Contents

1.0 About This Report

1.1 This Building Survey is produced by an RICS surveyor who has qualifications in the conservation and repair of historic buildings that were originally developed by English Heritage and are now recognised by Historic England. This is along with qualifications in energy efficiency for older and traditional buildings which are recognised by the UK Government and meets the requirements set out in PAS2035 and PAS2038 for working on traditional and protected buildings.

1.2 The Building Survey aims to:

- help you make a reasoned and informed decisions planning for the repairs, maintenance and upgrading of the property;
- provide detailed advice on condition;
- describe the identifiable risk of potential or hidden defects;
- make recommendations as to any further actions or advice which are needed

The report does not intend to act as a specification of works but provides recommendations and advice to help develop one. It is strongly advised that you seek professional guidance when carrying out repairs, alterations and upgrades etc. to the property.

1.3 Address of property surveyed (The Property)
1 South Road,
Kingsdown,
Kent,
CT14 8AQ.

1.4 Brief
Instructions were received from Jon More on the 16th November 2023 to undertake an invasive Building Survey and produce a report detailing findings to help inform the refurbishment of the property

1.5 Date and circumstances of inspections
The inspections were undertaken on the 12 & 19th December 2023 during cold and wet/damp weather conditions. The property was furnished but is generally unoccupied.

1.6 Surveyor who inspected The Property (The Surveyor)
Michael Foley, AssocRICS, PDD (Building cons).

1.7 Details of the surveyor's company
Standard Heritage Limited –Company Number 09281715
125 Canterbury Road,
Westgate-on-Sea,
Kent, CT8 8NL.

1.8 Report prepared by
Michael Foley, AssocRICS, PDD (Building cons).

[redacted]

2.0 Executive Summery

1 South Road is going to be altered and refurbished to bring it up to modern standards of energy efficiency and comfort.

The property is an end of terraced house that was constructed circa 1850. There are two separate structures at the back of the house which were built separately are thought to have been built after the house. The two structures were not designed for habitation but have been converted in an ad hoc fashion to house a kitchen, utility room, a bedroom and a bathroom.

The house has extreme damp problems and requires a serious amount of work carried out to remedy the issues. The walls at the two structures at the back of the house need building out as they have been constructed using a simple stretcher bond and are only 'half a brick thick' (about four inches thick). This will require some well considered design work and execution of the works to bring them up to current and acceptable standards. Re-construction of the extensions may be a better option.

The external works will be governed by the relevant parts of the *Planning (Listed Buildings and Conservation Areas) Act 1990;*
https://www.legislation.gov.uk/ukpga/1990/9/contents

General works will be guided by the relevant Approved Documents, which contain guidance on how to comply to the UK Building Regulations 2010, with 'special considerations for buildings of architectural or historic interest'. See Historic England's guidance for building owners on how to comply to the regulations;
https://historicengland.org.uk/advice/technical-advice/building-regulations/

Main works required

The works required to remedy the damp issues, bring the property up to modern standard and where it only needs routine maintenance are summarised here but discussed in detail in the relevant report sections.

Chimneys; the chimney stacks need sensitive repairs and the brickwork of the breasts inside the main roof space need consolidating

Roof Coverings; the slate roof coverings are in a fair condition but require localised repairs

Roof, Insulation; insulate the roofs

Rainwater Goods and Drainage; the rainwater goods and drainage need re-designing by an engineer and replacing

Main Walls; the main building needs the cement render stripping, repairs to the masonry carried out and re-rendered with a specified lime mortar

Internal Walls; will need stripping back to bare brick, repairs carried out and insulating

External Ground Levels and Internal Floors; the external ground levels need reducing and it is recommended that the current floors throughout are replaced with a Lime-Crete floor system

Doors, Windows and Second Fixed Timbers; will need re-decorating and localised repairs, including brush stripping

Internal Environment Install a whole house humidity controlled ventilation system

Services; Gas and electricity meters/ fuse boxes need relocating.

Further Investigation

Locate the below ground drainage at the front the building and carry out a CCTV drain survey
Check for lead water pipes

Carry out a CCTV survey of the chimneys and have them swept

Carry out an air permeability test before any work commence

Carry out a Demolition and Refurbishment Survey (Asbestos) prior to any construction works.

3.0 Property Overview

3.1 Description

The property is an end of terraced house that has been extended at the rear with two distinct single story structure. The terrace was built for the local fishing community and is part of the Kingsdown Conservation Area. Please see the Kingsdown Conservation Area Appraisal for further information ; https://www.dover.gov.uk/Planning/Planning-Policy/PDF/Kingsdown-Conservation-area.pdf

The house originally had a simple two up two down layout but a bathroom has been added at the rear bedroom. The roof coverings are slate, with an interesting slate porch roof.

The external walls and chimneys were traditionally constructed using hand made bricks bedded and pointed with lime mortars. The external walls at the front and side elevations and chimney stacks have been rendered with cement. The rear elevation has been repointed with cement. All the walls have been painted white with modern masonry paints. Internally the walls are a mix of cementitious plasters and dry-linings. The spine wall that divided up the ground floor has been removed.
Large areas of the original suspended timber floor at the ground floor have been replaced with solid concrete.

The Extensions

It is thought that the structure furthest away from the building was constructed first and the second structure linked the two up together. It is thought that the extensions were used as a dairy or even a shop as the Conservation Area Appraisal suggests. It is thought that both structures were built post 1919.

The windows through out the property are a miss-match of styles and materials; timber and u-PVC

For the benefit of the readability of this report, the house will be called the 'main building' the structure attached to the main building will be called the 'first extension' and the end structure will be called the 'second extension'. Note; ' the property' will be used when describing the main building and the extensions together and its element will be described as seen facing it from the street ie. to the; left, right, front, back, unless otherwise stated.

Please read report sections for detailed information on the buildings elements.

1 South Road, in context

3.2 Construction Principles

It should be noted that there are two distinct construction types in the UK. The first being traditional construction (pre 1919), which is recognised in the UK Building Regulations and Approved Documents (AD) under the headings of; Historical and traditional buildings where special considerations may apply (AD L1B & AD C) *buildings of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.* The second type -modern (post 1919) uses impermeable building materials and relies on impervious barriers to resist the passage of moisture from entering a buildings envelope. When modern building materials are applied to breathable building fabric, their impervious nature tends to trap moisture, which often results in dampness.

<u>Note on post-1919 building materials</u>

Hard cement based and other impervious materials applied either internally or externally (this includes, cement render, internal cement plasters and non-breathable masonry paints) are inappropriate for solid, lime mortared and pointed construction. This is for two main reasons:

> Masonry walls built with lime mortar joints are able to move and flex with the seasons – cement is totally rigid, and when flexing in the walls occurs, the render/plaster cracks, as does cement mortar used to point the wall. Water is able to penetrate the cracks, and builds up behind the cement, masonry paint and the pointing, causing high moisture levels in the wall. The trapped moisture then damages the faces of the bricks when it freezes and expands during the freeze/thaw cycle; this is known as spalling.
>
> Masonry walls pointed with lime externally and plastered with lime internally have the ability to let moisture escape from the materials and allow evaporation of moisture; this is commonly referred to as a wall being able to 'breathe'. If the wall is sealed internally and externally with impervious cement or paints, this process of moisture evaporation cannot occur and results in damp manifestation. This is commonly misdiagnosed as rising damp.

Note - Further reading and referencing for statements made in respect of why impervious materials (such as cement renders and plasters) are not appropriate for solid walled buildings and the importance of maintaining breathability can be found at:

- BS 7913:2013 – Guide to the conservation of historic buildings
- Historic England - Brick and Stone walls; Guidelines for best practice;
  https://historicengland.org.uk/images-books/publications/repointing-brick-and-stone-walls/heag144-repointing-brick-and-stone-walls/
- The SPAB; The Need for Old building to Breathe;
  https://www.spab.org.uk/sites/default/files/SPAB%20Technical%20advice%20note-Need%20for%20old%20buildings%20to%20breathe.pdf
- English Heritage/ Historic England Practical Conservation series volumes: Mortars, Renders & Plasters. Earth Brick and Terracotta. Stone. Environment.

4.0 Building Exterior

4.1 Chimneys

There are two chimney stacks emerging through the roof either side of the ridge of the main building. Both stacks are shared with the neighboring property.

The main stack has two tall chimney pots, which are both capped with vented rain caps. The one towards the front one being of red clay with a clay cap and the one to the rear being buff clay, with a metal rain cap and flue end. The red pot looks like it has a crack at its base. The pots are set in a cement flaunching (the mortar the pots are set in) and the stack has been rendered with cement. Note: all the front stacks in the terrace have been rendered with cement and have an architectural detailing which is unique. It is not possible to assess the condition of the flaunching or the render without safe access. However, cement flaunching tends to crack and needs replacing/ repairing periodically; this will include the mortar around the neighboring property's pots. Any repairs carried out to the cement must be done very sensitively so as not to change the character of the stack.

