

WHEN EVERYTHING HAD DRIED OUT

After 5 months of drying out using heaters and dehumidifiers, sanding and treating all rotten wood, repairing damaged mortar joints we were able to start plastering.

I chose a plasterer who specialised in Lime, I had multiple plasterers come look at the job, some weren't interested as soon as I mentioned lime, others vaguely said they could do it but they obviously had little to no experience. So I chose JH Plastering who had training and experience in lime plastering. He was already working in the village at the bakery (Pharmacy House, Grade 11 Listed) on Overton high street, one of the older buildings in the village, and it was being plastered using hemp lime. The project was featured on Renovation Nation. I liked Jack because he was passionate about his work and I wanted to work with someone who would appreciate the uniqueness of this job.

In each room we discussed what areas were to be plastered, some of the wood was going to be plastered over but I wanted to keep a lot of it exposed, I felt it would be such a shame to hide those fascinating details. Each piece of oak could tell it's own story and was full of gnarly character that I felt I would be doing it a disservice if it was to be covered up. I also knew that the areas where the lime plaster had been put on top of the wood were the worst areas for the plaster having absolutely no attachment to the wood, there had been air gaps between all of it through the house. Some of the walls were straight forward but for the complicated ones I took a photo of them and painted different ways (on my phone) that it could be plastered, it made it easier to visualise the final look.





Any of the oak that was plastered over, first had to have a steel mesh attached to it, so that the plaster has something to key to and to prevent the same detachment that had happened previously.

Hemp lime plaster was used for the whole project, horse hair was only added to the scratch coat then there was a second float coat and the final top coat.

Ty-Mawr Lime Hemp Plaster is made from a high calcium lime (also known as a fat/air/putty Lime or non-hydraulic lime) blended with the hemp fibres and a pozzolan to aid the set.

It requires exposure to Carbon Dioxide in the presence of moisture to harden however, it can be applied in thicker coats than conventional lime plasters and is easier and quicker to use.

Like all non-hydraulic lime products, it is extremely flexible and breathable which makes it suitable for use in the restoration of old 'solid wall' construction buildings and ideal as a 'wattle and daub' replacement in timber-framed buildings. It is also suitable in ecological new builds as it can be applied to a variety of substrates e.g. woodfibre boards, wood wool boards, strawbale.

The addition of hemp fibres not only improves the strength and flexibility of the product, it also increases the thermal properties of the plaster and so is an excellent way of adding some insulation to your wall. Please contact us with details of your building so that we can assess the suitability and the likely improvements to performance.

<https://www.lime.org.uk/lime-hemp-plaster-non-hydraulic.html>

INSULATING THE EXTERIOR WALLS PRIOR TO PLASTERING & REPLACING PLASTERBOARD WITH WOOD WOOL BOARDS IN THE LIVINGROOM / OFFICE / FRONT BEDROOMS / HALLWAY & STAIRCASE

We chose to insulate the interior of the external walls to improve the energy efficiency and reduce the cold spots which had evidently contributed to the damp areas. After speaking with my neighbour who had restored Kew Cottage, I followed the same methods as she did because they had been approved by her conservation officer.

This consisted of building a stud framework, wool insulation, wood wool celenit boards & lime plaster finish.

Having the stud framework there also allowed for electrical cables, radiator and water pipes to all be hidden within that.



LEFT - This was taken during the renovations at Kew Cottage and shows the materials mentioned above

Celenit Wood Wool lime plaster boards

Celenit wood-wool boards are high quality vapour permeable boards, suitable for use internally or externally as part of a breathable wall construction.

Celenit boards are a great alternative to cement board, plasterboard and expanded metal lath. The open texture of the boards means that a lime plaster or lime render can be applied directly without the need for latex, PVA or SBR type primers.

Celenit boards are self-draining and the mineralised coating on the wood strands, give the boards a Class B fire rating. This means that they will only char and not catch fire. The mineralisation also makes them extremely durable and they will not crumble or rot when wet.

