-20% we now use a moisture probe which has radically changed the efficiency of the fire. Having always bought logs with a verbal promise that it had less than 20% moisture content (or foraged it with only an educated guess) it then lives outside more or less in the elements until it is brought inside with very much unknown moisture levels. Now that we have the probe, each log only gets to come inside if it is less than about 25% moisture. It then stays by the stove until it gets to about 20% when it's allowed to sit on the hotplate of the Esse until it's down to about 10-15%. Only then does it get to be used on the fire. This really gives us confidence that we're doing the best we can and has made a huge difference to how easily the fire lights.

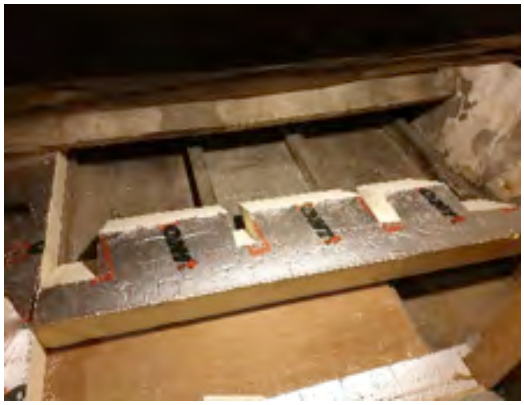
Insulation

We wanted to maximise our insulation without compromising the limited space. Of the easily available insulation systems, PIR (Kingspan, Cellotex, etc.) boards offer the best efficiency of insulation with a thermal conductivity of 0.023W/mK. Unfortunately, PIR does have the disadvantage over wool and other non-rigid insulation that it has to be very accurately cut to stop draughts which will hammer the performance if allowed to exchange your inside air every few hours.

Walls

Middle Ollerbrook Cottage has solid gritstone walls about 600mm thick. Our only real option for insulation was some sort of internal lining. Having had really good experience previously with dot-and-dabbed laminate boards (Kingspan type PIR backed plasterboard) we went for 50mm backed 12mm plasterboard on the inside of all external walls. Depending on space and proximity to the colder walls, the non-external walls got anything from 25mm laminate to nothing. Most of the laminate boards were sourced from Markovitz Insulation and Drylining centre in Chesterfield.

To keep a check on draughts, expanding foam and caulk fillers were used wherever air could get in. We managed to finish the plasterboard joints with drywall tape and fill without plastering by using taper edge boards and carefully cutting to minimise joints.



I'm not a fan of the philosophy of having a big thermal mass inside the living space to retain heat and prefer a light and quickly heated/cooled space. Thus the internal insulation option was not just the only practical one for our walls but it suits my needs as well. There is an argument for leaving old sandstone walls to "breathe" so that they can dry out and become less of a thermal drain. However, I am confident that our walls are sufficiently ventilated and open for them to dry from the outside and I'm not keen on losing a lot of heat evaporating moisture.

Ceiling/floor

The exposed joists in the kitchen and living room are particularly large and so gave us the opportunity to fit 50mm of rockwool for sound and thermal insulation and 12mm fireproof plasterboard.

Loft

The loft was reasonably insulated with glass fibre wool but was horribly dirty. The old wool was lifted and shaken clean then the whole loft space cleaned. The old wool was then re-fitted between the 75mm joists and 100mm of Kingspan type PIR foil backed foam very carefully fitted to leave minimal gaps and laid on top of the rafters with taped joints. Where access is required, loft boards are laid over the top although it is possible to move around on top of the foam boards. Access hatches were very carefully fitted to stop draughts from entering the house. Using the old fibre glass wool saved a lot of waste and stopped a lot of potential draughts as it's impossible to fit the PIR boards to every nook and cranny of the rafters, joists purlins and rough stone walls. Cleaning, precise cutting and fitting of the insulation was not a pleasant job and FULL PPE is essential but it's now a pleasure to go into the loft and the surface of the PIR boards is easy to sweep and clean.

Underfloor Heating

Big joists in the crawl space under the kitchen and living room allowed us to fit underfloor heating pipe directly to the underside of the floorboard with 100mm of Kingspan type PIR carefully fitted beneath and between the floor joists. I am toying with the idea of fitting a superfoil type membrane beneath all to eliminate draughts as it's challenging to perfectly cut and fit the PIR to old, warped joists. Needing to heat only the floor boards goes along with my philosophy of a small and agile thermal mass although there is the disadvantage of the wood being quite a good insulator. With the good PIR insulation below I'm happy that the heating works well this way.

Doors and windows

Having insulated the walls in the living room, the existing front door then looked decidedly flimsy and cold. So we came up with the idea of doubling its thickness and installing 25mm of PIR foam. We've also fitted a technical Aquamac 21 weather seal all the way around. All of the sash windows will be fitted with a similar Aquamac seal and brush seals over the sash boxes. Details of this is to be decided

Heat Recovery

Having had a problem of condensation on large Georgian sash windows of a listed property and solved it with heat recovery, I'm very keen to do the same here. The unit consists of two fans, two filters and a heat exchanger matrix. Warm moist air is drawn from the living spaces and discharged through the heat exchanger. Fresh, outside air is drawn in, filtered and warmed before being discharged back into the living spaces. This:

1. keeps the inside air from getting overly humid, so reducing condensation on windows and walls
2. keeps the inside air filtered and fresh,
3. maintains the room pressure (so reducing draughts) unlike a straight extractor fan
4. minimises heat wasted

It's reasonably simple to install in the upper floor as the ducting can be run in the loft with suction through the ceilings and discharge down the chimney where available and through the ceiling where not. Downstairs in the kitchen and shower room I intend to fabricate a similar system using a pair of fans and achieve the heat exchange by carrying the stale air inside a long aluminium duct fitted within an insulated duct carrying the fresh air in the opposite direction. I have plenty of room for this in the ceiling voids and can ensure that the inevitable condensate drains to the outside by carefully arranging the duct falls.