The detailing of the lead back gutter and flashing at the base of the front stack is poor. The back gutter has been worked on recently. The slates behind the stack are missing and mastic has been used in an attempt to point in the flashing that covers the back gutter. The flashings at the side of the stack have not been stepped in to the brickwork. The flashing has been mucked in with a lower quality of cement mortar, which is failing. It should be noted that cement mortars applied to lead will always fail eventually. This is because the lead expands and contracts with changes in temperatures but the cement being rigid tends to crack as it can not accommodate any movement.

There is a redundant satellite dish attached to the stack. This should be removed.

The rear stack has only one pot (and only one flue). The pot and its rain cap are of red clay. The pot is set in cement flaunching and the brickwork facing the front has been rendered with a thin coat of cement. The stack has been re-pointed with cement, which has failed and has damaged some of the bricks to the lefthand side of the stack.

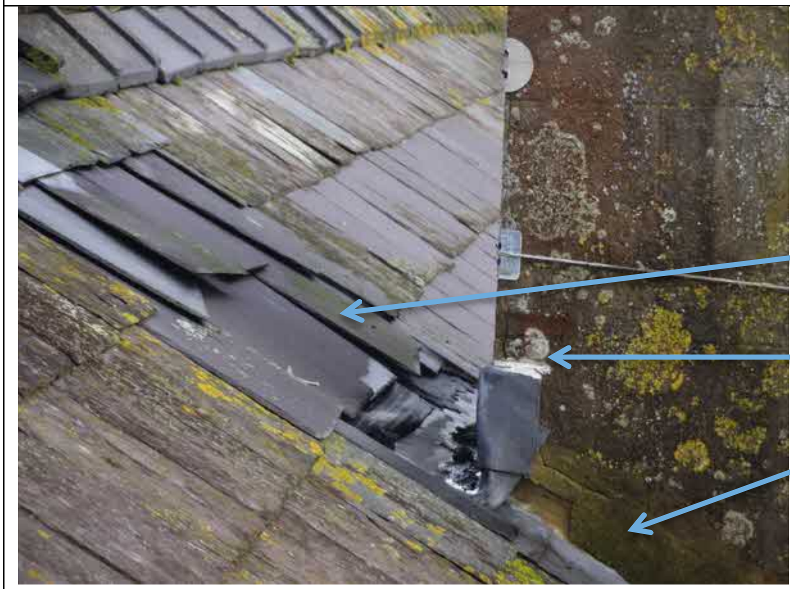
The stack has a slight lean to the south; brick built chimneys tend to lean away from the north, this is thought to be due to frost jacking. The masonry to the north doesn't get the benefit of the suns heat and faces the colder winter weather and any water in the buildings fabric that has turned to ice jacks up the stack, whereas as the south facing part of the stack tends to thaw sooner, causing the stack to lean.

The flashing detail is good but the condition of the lead cannot be established without accessed inspection. The stack will need re-pointing, with lime.

Section summary

Both stacks will need accessed inspection to establish the mount of repairs required. The fact that the property is in a Conservation Area and is so important to the overall character of the land/ seascape it is important that sensitive repairs be caried out to the cement render on the front stack and the retention of the patina is considered. The wholesale removal of the render would be a mistake that would cause irreversible damage to the (shared) stack and its character. The flaunching will more than likely need to be replaced on both (shared) stacks and this can be done with a NHL 5 mortar mix. The repairs to the render of the front stack need to be done with a specified NHL 2 mortar mix that will provide flexible repairs and which will also achieve a close aesthetic match.

The rear stack will need the cement pointing and render stripping and the damaged bricks replaced on a like for like basis and the stack re-pointing, with a specified mortar, which will need to be softer than the bricks. This is likely to be a slaked quick lime, maybe slightly gauged with a pozzolan or a formulated NHL2 mix in order to soften it to what would have been described historically as a feebly hydraulic lime.

	The chimney stacks
	Back gutter of front stack Notes: Missing /broken slates Bodged in mastic Failed cement fillet
	The rear stack Notes: Failed cement mortars Damaged bricks

4.2 Roof Coverings

There are four roof areas:

The main roof
The porch roof
The first extension
The second extension

The main roof, the rear addition and the extension roofs are traditionally hand cut and pitched, with ridges that run parallel to the main walls that they are built off of. The main roof and the second extension have gable ends.

The porch roof has an unusual slate covering. There are two pieces of thick slate on a low pitched roof with a concrete ridge. The concrete will need minor repairs.

The main roof, the rear addition and the extension have been re-covered some time before the mid 1990's with Welsh slates, with blue clay ridge tiles, which have been bedded in with cement mortars. The slates have been fixed to battens on a re-enforced polythene undersarking/underlay. Note; from the mid 1990's breather membranes were used for undersarking on roof in the UK. The undersarking which has been run in to the gutters has degraded, this is due to exposure to UV (ultra-violet) light. The undersarking in the roof spaces (where seen) has not been affected. Note; undersarking/ underlay is a relatively new technology and wasn't used on pre-1919 slate and clay tied roofs. The roofs had enough pitch on them to shed rainwater effectively and there was enough incidental (draughts) and cross-flow ventilation from the eaves in the roof space to clear any wind driven rain that penetrated the area. Also, slate and tiled roofs will not leak if a slate/tile is missing in isolation as there is enough coverage provided by the surrounding slates/tiles. The idea of undersarking is to provide a secondary barrier which collects any rainwater that has penetrated the roof covering and deposit it in to the gutter. In situations where a roofs undersarking has failed at the roof ends, proprietary felt support tray can be post fitted.

The lead flashings where first extension meets the back of the main building and the second extension has been chased in instead of being stepped.

Apart from the missing/ damaged slates behind the back gutter on the front pitch, a slipped slate at the first course of the right-hand pitch at the rear addition and a missing slate at the right-hand pitch of the extension, the roof covering are in a fair and serviceable condition. The missing/damaged slates should be replaced as soon as possible.

	The front roof – in context
	The rear roofs – in context
	The right-hand pitch of the fi extension roof

4.3 Rainwater Goods and Drainage

The original rainwater goods (gutters and rainwater downpipes) have been replaced with u-PVC versions and the original design has been altered.

Note; in almost every case we see, the management of the rainwater goods and drainage is always an afterthought when buildings are extended or altered. This more often than not results in design clashes and causes damp and sometimes in extreme cases, structural/ localised subsidence issues that can be on going until they are dealt with.

The downpipe that collected rainwater from the front pitches of the roofs of No.1 and No.2 South Road has been removed and the rainwater has been redirected so it runs to the left-hand end of No.1 and in to a dog legged downpipe that discharges on to the ground instead of a drain. This will be causing localised dampness at the base of the wall and could lead to localised subsidence as the large amounts of rainwater being discharged could end up washing away the ground that the foundations are sitting on.
The ground where the old downpipe would have run to was dug up by the surveyor in order to see if a drain could be located but the external ground levels have risen so much that it will take some proper excavation to find the drain. A piece of cast iron from the old downpipe was found in the ground, further indicating there is a drain here. Note; this downpipe positioning is still in place at the other end of the terrace, and so is the poor detailing of discharging rainwater on to the ground at the side of the building.

The rainwater from the rear pitch of the main roof discharges away and into a downpipe in the neighboring property.

The rainwater management at the lefthand pitch of the first extension is compromised by the construction of the second extension. The rainwater from the left-hand pitch of the second extension discharges on to the roof here. The rainwater has no where to go other than into a downpipe that discharges on to the ground; this could be causing localised damp and could lead to localised subsidence.

The rainwater management and drainage at the back of the building has been run in an ad hock fashion and is a demonstration of poorly considered drainage design. A plinth has been built to carry the drains at the side of the first extension. The bathroom waste from the main building, the kitchen waste and the rainwater from the right-hand pitches extensions both discharge in to the same drains. The drainage then runs in to shallow below ground drainage at the side of the extension.
The manhole coverer at the plinth and next to the extensions were lifted and foul waste was observed in both inspection chambers. The drain from the extension bathroom to the drain has been poorly run and will be causing foul water to splash on the benching opposite, where some form of fungus is growing. The other two manhole covers were not lifted as they are a two man lift and the handles are prone to breaking if lifted by one man from one end.

	Rainwater runs at the left hand pitches of th extensions
	Combined foul and rainwater being run in the same drains at the side of the extensions
 	Inside the inspection chambers

4.4 External Walls

The Main Building; front and side elevations

The external walls of the main building are of solid wall construction, they are one brick thick (9 "- nine inches), up to the gable end, where the thickness reduces to half a brick thick (about 4' – four inches), with an off-set pier. Reducing the brick thinness at the gable was often done to save some construction costs. The bricks are relatively soft 'Kent reds' laid in a Flemish bond. The walls at the front and side elevation have been rendered with cement and decorated with impervious masonry paints.

The cement render was checked as far as reasonably possible by striking it with a steel plugging chisel and listening for any changes in the sounds and feel form the actions. The render was generally found to be firmly attached to the walls.

There is some distortion in the render above ground floor window, there could be a timber lintel or a replacement concrete one under it. This area will need opening up to see what material the lintel is. If it is timber and it has decayed, it will need replacing.