<https://www.celticsustainables.co.uk/celenit-wood-wool-render-carrier-boards/#:~:text=Celenit%20boards%20are%20a%20great,PVA%20or%20SBR%20type%20primers.>

LIVING ROOM



OFFICE



FRONT MAIN BEDROOM



ABOVE - It looks like different boards were used but they were all the wood wool celenit boards, each batch varied in colour

The ceiling had damaged areas from a water tank that had once leaked and been repaired very badly. These areas were cut away and then it was over boarded ready to be skimmed, Rather than pull down the whole ceiling, over boarding was the least destructive and safest option. My plaster said there might be a very small chance of asbestos in the artex due to the age of it so we decided to avoid disturbing it as much as possible.





FRONT SMALL BEDROOM



HALLWAY & STAIRCASE



TOP RIGHT - This wall which backed onto the small front bedroom had previously had plasterboard on top of the wooden laths and plasterboard on top of some areas of lime plus gypsum skim on top all causing the materials to pull away from the laths underneath (as detailed earlier), these were all removed and the wood wool boards were attached on top of the laths.

INSULATING THE EXTERIOR WALLS & PREPARING THE WALLS READY FOR PLASTERING IN THE KITCHEN / UTILITY ROOM / BACK BEDROOM & BATHROOM

As mentioned earlier, the kitchen, utility, back bedroom & bathroom didn't have any lime plaster, only plasterboard, gypsum render & skim. I wonder if perhaps it did originally, when the extension was first built and then later removed? The date of the extension is unknown but it's been suggested by different people that I've spoken to that know more about the history of these cottages is that it was in the late 1800's and if that was the case then it might have been lime because gypsum wasn't commonly used in domestic homes until the 1900's.

The introduction of gypsum plaster to the UK construction industry in the 1930s irreversibly changed the plastering landscape. With 'just add water' variants which simplified the mixing process becoming commonplace by the 1960s, following the post-war housing boom, lime-based plasters were in some instances overlooked.

<https://limeliteheritage.co.uk/case-studies/the-forgotten-solution-renovating-plaster>

BACK BEDROOM

The render in these rooms was solid, a few big cracks here and there but firmly attached to the walls, it hadn't been badly affected by the leaking roof and the mould spores had been removed and hadn't returned once there was heat and ventilation. So we had no intention of disturbing the render and used a product recommended by our plasterer to allow a fresh coat of gypsum skim to be applied over the top.



- Blue grit, a bonding solution, was painted on the walls to give the skim a good surface to adhere to.

A stud framework was built on the exterior wall of the back bedroom, with wool insulation and plasterboard on top. The ceiling was insulated with Celotex insulation boards and plasterboard.



BATHROOM



KITCHEN

All the old paint was scraped from the walls, mould removed and it was painted with blue grit also, I must have forgotten to take a photo of it at this stage

UTILITY ROOM



2 walls were studded and plasterboarded and the other 2 were left with the brick exposed ready to be painted in the Breathable Earthborn claypaint that I was going to use for all the walls. I chose this paint because it was recommended by Ty Mawr Lime where the hemp lime was purchased from.

LIME PLASTERED WALLS

PRODUCTS USED



The front of the house (living room, office, front 2 bedrooms, stairwell and upstairs hall) were all plastered in lime alone. Even though the stairwell previously only had plasterboard on the left wall I chose to use lime instead, mainly because it had been such a damp wall and I wanted to allow as much breathability in case there was still some moisture within the bricks.

PROCESS

Attached below is the information and process of application followed:

Description

Tŷ-Mawr Hydraulic Hemp Plasters are made from hydraulic lime blended with the hemp fibres. In situations where a faster set is required, a dry premixed hemp lime plaster can be a good alternative to the fat lime hemp plaster. The Tŷ-Mawr product is entirely made from British hemp. It requires exposure to Carbon Dioxide in the presence of moisture to harden, however, it can be applied in thicker coats than conventional lime plasters. It has good flexural strength and is breathable, which makes it suitable for use in the restoration of old 'solid wall' construction buildings as well as ecological new builds.

Structural defects can not be overcome with plasterwork, not even hemp plaster! It also provides additional insulation, is easier to use and is ideal for patching and improving air tightness.

It should not be used in damp situations e.g. basements or on wet substrates. Good practice should be taken to ensure that the building structure is 'breathing' e.g. removal of external cement renders/plastic paints etc

Time needs to be given for previously wet walls to dry out if cementitious renders have been removed.

Please note

The application of lime plaster is more involved than using conventional plaster. It is highly recommended to use a plasterer experienced in the use of lime plasters or at the very least some practical experience is essential e.g. by attending a lime course, as it is not possible to cover every point in detail here. However, should you experience difficulties in applying our products after following the advice given, please contact our Product Support Team at tymawr@lime.org.uk.

Preparing the mix

A bell mixer is an ideal way to mix the lime hemp plaster. Place the dry plaster in the mixer and approximately 2/3rds of the water, for each 25 kg dry mix add approximately 10-14 litres of water. It should be left to turn for approximately 20-30 mins before adding any more water. Over mixing can cause air bubbles to become trapped in the mix, which will affect the final finish and might result in undue shrinkage of the plaster. The mix should be left turning long enough to achieve a suitable consistency.

For the plaster to have more body and a feel similar to a fat lime hemp plaster then it should be allowed to steep over night once it has been mixed. It can then be 'knocked-up' again the following day. This will aid in the application onto ceilings.

Hydraulic Hemp Plaster Selection

Building Material	Site Type	Suggested Base Coat / Levelling Coat	Suggested Build-up	Suggested Top Coat – <i>please note the top coat should not be stronger than the base coat</i>	Suggested Build-up
Cob, Rammed Earth, Strawbale	Internal	Lime Hemp Plaster (medium)	1 x 15mm	Lime Hemp Plaster (fine)	1 x 6mm**
Lath, Reed Mat, Reed Board	Internal	Lime Hemp Plaster (medium)	1 x 15mm	Lime Hemp Plaster (fine)	1 x 6mm**
Celenit Wood Wool Boards	Internal	Lime Hemp Plaster (fine)	1 x 6mm	Lime Hemp Plaster (fine)	1 x 6mm**
	Ceilings	Lime Hemp Plaster (fine) (coarse mesh)	1 x 6mm	Lime Hemp Plaster (fine)	1 x 6mm**
	Heavy Stress	Lime Hemp Plaster (fine)			
Woodfibre Board	Internal	Levelling coat: level background with standard hydraulic lime plaster (min 2 x 10mm), for adhering boards 5mm to back of board. Base coat Lime Hemp Plaster (fine)	1 x 6mm	Lime Hemp Plaster (fine)	1 x 6mm**
Soft Stone, Brick	Internal	Lime Hemp Plaster (medium)	1 x 15-25mm ^{oo}	Lime Hemp Plaster (fine)	1 x 6mm**
Hard Stone, Hard Engineering Brick, Concrete Blocks	Internal	Lime Hemp Plaster (medium)	1 x 15-25mm	Lime Hemp Plaster (fine)	1 x 6mm**
Insulation Blocks*	Internal	Lime Hemp Plaster (medium)	1 x 10-15mm	Lime Hemp Plaster (fine)	1 x 6mm**
•May require more coats due to waviness of bales. ^{oo}Depending on suction. Could be greater on well keyed, high suction backgrounds. **For a smoother finish, a Lime Top Coat Plaster (standard) can be applied in 1 x 3mm coat. *Insulation blocks have very high suction, be careful to control the suction. N.B. Drying times will be extended with thickness.					

The three main stages were:

- Scratch Coat (Lime hemp plaster with horse hair)
- Float coat (Lime hemp plaster)
- Top coat (Lime hemp Finish plaster)

These were done over several months allowing adequate drying time in between.

Front Main Bedroom



Lime plastered walls and gypsum skim on the ceiling.