There is diagonal cracking in the render at the front elevation of the main building from the top corners of the ground floor window to the bottoms of the windows above. If an imaginary perpendicular line is struck off from crack paths, they will point towards the cause of the crack. in this case the arrows point towards the tops of the of the lower structural openings.
It is common to see cracking between the tops and bottoms of an old buildings structural openings which have been rendered with cement. The cement will crack as the building moves throughout the seasons with thermal expansion and cracking will occur at the weakest points in the masonry. Normally, the structural openings of an old building would be directly above each other and the cracks would run in pairs vertically between the corners. However the buildings structural openings are unusually offset and it looks like the movement has taken the path of least resistance and the render has cracked at the weakest points.

A couple of areas of the render at the front and side elevations, where the render has cracked at low level were opened with the use of a SDS rotary hammer drill. The cement was found to be firmly attached to the brickwork and the opening up was stopped to avoid damaging the masonry. The material in the chasing looked to be cement and brick, indicating previous repairs.

There are a couple of areas in the render at the side elevation, one at low level and one higher up that look like there may have been openings there. The top one is at the gable but there were no signs of an opening when the wall was viewed from inside the roof space. The are various cracks elsewhere in the render which are common.

The window sills (all elevations of the main building) are replacement cast concrete versions. The window sills are missing drip details. Note; Drip details are groves under front edge of a sill. The grooves are designed to throw rainwater away from the wall and prevent water from running under the sill and into the sill / wall junction. Missing / faulty drip details can allow rainwater to soak a wall locally and cause accelerated decay to the buildings fabric. The sills have various defects and the

-window reveals have been repaired (with cement) in places and there are areas where the render sounded loose. The render at the window on the right-hand elevation of the main building has cracked and is failing.

Diagonal cracking between the structural openings at the front elevation

Notes:

The yellow lines indicate the crack paths and the perpendicular arrows are pointing at the tops of the structural openings below

Blue arrow is pointing at the distortion in the lintel above the ground floor window

Section Summary

Cement render tends to hide a multitude of sins and the level of defects that its covering isn't revealed until its been removed. The removal of cement render can be a brutal process. The cement is firmly attached to the brickwork and will take off the fired faces of the bricks. The wholesale removal needs to be justified, and when it needs to be done, it must be done by skilled people that have experience with this type of work.

Once render has been removed, whether it be localised areas for repairs or wholesale removal, the replacement must be a well considered lime mortar, decorated with lime wash. Note; lime wash is the correct material to decorate lime work with. The lime wash is easy to apply, is long lasting and easy to maintain. Lime wash has 'moods' and changes colour/ becomes a darker tone when its wet, returning to its natural colour tone as it dries. It also gives off a unique glow due to the double refraction of the calcite crystals in the material.

Example of cement removal and re-rendering ; Farmhouse

Notes:

- The full extent of the repairs only became evident after the cement was removed
- Vertical cracking between the structural openings

Arrowed yellow line is pointing at the during and after alterations and repairs

Project managed by Standard Heritage

Example of localised repairs, including structural work; re-faced timber framed buildings

Before paint removal and localised structural repairs, including cracks between the structural openings

Final finish, after repairs

Note; the double refraction producing a glow in the early morning light

Project managed by Standard Heritage

Rear elevation and extensions

The brickwork where it joins the neighbouring property at the party wall junction dis-jointed, the bricks do not follow the rhythm of the brick bond, this indicates that the bricks between the two houses were laid at different times. There is a cracked brick at the top window arch which could do with replacing when the area is accessed. The wall has been re-pointed with cement, coated with a Black Jack type of bitumen paint and finished with impervious masonry paint. The wall would benefit from having the bitumen paint and the cement pointing removed. Removing the bitumen will not be an easy job and may need wet blasting to get it off, or alternatively a TORC cleaning system may do the job. Contact STONEHEALTH for technical information; https://stonehealth.com/products/torc/

Once the bitumen is off, the cement can be stripped and the wall re-pointed with a specified lime. Once the wall has been repointed, it can be decorated with a modified limewash called Pozzilime. Pozzilime is designed to cover all substrates and works really well on new work too. See Inglby website; https://www.ingilby.co.uk/limewash

The extension walls are half a brick thick, which are bedded in with cement mortars. The first extension walls have been coated with a Black Jack type of bitumen paint and the second extension walls have been rendered with cement. The walls have been finished with impervious masonry paint. The removal of the cement is not recommended as it may cause irreversible damage to the walls, the render should be repaired with a lime mortar and lime washed. This applies to the boundary wall too.

The bitumen paint could be stripped or lime washed over.

The left-hand elevation of the first extension houses the gas and electricity meters, the backs are evident on the inside of the wall due to the lack of depth in the masonry and the mains wire has been run externally in to the fuse box at the top of the wall inside the kitchen.

There is an area of wall under the structural opening of the window at the first extension that has been either repaired or a larger opening bricked in. This may have been a shop front.

The walls in the extensions need to be built out and this could be done with well designed breathable insulated dry-linings.

As reported on earlier in the report; there is a really unusual masonry plinth has been built against the right-hand elevation in order to carry drains, part of which is open.

4.5 Damp Proof Coursing, External Ground Levels and Internal Floors

The relationship between the external ground levels and the internal floors is significant and needs to be considered at the same time in this section of the report as best building practice is to have external ground levels at least two brick courses or 6” (six inches/ 150mm) below damp sensitive internal building fabric such as and subfloor timbers built in to the external walls, skirting boards and internal plasters.

In a traditionally built building, this distance is significant as it allows any ground moisture to evaporate harmlessly away from the building’s fabric at first tow brick courses at the base of the wall. It is also significant as it is governed by the height of the splash back from rain; rain will not splash back higher than two brick courses (150mm), thus keeping any sensitive building fabric such as built in subfloor timbers and the internal building fabric out of the of the range of the additional moisture at the base of the walls caused by the rain splash back. This detail is current in UK building regulations; *Approved Document C: Site preparation and resistance to contaminates and moisture.*

The original external ground levels have raised over time, so much so that they are only about two inches below finished floor levels at the front door and marginally lower at the back door. The subfloor grills at the front and back of the main building are a good indication of the original ground levels. Typically the external ground levels would have been two brick courses below the bottom of the grills.

The external ground levels rise away from the front of the building. The external ground levels at the side of the main building by the window are above the internal floor finish by about four inches (100mm) and the hard standing in the garden has a step to accommodate this.

The main building was built before Damp Proof Courseing (DPC) became mainstream construction practice in the late 1870’s.

With or without a DPC the main building fabric would have relied on appropriate external ground levels, adequate internal ventilation and the breathability of the lime bedded and pointed masonry and plasters to allow moisture to evaporate and breathe harmlessly away from the base of the walls. Many damp problems in older properties are found from this mechanism of controlling damp being altered and the misunderstanding of movement of moisture within the building.

It wasn’t possible to locate any DPC in the extensions due to the materials applied to them. There may not be any as the structures were not built for habitation or to building codes of the time.

Holes have been drilled into the walls of the main building and the second extension, vertically and horizontally for the application of a so called ‘chemically injected DPC’s (Damp Proof Course) in a misguided attempt at managing dampness. It should be noted that these so called chemically injected DPC’s are completely ineffective.

There is some suspended timber flooring at the front room, with some hard spots but replacement concrete floors in the back of the main building and into the rear addition. There are suspended timber floors in the hall and bedroom at the second extension but solid ground bearing slabs in the bathroom and utility.

The single subfloor grills in the front and back walls of the main building, which would have provided subfloor ventilation for suspended timber floors. There would have been subfloor grills at the side of the building, but these have been rendered over. There is an airbrick at the base of the right-hand wall of the second extension.

Concrete ground bearing slab floors with or without Damp Proof Membrane (DPM), or any impermeable solid floor, will tend to push any moisture under the slab towards the walls at its edges. This is opposed to traditionally loose laid flagstones or suspended timber floors, which through adequate internal ventilation and breathability will allow the evaporation of moisture. As infilling with concrete is inappropriate in older solid walled properties, common practice is to use LABC (Local Authority Building Control) approved Lime-Crete instead to prevent ground moisture from reaching the slab by providing a breaks in the surface tension, (which is the transport mechanism for moisture in masonry) and to allow breathability. Lime-Crete floors are naturally insulated and are ideal for the installation of under-floor/ integrated heating.

See Ty-Mawr website for Lime-Crete floor details;
https://www.lime.org.uk/products/sublimer-insulated-limecrete-floor.html

The LIMECRETE Company provides excellent services and can price up a job remotely. See website for more details;
https://limecrete.co.uk

4.6 Doors, Window and Second Fixed Timbers

There are replacement timber boxed sashes and at the front elevation. The sashes have the wrong detailing. The sashes have a six over six configuration but have horns and an increase in meeting rail dimensions that were introduced as glass sizes increased after the relaxation of the Window Tax in 1850. The horns on the sashes were designed for two over two sashes. This glass configuration and the reduction of glazing bars, which helped support the glass with their wedged tenons and mortices resulted in the need for thicker meeting rails and horns to help support them being introduced. The main rhythm of the windows at the first floor in the terrace are a two over two configuration. Note; the structural opening of the ground floor window is smaller than No.s 3 and upwards of South Rd, which have Regency/ Georgian style bow bays at the ground floor.
The windows have crude brush strip on the parting bead but the windows are still loose in their boxes and are draughty. The timber in the windows and the boxes were found to be firm when pressed with a Stanley knife.

The porch door is timber planked and ledged. There is some localised decay at the bottom of the door and its frame and at the back of the centre ledge, the bottom ledge to the left has had a piece of new timber attached to it, in the form of crude repair.

The front door is metal framed split ‘stable or Dutch door’ which is in exceptionally good condition, including its lock, which is fully functional.

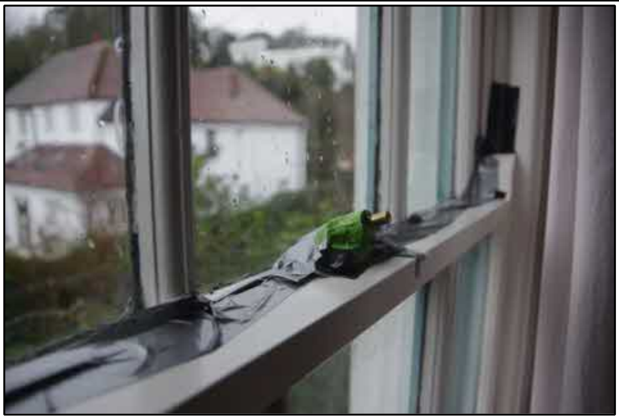
The ground floor side window my have been a boxed sash window set at one time. It looks like the box is still in place and the current double glazing unit has been inserted in to the box and had timbers tacked in to hold it in place. The timber around the external par of the window is decaying.

There are u-PVC replacements at the back of the main building and the bedroom in the second extension.

There are various styles of timber windows elsewhere in the extensions. The widow to the left of the second extension is decaying.

The buildings energy efficiency would improve with brush stripping/ draught proofing the doors and windows. New factory made timber double glazed windows throughout could be considered, along with a new back door.

See https://www.mumfordwood.com/

	Example of crude and incorrect detailing at the meeting rail of sliding sash
	Extremely draughty window taped up
	Timber windows in the street scene at the first extension Note brick infill work below the windows
	Decaying timber at the second extension, at the street scene

5.0 Building Interior

5.1 Roof Spaces and Structure

The roof has been recovered using an impervious under sarking and there is no real provision for cross flow ventilation, this is effectively sealing in the roof in. When a roof has been recovered in this way, condensation tends to form on the underside of the impervious felt and the timbers, which can then cause the moisture content of the rafters to rise but this is rare as the timber structure has the ability buffer moisture i.e. absorb and desorb high humidity levels.

White mould is has formed on the rafters. White mould is relatively harmless but is an indicator of high humidity levels in the roof space which are usually caused by unmanaged internal environments in the building below.

The situation with the lack of cross-flow ventilation can be remedied by adding simple 'felt lap vents'. See link; https://www.manthorpebp.co.uk/roofing/roof-ventilation-—-solutions-modern-day-problem/felt-lap-vent

The roof structure was found to be in good shape and free from any decay related damage apart from under the back gutter of the front chimney stack. The trimmer and the and the gutter board have been replaced. This will be due to a leak. Note; this is where the missing /broken slates are.

Some of the bricks in the chimney breasts have become friable. These bricks could be replaced.

The Party Wall has been in filled with concrete blocks so as to provide a fire break. There are areas in the block work that are missing mortar. These areas need to be finished either with a mortar or fire rated intumescent foam.

The main roof has been very poorly insulated and what insulation that is there will not be providing any benefit at all as a roof plane has to have an even covering of insulation across the entire roof plane. All the benefits of a buildings loft insulation can be lost through an insulated loft-hatch.

There are redundant plastic water tanks in the area, these should be removed as have no use and will prevent the laying/ fitting of insulation.

There is no access to roof structure of the first extension due to the timbers and the boxing-in fixed to it, so the timbers could not be checked. It is doubtful if there is any ventilation provided.

The roof space in the second extension was viewed from the access hatches at both ends of it. The timber structure was in good shape and looked to be free from any decay related damage. The roof has been re-covered with the same impervious under sarking as the main roof. This roof space has been poorly insulated too. The roof space houses various pipes to do with the central heating/ hot water system.

Both accessible roof spaces will need to be cleared out for the fitting of insulation. The roof covering at the first extension will need to be lifted or the ceiling taken down to fit any insulation. See report section 7.0 Energy Efficiency for information on insulating roofs.

	Inside the main roof space
	Insulation stuffed it to the gap between the roof and the fire break
	Example of gaps in the fire break
	Repairs to the roofs timbers at the front back gutter

5.2 Chimney Breasts and Fire Places

There are two chimney breasts in the main building which serviced three fire places; two at the front breast and one at the rear on the ground floor in the dining room.

The fireplace in the front bedroom is blocked up and there is a cast iron fire pace on the ground floor that is fired up with natural gas; the condition of the flue liner and the method if insulating it is not known. Note; Unused chimneys need their pots to be capped and the flues vented at low level, this is to provide cross-flow ventilation which prevents rainwater penetration and condensation building up inside the flue. Masonry in an around chimney breast, particularly at the tops of chimney breasts at the top floor can be contaminated with salts deposited from the burning of fossil fuels. The soot deposits on the inside of chimney flues contain salts, if they get wet because of rainwater penetration and or condensation formation due to the lack of ventilation caused by fireplaces being blocked up, the salts will diffuse in to the masonry and can appear on the chimney breasts. These salt deposits are hygroscopic, which means they will absorb moisture from the internal environment. Once internal relative humidity's exceed 80% (21ºc) the salts will absorb the moisture in the air and become damp, staining decorative finishes.

The chimney flues need to be inspected and CCTV surveyed before any type of use, particularly the gas fire as there is a risk from carbon monoxide with defective flues and flue liners. Note; a vent has been provided in the front wall in order to service the gas fire.

There is a chimneybreast in the second extension, which carries on up through the roof space but has had its stack removed.

5.3 Ceilings

The ceilings in the main building are plaster board, skimmed with gypsum plasters.

The ceiling in the first extension is timber boarding, with a boxing in that houses the hot water pipes from the boiler to the main building.

The ceilings in the second extension are plasterboard, skimmed with gypsum plasters.

5.4 Internal Walls and Partitions

The external walls internally are a mixture of solid cementitious tanking plasters and dry linings. The cementitious plasters were nearly always part of a (misguided) retrofit 'chemically injected DPC' system. These systems apart from failing to address the causes of damp issues tend to trap moisture, particularly if the buildings external envelope has been covered with any sort of imperious material.

Dry-linings were originally developed by the Georgians. The dry-linings were fitted in situations where it wasn't possible to present dry internal walls due to external issues that couldn't be changed such as external ground levels being level or above internal floors and locations that were extremely exposed and suffered from dampness caused by wind driven rain.

Timber laths were fixed to battens on the walls, which were plastered (with lime) and often vented all the way up to the roof space where any excessive moisture was vented away by the incidental ventilation (draughts) around the slates and any cross-flow ventilation from the the eaves. This provided a vented breathable dry-lining.

The dry-linings against some of the walls are a modern interpretation on this. However, they are not breathable elements due to the application of bitumen felt behind the battens against the walls and the plastic paints applied to them internally, nor are they ventilated.

There is scope to provide insulated breathable dry-linings against the external walls on the ground floor and wood-fibre boards directly against the wall on the first floors. Both systems can be plastered with lime.

The masonry spine wall which would have ran from left to right and would have divided the building up has been removed at ground floor level. The means of support for the masonry above is not known ie. Universal Beam/ RSJ (Rolled Steel Joist) of a flitch beam (composite timber and steel). The support sits on stepped nibs at each wall. There are no signs of current or on-going movement. It would be wise to open up the

There are timber stud partitions in the back bedroom which divide off the stairs and the back bathroom.

There is timber wall, with a traditionally made door at the utility.

There is a stud wall between the hallway and bedroom No.3 in the second extension.

5.5 Floors and Staircases

Upper floors and staircases

The upper suspended timber floors were subjected to the heel drop test' ; the heel drop test is carried out by raising to ones tip toes and dropping the full weight of the body on to ones heels and noting any excessive deflection in the floor. The floors felt firm enough under foot. However, the condition of the joist ends where they are built in to the walls need to be checked.

The single flight staircase between the floors of the main building, which runs from left to right. The staircase is a relatively modern replacement.

5.6 Joinery, Built in Fittings and General Decor

Doors and Second Fixed Timbers

There are some traditionally hand made ledged doors

The original skirting's have been replaced by simple square edged boards. Note; the skirting at the front wall of the bedroom No.1 has been formed with cement. This could have been done to replace a decayed timber version.