Front Small Bedroom



Living Room - All walls lime plastered



Office - All walls and ceiling lime plastered



Hallway & Staircase



GYPSUM RENDER AND GYPSUM SKIMMED WALLS & CEILINGS

Back Bedroom



Bathroom



Kitchen

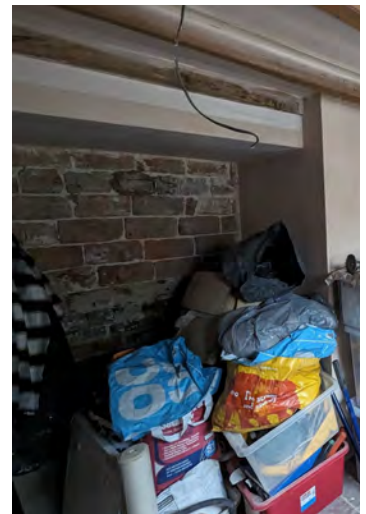


Utility



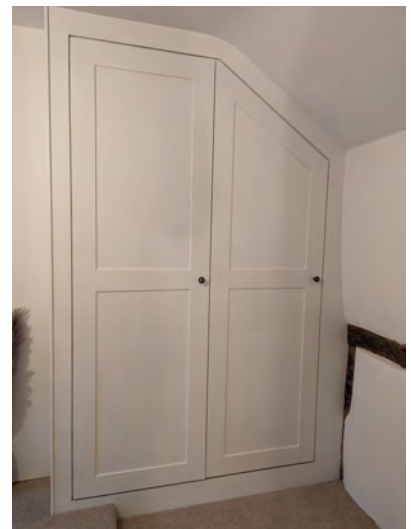
RIGHT - This is inside where the cupboard used to be which is now an open space for ventilation purposes, and also as a feature to show the brickwork of the back wall of the original building.

ADD ANOTHER PHOTO



7. CENTRAL HEATING AND 8. ELECTRICAL REWIRE

This was a process that wrapped around the plastering, the first fixes and prep was done before the lime plastering had started and then finished once the plaster had dried out. The boiler was fitted in the same place as the old immersion tank in the main front bedroom, not a normal place to have a boiler, which would usually be in a kitchen or utility room or cupboard but it was going to be a much easier and less destructive process to fit it there than run the mains pipe to those other rooms so we opted for the bedroom as it was going to be concealed within a fitted cupboard and we were assured by our Central Heating contractor that the boiler itself is virtually silent so it wouldn't be a problem in the bedroom.



The radiators installed throughout the building are slimline modern column radiators.



The new fusebox has been installed in the same place as the old one in the corner of the living room next to the window, along with the new gas meter. Both of which have been concealed within a built-in cupboard, that's waiting to be painted.



10. New plumbing system

All the old pipes were removed and new ones installed along with a new bathroom suite & utility room sink. The bath and sink placement were the same as previous but the sink was moved to the right of the window rather than underneath, it made more sense to fit the radiator under the window. I decided to go for a vanity sink unit rather than just a sink because the bathroom is tiny and I needed to maximise what space there was with some storage so a vanity unit seemed the best option. But I couldn't find one that fit the aesthetic I was aiming for, I didn't want anything new. I wanted to breathe new life into old unwanted items where I could so I bought an old oak sideboard and turned it into what I'd visualised. It was too low for the sink so it also had to be lengthened and every leg had to be a different length thanks to the uneven floor so it's definitely a 'bespoke' item :-)



The original sink in the utility room was under the window, but the room was already narrow and this made it even narrower so I decided to put it on the back wall to utilise the space better,

11. GROUNDWORKS & DRAINS

The ground was lowered at the front and back of the house because it was higher than the floor inside, both of which were the main source of damp on the inside walls and since being done the walls have dried out as detailed in the earlier DAMP REMEDIAL WORK section.

RIGHT - This is before it was lowered at the front, it's hard to see in the photo but the lawn was 2 big bulges either side of the porch which sloped down to a concreted area underneath each window. This concrete was slightly higher than the floor inside.



The concrete was removed and the ground dug away and levelled out at a height of 150mm lower than the floor inside.

At the back, this was the original mass of concrete that was causing all all the problems -



Once it was removed and all the protruding bricks cut back the inside was able to start drying out.



The groundworker had done some temporary repairs on the leaking drain early on in the project just to tide us over until he was able to come back and replace the full drainage system and manholes.



The rest of the concrete was removed from the back of the house and the earth dug away to reach the pipes. The garden itself was about a metre higher than the ground floor and it sloped down to the house and when it rained the water would just fill up the concrete area with nowhere to go except sit against the house. So the main objective with lowering the ground level at the back was so that there could be a drainage channel next to the house

and the new patio was going to be angled so that water rain away from the house instead of towards it and it would run into eco drains that would then filter into a soakaway.