Kitchen

There is a functioning kitchen.

Built in fittings

There is a built in cupboard in bedroom No1 and an unusual cupboard above the stairs.

Décor

The entire property needs re-decorating, inside and out.

5.7 Services

The services (gas and electric) are not tested or commented on as far as compliance with current regulations. It is recommended a qualified persons from NICEIC / Gas Safe UK are commissioned to test electric / gas services. Save for the above, the following comments are made; There is an old fuse box/ isolator mounted on the left hand wall of the kitchen. The mains power cable has been run on the out side of the wall from a new Smart meter and switches which is accessed externally. The meter has been badly fitted and is loose on a board. The gas meter is also situated externally next to the electricity.

The building is heated with gas central heating. The boiler was installed in November 2016 according to the Local Authority Planning Portal;
https://publicaccess.dover.gov.uk/online-applications/buildingControlDetails.do?keyVal=ZZZXY4FZMS619&activeTab=summary

The pressure in the boiler was low at 0.5 of a bar, it should be around >1.5 bar. A drop in the boiler pressure is an indication of a leak somewhere in the system. A plumber that has the ability to pressure test the system should be engaged to test it and to locate any leaks and repair them.

The Mains Water meter is in the ground at the side road. The meter is new, and so is the pipework to and from it (where seen). However, there may be concealed lead pipes inside the property.

6.0 Measuring Damp and the Internal Environment

Along with visual and physical (touch/ feel) assessment of the property various pieces of surveying equipment were used to measure dampness inside the building and its extensions:

A thermal imaging camera was used to view any differences in the temperature of the building fabric; damp building fabric has lower temperatures compared to dry building fabric

A scientific grade thermo-hygrometer was used to measure the humidity and temperatures inside the building. The meter has a long probe (4x 230mm), which can be placed into gaps, and drilled holes etc. Raised localised Absolute Humidity (AH) is indicative of damp

A resistance meter was used to measure the moisture content of timber. Note resistance meters do not in fact measure damp, they measure electrical resistance and the measurement is expressed as WME (Wood Moisture Equivalence). It also should be noted that these meters can not be used to measure moisture in masonry as they will record the presence of salts and carbon and give unreliable results

A gas carbide meter was used to test masonry samples taken from within the walls in order to build up a moisture profile of the buildings fabric which will inform any remedial works.

Thermal imaging is a useful tool for identifying areas of potential dampness in the building fabric and at depth and at its surface. However it can not tell the difference between cold and damp fabric.

The thermo-hygrometer was used to assess the internal environment. The results can be cross-referenced with the temperatures recorded with the thermal imaging camera to assess condensation risks. Note; the conditions for the thermal imaging and the thermo-hygrometer were only a snapshot of conditions on the day, in an unoccupied property. These conditions will change with occupation.

The resistance meter is only used with caution and occasionally as it can be such a misleading instrument.

The best way to establish the Total Moisture Content (TMC) of masonry is to take samples from deep within the walls and measure them chemically with a Gas Carbide Meter; Gas Carbide testing is the definitive onsite method for accurately measuring the TMC in masonry.

Carbide readings in masonry of over 2% TMC indicate that there are raised moisture contents which caused by something other that normal conditions. Any timbers in contact with masonry with a TMC of > 3% can become damp and gypsum plasters may be damaged. TMC's up to 4 or 5% can be considered reasonably dry in a traditional masonry unit but may cause damage to some decorative finishes other than natural breathable materials. TMC of >5% can be considered an appropriate threshold where action is needed to remedy a problem. It should be noted that the moisture contents of masonry can and does increase with periods of extended wet weather by up to 2%.

For more information on the Gas Carbide Meter, see link
https://standardheritage.uk/wp-content/uploads/2017/11/Calcium-Carbide-Meter.pdf

Thermal Imaging

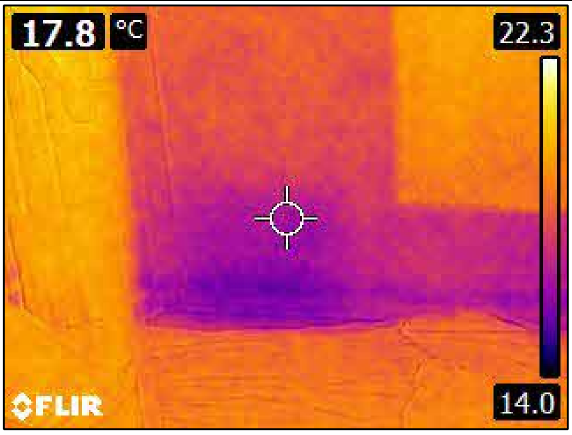
Thermal imaging ideally needs a buildings fabric to be up to operational / occupied temperatures so that the camera can 'see' the differences in the temperature of the building fabric. However, the heating in the property was on and the camera provided some meaningful images.

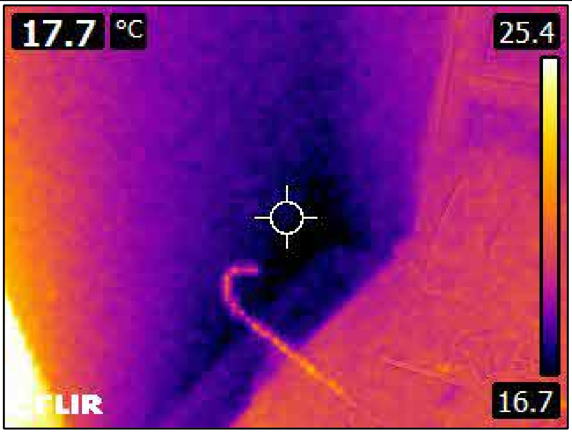
Notes on thermal images:

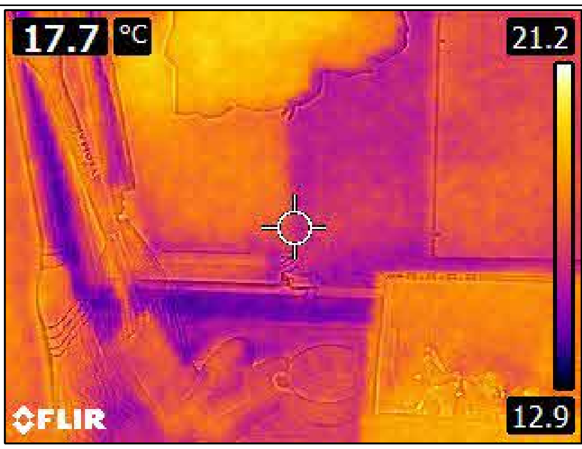
The darker colours represent cooler temperatures

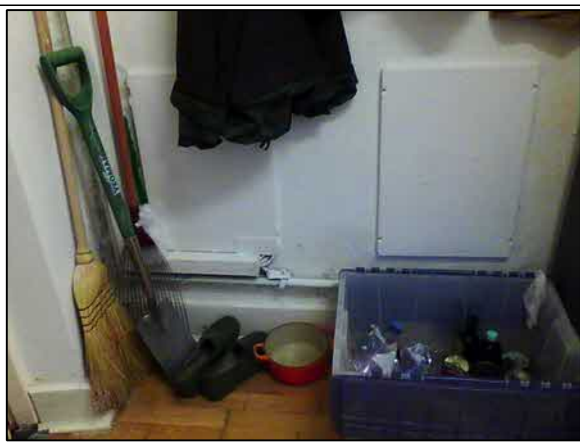
The temperature at the top left of the image shows the temperature in the cross hair

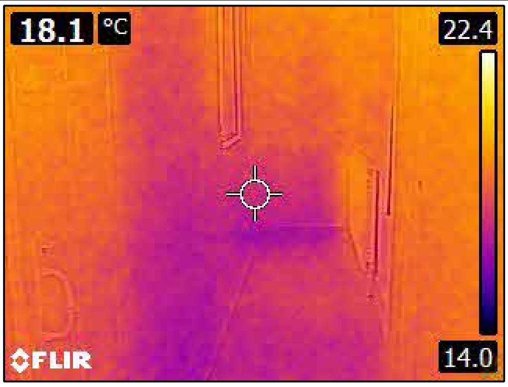
The scale to the right shows the range of temperatures in the image

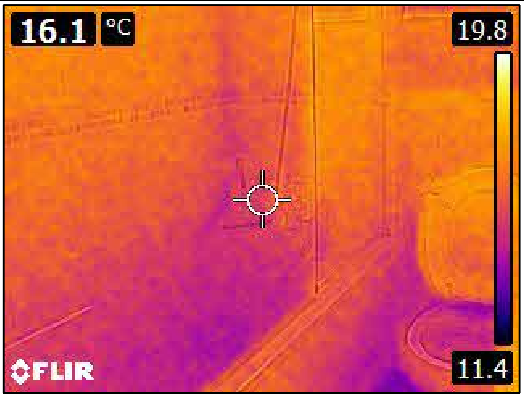
<table>
<tr><th>Example Thermal Images</th><th>Comparative Digital Images</th></tr>
<tr><td>