I took close ups of the broken sections of the drains, and I can't find them, I took them while my groundworker was there because he told me to make sure I had them as evidence and I have no idea why they're not in my phone gallery, it's extremely frustrating when I've tried to document everything so I do apologise, unfortunately I can't show you those photos.

And I wasn't there the day that he was removing the old pipes and fitting the new ones so all i have is the photo from when I got there after work, by this point it had all been done and covered over -



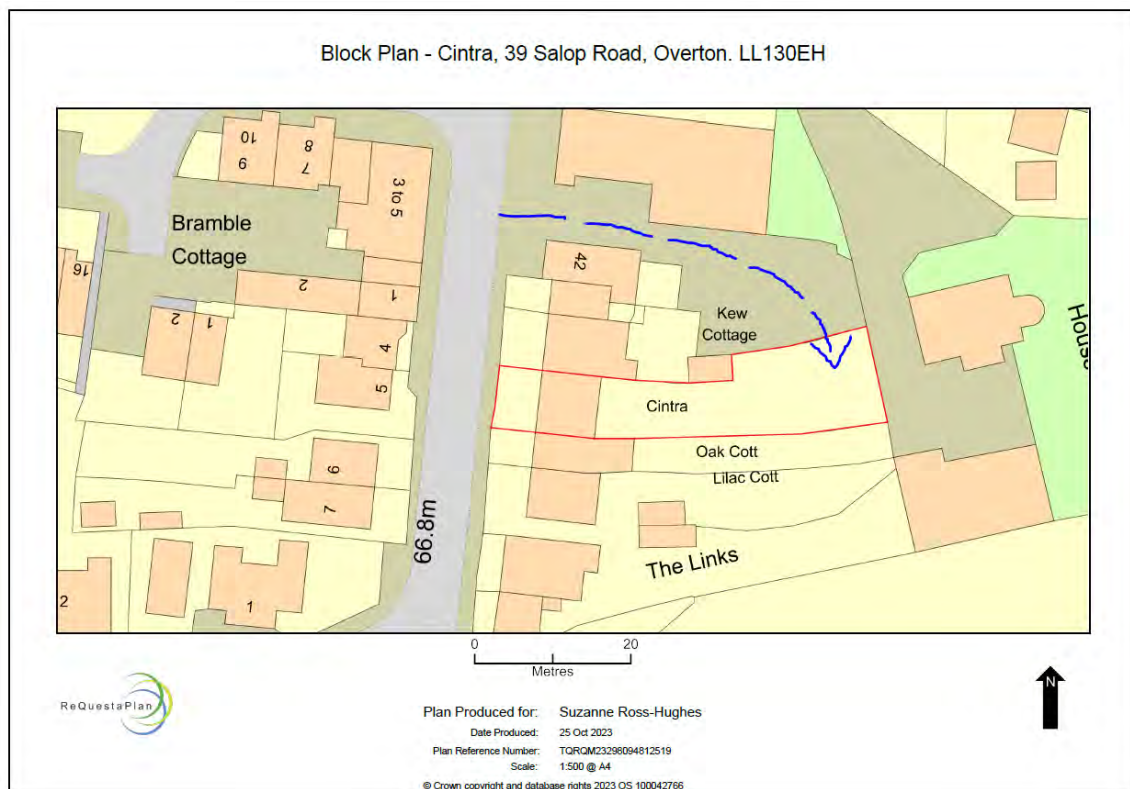
Combining the 2 rectangular manholes into one square one made such a difference once the patio was laid because we were able to use a recessed manhole cover and disguise it completely.





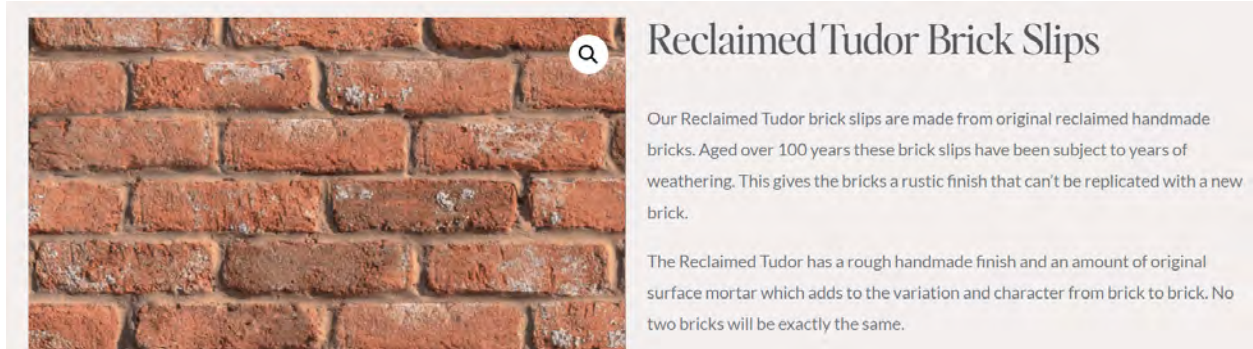
ACCESS

There is no fence at the end of the garden and it allows access through the yard at the back of FERDIS LOCAL. We came to an agreement with the owner Robin Wason, who allowed us to gain access through his yard, this meant that any machinery was brought through there and didn't cause any disturbance to our neighbours.



TUDOR BRICKSLIPS

The brick slips that I used for the fireplace with from www.reclaimedbricktile.com. I chose the Tudor brick slips because they were over 100 years old, they were long and thin like the old bricks that were used to build the house so I thought they would suit the age and character of the building.



Conserv gunlime in Oatmeal was used to point the bricks and with what brick slips I had left over I used in the little fireplace in the Front main bedroom.





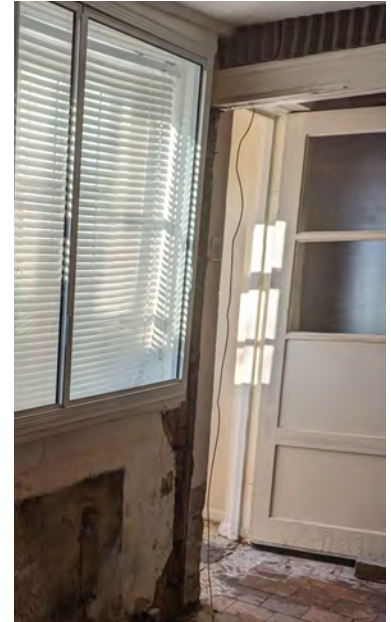
Doors

The door into the office and the door from the living room into the kitchen were removed, they were fitted in the late 1970's by the previous owner, not in-keeping with the age of the property and in bad condition. When they were removed we discovered the oak framework and decided that it made more sense to have more of an open plan layout, the same as Kew Cottage next door, making the oak framed doorways a feature.



Porch door

RIGHT - This was a glass paned door, also not fitting with the age and character of the building, meant to have 3 panes of glass but one had been replaced with a piece of wood and painted white at some point. It was outdated and damaged so we replaced it with an oak door and frame with 6 panes of glass to match the front windows IMAGE BELOW.



Doors upstairs



I don't have any photos of the old ones but they were the same as the downstairs ones, hollow and in bad condition. These were removed and replaced with oak framed doors with wrought iron furnishings.



Living Room ceiling

This is the original lime plastered ceiling, not in the best condition, the paint was all flaking off and there was many areas of lime that just crumbles if you pressed it but it hadn't been affected by any leaks or mould and as long as nobody touches it will probably last for years to come.



I carefully scraped all the loose areas away, trying my best not to disturb the lime plaster. Then I painted it with the Earthborn Clay Paint which is their most breathable paints but staining kept showing through from the areas of exposed lime so I made a very diluted mix of PVA and water and applied that in those areas. Once it was dry I repainted with the clay paint and the stains no longer showed through.



PAINT

Every room was painted the same as the living room ceiling, using the Earthborn Clay Paint.

Our breathable Claypaint is a luxurious, ultra-matt finish for interior walls and ceilings. Made using our unique eco friendly clay recipe it results in a highly breathable flat matt paint. Due to Claypaint being highly breathable it means that it is especially suitable for use over lime.



<https://earthbornpaints.co.uk/paint/lime-plaster>



Front windows



These are the original single glazed sash windows, quite unsafe, major heat loss source and unable to be opened because the frames are so fragile. They were sanded down and wood filler applied where needed and then painted, they are also sealed shut now so to stop the water penetrating inside.