Drylining at external wall in dining room</td><td></td></tr>
<tr><td>

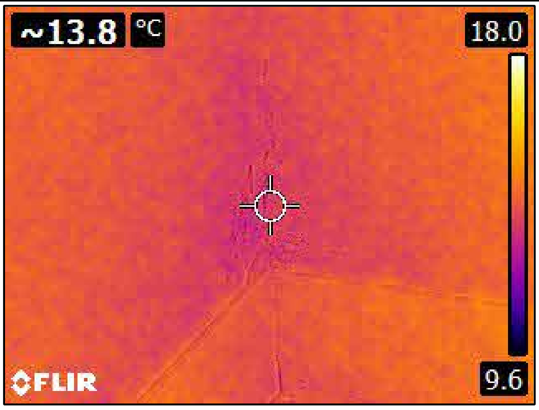
Back wall of dining room, right-hand corner</td><td></td></tr>
<tr><td>

Left-hand side wall of kitchen</td><td></td></tr>
</table>

<table>
<tr><th>Example Thermal Images</th><th>Comparative Digital Images</th></tr>
<tr><td>

The hall way at the second extension</td><td></td></tr>
<tr><td>

Bathroom in the second extension</td><td></td></tr>
<tr><td>

Righthand wall of bedroom No.3</td><td></td></tr>
<tr><td>

Front right-hand corner of bedroom No.3</td><td></td></tr>
</table>

Humidity and Temperature

The ambient internal and external humidity and temperatures were recorded as controls, these controls can be compared to the localised recorded measurements that were taken form various places around the property.

Note;
The important measurements are the Absolute Humidity (AH) and the relationship between the Temperature (ºc) and Thermal Dew Point (TD). Relative Humidity (RH) will vary with differing temperatures but the AH is the actual amount of water vapour in the air at the time and will be a constant. AH is measured by the amount of grams of water per cubic meter of air and is expressed as **g/m^3.** Relative Humidity indicates how close the water vapour is to forming as condensation.

Water vapour will condense on materials when the temperature drops to the TD. For or example, the temperature and the TD are less than 1ºc at measurement E. and water vapour will condense with a minor temperature drop.

Positions where the humidity and temperatures were recorded:

A. External conditions
B. Ambient, ground floor, main building
C. Ambient, first floor, main building
D. Ambient, kitchen
E. Ambient, utility
F. Ambient, back bathroom – extension
G. Under the floorboard next to the party wall at the front of the main building
H. Void between the suspended timber floor and the solid floor of the extension bathroom
J. Bottom front right-hand corner of bedroom No.3, at low level where black mould has formed

	Relative Humidity	Temperature	Thermal Dew Point	Absolute Humidity – g/m^3
A.	89.9%	11.9 ºc	10.3ºc	9.5 g/m^3
B.	64.7%	17.8ºc	10.5ºc	9.8 g/m^3
C.	65.6%	17.1%	10.6%	9.5g/m^3
D.	74.6%	14.9 ºc	10.5 ºc	9.6 g/m^3
E.	62.6%	19.2 ºc	12.2ºc	10.5 g/m^3
F.	77.9%	14.2ºc	10.4 ºc	9.5g/m^3
G.	72.3%	14.4 ºc	9.5ºc	8.9g/m^3
H.	96.0%	12.0 ºc	11.3ºc	10.2 g/m^3
J.	85.3%	13.3 ºc	10.9ºc	9.8 g/m^3

Section Summary

The ambient AH through out the property was fairly consistent, and consistent with the external levels, this was partly due to various windows being open in the property on the day of the survey. However, the temperatures between the main building and the extensions were different. The ambient temperatures in the main building were 17.1/8ºc but the ambient in the extensions they were 14.2/9ºc. This demonstrates how temperature alone can affect the RH and that by raising it, it lowers the condensation risk.

The Thermal Dew Point at the bottom front right-hand corner of bedroom No.3, was recorded at 10.9ºc and the lowest temperature picked up by the thermal imaging was 9.6ºc. This means that water will start forming on the surface of the wall with a temperature drop of 1.1ºc.

The utility was in use and clothes were being dried, presumably after being washed. The Absolute Humidity was up at 10.5 g/m^3 but as soon at temperature drops to outside levels the RH goes up to 98.5% and condensation will start forming with a slight drop in temperature.

The Relative Humidity in the property can be referenced against this table;

RH levels and effects; source - Edwards Hart (2015)

RH (%)	Typical Effects
100	Saturation percentage
>96	Mould can form on glass wool
>90	Bacteria can multiply; mould can appear on brick and painted surfaces
>85	Dampness stage; materials can become visibly damp or damp to touch. Timber decay occurs
>76	Mould can develop on leather. Multiplication of mites greatest above this level
>70	Viability of mould increases markedly
65	Maximum optimal comfort level for humans
40- 50	Minimum survival level for dust mites
45	Minimal optimal comfort level for humans. Electrostatic shock more likely below this level.

Results of gas carbide testing

No.	Position	Result in TMC
1.	Front wall of main building, to the right of the window, low level	13.0%
2.	Front wall of main building, to the right of the window at 1000mm	10.1%
3.	Front wall of main building, to the right of the window at 1850mm	12.1%
4.	End of left-hand wall, inside porch at 150 mm up	12.0 %
5.	End of left-hand wall, inside porch at 1800 mm up	14.0%
6.	Brick pier between sitting and dining rooms – new brick, low level*	0.5%
7.	Dining room wall, low level	10.4%
8.	Dining room wall 1700mm up	9.4%
9.	Front bedroom wall, low level; The wall was friable here and the first couple of attempts at gaining samples failed	14.9%
10.	Masonry nib wall on first floor, spine wall, inside cupboard area	5.0%
11.	Back wall of dining room	14.8%
12.	Kitchen wall* (behind bin)	0.0%
13.	Left-hand wall of bathroom in second extension*	5.0
14.	Bottom front right-hand corner of bedroom No.3, at low level	0.0%

Damp Section Summary

It is unusual to see such high TMC's in an old buildings fabric. Typically, the damp tends to be at the base of the walls and diminishes the further you go up. It is extremely unusual to find the extreme high levels such as those at the front bedroom. This situation would not exist if the walls were in their original state and had not been rendered and re-plastered with cementitious mortars and decorated with impervious materials. The condition of the wall in times past is not known but there is usually a good reason behind the decision to render a wall; there may have been all sorts of defects in the masonry.

The defective window sills will be a cause of dampness. The missing rainwater downpipe may have been defective and one of the reasons behind its removal, and the gutters may have been in a state of neglect, saturating the masonry below. The wholesale removal of cement render and stripping a building of its plasters (and dry-linings) is a last resort intervention and we only ever recommend this

-in extreme cases – this is an extreme case. Unless the renders and internal finishes along with the cement pointing at the rear elevation are removed, the building will remain damp and will attract more moisture through interstitial condensation; interstitial condensation forms inside a buildings fabric and gets trapped by impermeable materials, particularly at the outside of the external envelope where the fabric temperatures are at their lowest. All the impermeable materials should stripped from the external walls of the main building.

As a general rule of thumb, masonry takes about a month an inch of thickness to dry out, once the impermeable materials have been stripped and all damp causing defects have been remedied. In situations like this it is recommended that commercial desiccant dehumidification be used, for an undefined period along with a snail air blower to accelerate the drying process. The old building would need to be sealed up as much as possible to avoid relatively humid external air from entering the place and the external walls would need a covered scaffold to keep them dry

Once the walls have dried down enough, repairs can be carried out and re-rendered externally with a specified lime mortar mix. This may provide an opportunity to insulate the internal walls with dry-linings made up with wood fibre-boards on battens attached to the walls with stainless steel fixings and plastic packers isolating the timber from the walls. See report section 7.0 Energy Efficiency for further information

The walls in the extension at test positions Nos. 12 and 14 were found to be surprisingly dry; the impermeable martials applied to the other side of the wall maybe doing a job of keeping them dry. However the results of test No.13 showed the masonry to damp at 5.0% TMC. The fact that test No.14 showed the wall to be dry, further demonstrates that the moisture that is needed for the black mould to form is being caused by condensation.

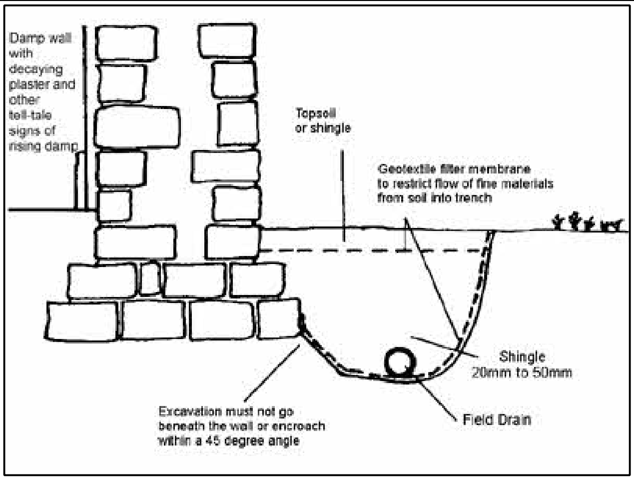
The masonry at the supporting nib at test No. 6 could be sitting on a DPC, thus isolating it from the ground.

It wasn't possible get to the subfloor of the surviving timber floor at the front of the old house without either cutting out a board or pulling back the carpet and lifting the length of a board. The recommendation here as with all the floors would be to replace them with a Lime-Crete floor system.

The rainwater goods and drainage needs to be completely re-worked and professionally designed. The rainwater from the front gutter needs to run in to a down pipe that discharges in to below ground drainage. A CCTV drain survey needs to be carried out to the drains at the front of the building, this will required some excavation works.

There is a challenge with the rainwater from the left-hand pitch of the first extension as there is no other route to a drain because the gutter line is below the second extensions. There maybe an option for the rainwater to discharge into a French drain. The alternative is to raise the roofline so it matches the second extensions, that way the rainwater could be run towards the back and around of it, where it could discharge in to a new drain.

The external ground levels need to be reduced to below the internal floor levels. This is not a problem at the front or the back of the property but it is at the sides as its still a loose laid track that was used for horse and carts but now driven on by large and heavy modern cars. The external ground levels here can be artificially lowered by very well and professionally designed French drain, which needs to be run in to below ground drains French drains are also last resort intervention. See IHBC guidance note;
https://www.ihbc.org.uk/guidance_notes/docs/tech_papers/French%20Drains.htm



Principle of French drain design

See diagram note at the base of the w excavations;

'*Excavations must not go beneath the wall or encroach within a 45 degree angle*'

Image; Ian Hume,I HBC

<u>The Internal Environment</u>

It is crucial that the internal humidity levels are managed in an old property, especially when its ability to breathe has been compromised by the use of inappropriate building materials and the blocking up of the building's built-in passive ventilation such as its chimneys. It should be noted that throughout any building damp problems can be encountered where airflow in rooms is limited.

Once internal relative humidity levels go above 75/80 % (21ºc) in any building the moisture content of its elements such as masonry and timbers, starts to increase and so does the condensation risk. Symptoms will include so called 'rising damp' patches on plasterwork at the base of walls, especially external walls, water condensing on and streaming down windows, odd patches of mould in areas of minimal air movement and hollow sounding plasterwork when tapped, especially around windows and near floors. This list is not exhaustive, but gives a flavour of the symptoms that can be experienced when subjecting an old building built with adequate ventilation and traditional materials, to modern air tightness and inappropriate building materials, for instance cement tanking plasters, gypsum plaster, cement render and pointing, acrylic emulsion paints, wallpaper etc. – anything which is plastic or impervious and prevents the fabric of the building from breathing.

The RICS reference publication, the Watts Pocket Handbook recommends humidity controlled ventilation and low background heating to help keep a building dry. Research by the Chartered Institute of Building Services Engineers (CIBSE) Historic England, Historic Scotland, the SPAB and others including our survey group, shows that if the internal relative humidity is maintained between 50 and 55% (21ºc) and background heating is maintained, few, if any damp problems will occur in a

-well maintained building. This is provided that the building fabric is kept at or above 15 degrees centigrade. To help maintain a low relative humidity level, it is necessary to introduce humidity controlled extraction at source with supplementary passive ventilation. All bathroom and kitchen areas should be externally vented and should be automatic.

To help reduce the risk of condensation we recommend installing good quality humidity controlled ventilation in the kitchen and bathrooms. I.e. Install VapourFlow WAD in the Kitchen and BlueRay unit in the bathrooms. This will manage the internal environment 24/7, 365 days a year.

The VapourFlow WAD provides Positive Input Ventilation (which extracts during times of high humidity spikes such as cooking), and cross-flow ventilation in the building when combined with extract. See links;

https://www.vapourflow.com/product/wad-k-warm-air-dehumidifier-kitchen-fan/

https://www.vapourflow.com/product/bluray-150-100-auto-continuous-kitchen-bathroom-utility-fan/

7.0 Energy Efficiency

There is a government led drive to reduce energy consumption in existing buildings. Managing a buildings energy efficiency is one of the keys in helping it provide a dry, comfortable and healthy place that runs economically.

It is extremely difficult, if not impossible, to retrofit existing buildings external walls with insulation due to technical challenges at the base of the walls and at the door and window reveals.

However, there is scope to carry out a 'deep retrofit' internally using breathable Solid Wall Insulation (SWI) building materials.

Good design and attention to detailing is crucial as all the benefits of SWI can be lost through un-insulated reveals and insulating part of a wall has no benefit at all. Poorly designed and difficult to detail SWI can lead to 'cold bridges' being set up which can lead to condensation formation. The unintended consequences of applying SWI are numerous with 19 major issues listed in the BRE (Building Research Establishments) document;
Solid wall heat losses and the potential for energy saving. See link;
https://files.bregroup.com/bre-co-uk-file-library-copy/filelibrary/pdf/projects/swi/UnintendedConsequencesRoutemap_v4.0_160316_final.pdf

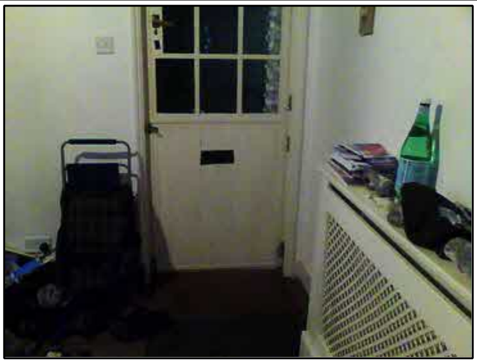
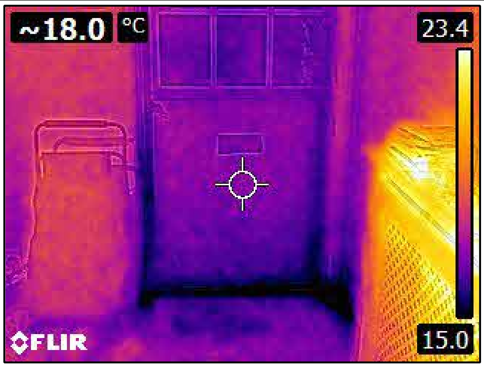
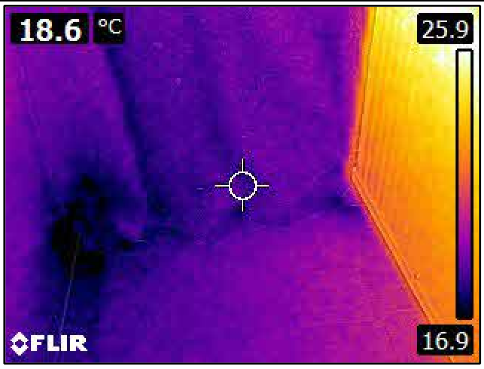
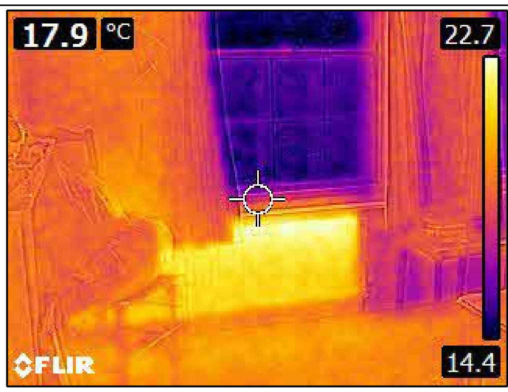
It is just as important, to keep the building fabric dry, reduce draughts and manage the buildings thermal mass it is to insulate its walls. Thermal mass is buildings ability to absorb/store the summers heat energy in its fabric and release it later. The best way of managing this stored energy is to maintain background heating at the end of the summer and in tothe colder months and never let the building fabric get cold as it will take a lot of time and energy to bring it back up to heat, which might not happen. Conversely the thermal mass in a solid walled building can help with managing overheating during the summer.

Historic England recently released the findings of recent case study in a substantial traditionally built building (a church) where they found the following heat losses:

43.5%- air infiltration
28.2%- through an un-insulated roof
15.9%-through the walls
7.7% - single glazed windows
5.2 %- through the floor – solid ground bearing

These correlate with the figures given out by the Environment Study Centre for Sustainable Buildings and can be used in calculating whether any retro-fit measures are 'technically feasible'. It should be noted that the cost of any energy saving works must be considered in financial payback terms. The financial payback needs to be within 15 years for it to be 'technically feasible' (financially worthwhile).

The thermal imaging camera picked a few areas of heat loss

Digital images from the infrared camera	Comparative infrared images
 Front door	 Note; heat loss through draughts around the doors
 Back door, with blanket	 Note; the lowest tempreture is nearly 2ºc higher than at the front door
 Lower front wall, first floor, main building	 Note; significant amounts of heat from tl radiators will be lost through the widc before having a chance to convect around the rooms

Other research by Historic England has found that people can and do tolerate lower temperatures in a buildings environment if there is a source of radiated heat such as an open fire, a multi-fuel stove or infra-red heat heating. This means that buildings maintained heat could be reduced from and average comfortable ambient temperature of 21 to 22ºc to 16-18ºc (dependent on individual users).