REMAINING WORK

The outside of the house needs painting. The plan is to scrape off all loose material, fill any holes or deteriorated mortar with new lime mortar and then paint with a breathable paint. Judging by the lack of care in the history of this property I doubt that breathable paint was used so ideally it would all need to come off and a fresh coat of



breathable paint or limewash applied. This might not be a feasible option for us so the backup plan is to paint all the newly lime rendered, pointed areas with Earthborn silicate masonry paint, this requires the Earthborn primer to be applied first and both of these products are breathable. If it's being used on top of already painted non-breathable paint then the Earthborn bonding primer needs to be applied first before

the paint, these areas wouldn't be breathable because of the paint that's already there.



Silicate Masonry Paint is a durable masonry paint that dries to a classic, matt finish. Being highly breathable and weather resistant it offers an alternative to traditional lime based and conventional coatings.

It can be used on interior or exterior bare, porous mineral surfaces. Eg. Stone, masonry, concrete, pebbledash, plaster and sound silicate-based painted surfaces. It's especially suitable for renovation projects and can have a lifespan of up to 15 years.

Approx coverage: 5-7m² per litre depending on surface.

Note: Earthborn Silicate Masonry Paint can be applied over conventional 'plastic' masonry paints with the use of Earthborn Bonding Primer. Some clay surfaces may require special treatment.

For Silicate Masonry Paint to work effectively it must be used with either Earthborn's Silicate Primer or Bonding Primer. Please click the Primer tab to check which primer is right for you.

Staircase -

When the old staircase was removed, my joiner made us a temporary one, we were hoping to have the new oak staircase in by the time we moved in on but unfortunately he was delayed because of other commitments. But what he did was remove the temporary staircase and temporarily fitted the new oak staircase in order for us to have a safer way of getting upstairs until he was able to finish it properly. We tried to get reclaimed oak from the same reclamation yard in Nantwich that we got the floorboards for the bathroom floor but we were unable to find a suitable amount. So the oak that's been used has been bought from a local company, Wynnstay Joinery.

The old one had 9 steps and the new one has the same, it's waiting on the bottom bullnose step being made and the oak strips to fill the edges either side of the staircase and then i'll use the Fiddes Hard Wax Oil in English Oak on it to protect it and match it in colour to the rest of the wood through the building.



REAR UPVC WINDOWS

These were installed over 10 years ago by the previous owner, perhaps in an attempt to improve the heat loss and under the impression that they could have UPVC on the back like many other cottages in the row.

They do not complement the age and character of the building and if we hadn't been so financially stretched with all the other works then these would have been replaced this year with hardwood windows the same style as Kew Cottage next door. They will be the next large job to tackle once our financial situation has improved.

UNSCHEDULED WORKS

Uncovering the little fireplace in the Front Main Bedroom wasn't intended, I had originally planned to plaster over it. But we had a major issue when trying to clear out the chimney, it was an impossible task from the fireplace in the living room because it was blocked from the ground floor to the top of the chimney! We had to make a hole in it from inside the attic as well as chisel out the blocked up fireplace in the front main bedroom to try and dislodge the blockage.. The previous owner had stopped using the coal fire over 20 years ago so there was all those years of nests and debris to remove! It took 3 of us 4 hours to complete and most definitely the horriblem job in the whole project.

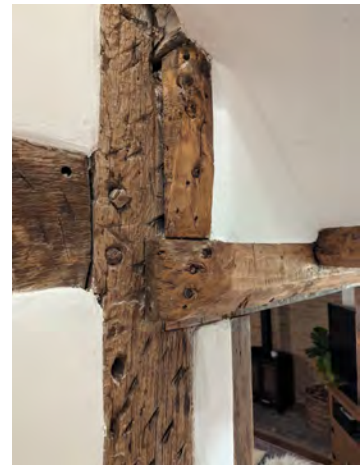


Uncovering the cobblestone path - This was an exciting find! Kew Cottage next door has one and I was hoping we would too. Possibly another feature of the original build. There's still more to do which I'll be finishing as soon as I get chance but I'm looking forward to revealing the full path.