It should be noted that a buildings heating bills are thought to be reduced by 10% of every 1ºc the heating system is turned down.

There are alternative means of providing heat and hot water that might suit the building; a biomass boiler in the form of a pellet burner that provides convected warm air into the building, with a back boiler and a pellet burner in the house. Alternatively, hydrogen ready boilers are anticipating advances in hydrogen production. An Air-source heat pump may provide enough heat, providing the building is completely and well insulated and air infiltration is managed.

See links;

Biomass
https://www.modernstoves.co.uk/product/stoves-with-back-boiler/biomass-pellet-burner-with-integrated-back-boiler-for-central-heating-hot-water-suitable-for-vented-or-un-vented-heating-system/

https://www.treco.co.uk/biomass-boilers?gclid=Cj0KCQiAsqOMBhDFARIsAFBTN3fhVr2U_Qt67Ap7Tm5IcYvnDmddRi4husBTh0wvVqNJ51SBNpa6Vw8aAvu_EALw_wcB

https://www.britishgas.co.uk/the-source/greener-living/hydrogen-heating.html

Infrared
https://www.suryaheating.co.uk

There is scope to install a solar array on the south facing pitch of the main roof but this will require planning permission.

8.0 Grounds, Boundaries

There is cement rendered wall that is built of the back of the rear extension, which returns around the end of the property's curtilage and in to some timber fencing and a gate. The right-hand fencing is made of concrete posts and panels. You should establish who is responsible for the fencing to the right.

9.0 Planning Information

Please note; you will need planning permission if you are going to re-cover the roofs as this will change in the character of the building. Even re-using the current slates will change the patina and it is advised that you talk to the local Conservation Officer about this and about the re-rendering works The replacement of the u-PVC and a changing the style of the current windows will need planning permission.

Once you have developed a really good idea of your plans, we would recommend a Pre-Application meeting with the Conservation Officer, we can assist and be in attendance for this. We have found that Pre-Apps with the Conservation Officer helps pave the way to a successful planning application.

Planning Apps

https://publicaccess.dover.gov.uk/online-applications/pagedSearchResults.do?action=page&searchCriteria.page=2

https://publicaccess.dover.gov.uk/online-applications/simpleSearchResults.do?action=firstPage

Appendix A – Useful Links

Crafts , Trades and Professionals

http://shireconservation.com

https://www.bpdrainsoutheast.co.uk

https://ctp-llp.com/services/civil-engineering/

https://www.ecotecture.co.uk/

Suppliers

https://www.vapourflow.com

http://www.castironairbricks.co.uk/product-category/vent-and-drainage-grilles/

http://www.ingilby.co.uk/pozilime.html

https://oricalcum.uk

http://www.chalkdownlime.com

http://earthbornpaints.co.uk/product/claypaint/

https://www.lime.org.uk/products//limecrete-and-sublime/labc-registered-sublime-limecrete-floor/

http://manthorpebuildingproducts.co.uk/product/g630-felt-lap-vent

Appendix B - About Lime

Lime can be generally categorised into two types:

Non Hydraulic Limes (putty and quick/ hot mixed lime)
Natural Hydraulic Lime (NHL and natural cements)

The main differences between the two types are;

Non Hydraulic Limes are pure lime. They set by carbonating and sometimes have additives mixed in with the mortar mix to gain stronger final sets, theses additives are known as Pozzolans; Pozzolan additives were developed by the Romans; examples of the durability of Roman mortars can be seen at Richborough Roman fort; https://www.english-heritage.org.uk/visit/places/richborough-roman-fort-and-amphitheatre/

Natural Hydraulic Limes (NHL) set by adding water to them and have certain percentages of clay in them, which gives them their final set strength, they also set with carbonation but not as much as pure limes.

During the hundred years between 1750 and 1850 major discoveries were found about mortar properties. The relationship between limestone and clay impurities were not understood before John Smeaton's work in the 1750's which confirmed the link between the clay content in lime stone and hydraulicity. Ramsgate Harbour has some of Smeatons ' notable works' ;
https://www.ice.org.uk/what-is-civil-engineering/civil-engineer-profiles/john-smeaton

Both types of lime have their place in traditional mortar mixes but careful consideration must be given to which type is used.

Note;
Extensive research was carried out on by English Heritage under the guidance of Professor John Ashurst as there seemed to be inconstancies with the classification of NHL's by the different manufacturers. It was found that the clay content in the NHL's varied by significant amounts; some NHL2's were found to be equivalent to NHL 3.5 and some NHL 3.5 were equivalent to NHL 5. This was leading to the wrong mortar specifications and historic masonry was being damaged as a result. The French lime manufacturer – St Astier worked with John Ashurst and English Heritage and St Astier produced relevant technical information on the amount of clay in their lime and have produced tables setting out their mortars final sets.

The designations (2 – 3.5 & 5) for NHL's is modern cement test and is measured at 28 days as this is how long it takes cement to set after mixing , whereas lime takes about 24 months to reach final set. Note; some (St Astier) NHL 2 mortars can have a final set that is equivalent to NHL 3 and NHL 4.25. See link;http://www.stastier.co.uk/nhl/data/nhl2.htm

Only St Astier NHL's can be used/ recommended in historic/ pre-1919 construction as they are they only manufacturer that provides technical data on the final set strengths and therefore the only reliable source of NHL.

St Astier NHL 2 has a final set strength that would be equivalent historic 'moderately hydraulic' lime (defined by Smeaton) and should be considered the maximum strength for most traditional masonry units, however, non hydraulic lime should be used on soft and friable masonry.

The use of traditionally slaked lump lime / hot mixed quick lime mortars have seen a renaissance in recent years and extensive study has been carried out Nigel Copsey, the Building Limes Forum, staff at Historic England and Historic Environment Scotland.
See Link to Nigel Copsey's book below for the most up to date information on the subject.

The ideal time to complete external lime work works is between April and September this is to prevent frost damage. A temperature of over 6 degrees ºc is required to ensure set in hydraulic mortars. Lime work should be damped down regularly after application, this is particularly important during the summer and windy conditions.

For information on lime work , see these websites for guidance;

https://historicengland.org.uk/content/docs/research/ctx154-henry-hot-mixed-mortarspdf/

http://www.stastier.co.uk/guides.htm

https://www.chalkdownlime.com/aboutus

https://www.mikewye.co.uk/guidesheets/

And these publications:

Hot Mixed Lime and Traditional Mortars: A Practical Guide to Their Use in Conservation and Repair by Nigel Copsey;
https://blackwells.co.uk/bookshop/product/9781785005558?gC=5a105e8b&gclid=EAIaIQobChMI19O-u4eE7AIVEuntCh0wbggTEAQYASABEgLMEvD_BwE

Practical Conservation Series by English Heritage/ Historic England, Volumes:

Mortars, Renders & Plasters
Earth Brick and Terracotta
Stone
Roofing

https://historicengland.org.uk/advice/technical-advice/buildings/practical-building-conservation/

Period Property Manual by Haynes – an excellent book for the home owner and professional alike
https://www.mikewye.co.uk/product/period-property-manual-haynes/
http://www.traditionalbuildingsupplies.co.uk

Appendix C - Timber; wood boring insects and rot

Wood boring insects need a certain amount of moisture in timber of around 20% and higher to thrive. Even Death Watch Beetle (DWB) does not thrive if wood moisture contents remain below 15% all year round; dry timber in the average building has a moisture content of about 11%.
Rots that affect timber need much higher moisture contents to thrive. For instance the brown rots AKA Wet and Dry Rot need moisture contents of around 28% to cause serious damage to sapwood timbers.

Insects and rot will only affect the sapwood of a timber member. Sapwood is the relatively new outer layers of a tree between the heartwood (inner part of the tree) and the bark, it contains the resins and proteins that the insects and rot need to feed on. The heartwood contains extractives, which are deposited in the timber as the tree grows; these extractives are toxic to insects and all forms of rot and form the trees natural preservative.

Extractives can be 'washed out' of the timber by rainwater through a defect in the buildings external envelope or defective services. The chemistry of heart wood timber can be altered by fungus (caused by wetting) enough to make it palatable enough for insects.

Wood boring insects have natural predators – spiders. The long legged house spider in particular (Pholcus phalagioides) is an effective predator.
The widespread use of chemical preservatives have a negative impact on the eco-system in a buildings roof or subfloor space as the spiders are more susceptible to the preservatives than the wood boring insects.
All wood boring insects including Death Watch Beetle populations will decline if dry conditions are maintained inside a building, at the same time the predation of spiders will become more effective, eventually leading to the extinction of the infestation. And all forms of rot will perish in dry conditions.
For further information see article written by Dr Brian Ridout;
https://www.buildingconservation.com/articles/insectdamage/insectdamage.htm