The oak!

I'm obsessed with all the old oak, some of it was on show but so much was hidden under layers of lime/gypsum plaster all these years. It's absolutely stunning, full of character and history. I'd love to know its origins and the events it's been a part of before ending up here. We've got some quirky little features throughout the house where you can see into each room through the various holes in the wood from where old pegged tenon joints of other timbers once were.



CURRENT PHOTOS OF EACH ROOM



BATHROOM



OFFICE





LIVING ROOM





KITCHEN





UTILITY ROOM





BACK BEDROOM



SMALL FRONT BEDROOM



MAIN FRONT BEDROOM





STAIRCASE & HALLWAY



IMPACT

There has been no change to the layout of the building, it's still the same as before the restoration work began (Please refer to the Floorplans & Elevations included in the application). Non-structural modern features were removed like the built in cupboards and stone fireplace and the removal of these has been beneficial because they were defective and didn't compliment the age and character of the building.

The loss of much of the original lime plaster is tragic, and has been caused by a concession of previous owners removing it or repairing it with the wrong materials, destroying it's structure, removing it's breathability and ability to flex with the building. And of late, the collective damp coming from the roof, gutter, chimney, leaking bath, leaking sink, high ground level and lack of ventilation for many years had created a very desperate situation and a health hazard for anyone wanting to live there.

Albeit some loss, it's gained more in other areas, longevity of the building structure, more energy efficient, all the exposed oak which has been restored to such a high standard and is now a feature throughout. Previously buried under lime plaster then gypsum on top as well as woodchip and layers and layers of paint, each room was an over-decorated mess that no longer reflected the period it had been built.

The front elevation remains unchanged, no change in the original appearance, the tiled roof exactly as it was before, lots of the original tiles still there and the welsh reclaimed slates used for the replacements are indistinguishable. The chimney looks the same, just a bit straighter and the lime mortar used to repoint it is lighter in colour than the original but will darken as it weathers over time.

The house has been given a new lease of life, has interesting historical features on show, increased it's value and I hope will make a beautiful home for many generations to come.

EVALUATION

What started as a simple process of repair and restoration turned into an all consuming 10 month project that not only broke me physically but has also stretched us so far financially we are at breaking point. But, it was worth it all, not only is the dilapidated building rid of all the issues that had caused all the problems, it's now a talking point, it transports you back in time and all the quirky little details throughout the building that give you an insight into the construction of how these vernacular 1800s cottages were once put together.

I wanted to work with the conservation team right from the beginning, I had no intention of doing anything without their permission, I contacted them in January and continuously after that. I ended up starting the work, I didn't know how long we would have to keep waiting, and even though I knew that there was a risk of prosecution my priority was to prevent the situation in the house escalating further. I hoped that by doing enough research and working with Emily next door who restored Kew Cottage and learning about all the materials and methods used, that I would be able to do everything in the right way to prolong the life of the building and inject some love into a very unloved little cottage.

RESEARCH

Emilienne Rebel - Owner of Kew Cottage. I got as much information as I could from Emily about the restoration works that she did when she bought the property. Which was in a far worse state than Cintra so it was hugely educational to discuss the whole process with her and what materials and methods were used. Knowing that all of the works were passed by the conservation officer at that time, and that Cintra being of the same age the reason behind the majority of the materials I chose were based around the information I got from her. Kew Cottage was restored and modified to such a high standard I wanted Cintra to be of the same quality. The only difference being that I had no plans to modify the layout or extend, solely to repair, restore and enhance any hidden historical details.

I haven't listed every forum, website, restoration blog that I read during this project because I didn't keep track of them and it would be pages and pages long, but I hope it's evident in the work done that there was considerable invested in each and every part of this.

<https://historicengland.org.uk/advice/your-home/maintain-repair/roofs/>

https://cadw.gov.wales/sites/default/files/2023-03/Investigation%20of%20moisture_final%20email%20version_0.pdf

https://masonryadvisorycouncil.org/wp-content/uploads/2016/05/Restoring-Mortar-Joints-in-Historic-Buildings_tcm68-1375178.pdf

<https://cadw.gov.wales/advice-support/climate-change/how-to-improve-energy-efficiency-historic-buildings-wales>