Cornerstone Technical Report

Our ref:		**Author:**	David Bly CSDB BDMA Dewpoint
Name		**Client**	
Address		**Contact**	
		Date of visit	
		Time of visit	

Scope

Following instruction from Mr ……., attend the above property to detail current conditions following reports of damp and mould in areas.

Report

1.0 Property:
The property relates to a three-bedroom semi-detached dwelling of cavity wall construction.

2.0 Incident:
The resident advises mould in all three bedrooms plus an area to the lounge.

3.0 Conclusion:
Upon arrival the occupants advised areas of concern mainly to the upper wall and ceiling junctions to areas in all three bedrooms and a localized area to the rear wall in the lounge. In addition, an area close to the front door was also viewed and, with no obvious defects observed, it is likely this area will be due to condensation as it is an elevation not benefitting from warm sunshine and is close to the front door where colder air is brought in that will meet with the warmer internal air leading to areas of condensation where air circulation is restricted.

A moisture assessment in areas of concern revealed dry conditions apart from the right-hand window reveal in the main front bedroom which was also noted to be 'hollow' in sound suggesting a likely disconnect with the window and wall junction. In this instance, it is recommended the reveal and window construction is checked for its structural integrity prior to next winter to uphold a dry internal condition.

With all mould areas suggesting dry conditions, a thermal assessment confirmed the patterns of mould aligning to colder structural areas and, a review of the loft insulation confirmed gaps where the wall/ceiling junctions are to the eaves.

Regarding adequate forced ventilation, there is no extractor installed in the kitchen and, the new bathroom extractor was yet to be configured to extract to the exterior. Both of these elements being 'wet' rooms where moisture is mainly generated, in the absence of extraction serve to uphold this warm moist air circulating the dwelling due to vapour pressure differences and, whilst the property as a whole is in very good condition, where temperature differences are noted to the structural surfaces, when the warm air comes into contact with it, at certain times of the day, the dew point temperature will be met leading to beads of condensation which are a key nutrient for mould.
From a passive ventilation aspect, some trickle vents were open and some closed. These can provide background ventilation and reduce overnight condensation where comfortable to be utilized.

Of note, mould spores are in the air all the time and, with no forced extraction will freely circulate the property alongside the vapour pressure transition aided also by the kitchen door being removed. Whilst this fully understandable, it simply adds a greater emphasis on ensuring the internal air is changed with dryer external air where possible to break the internal atmospheric trend condition and reduce the potential for mould to develop.

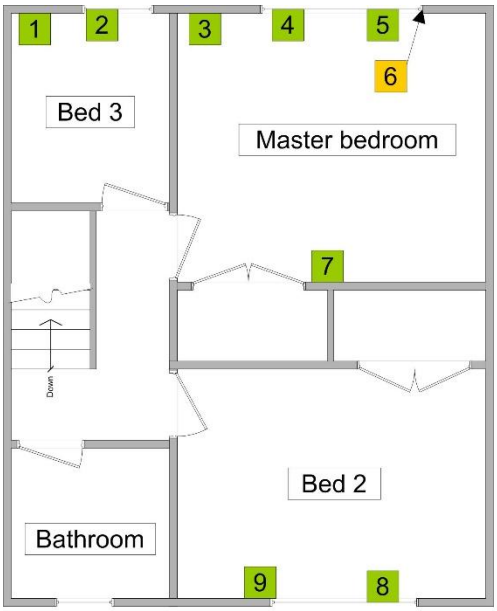
To conclude, it is the opinion of the author there is a requirement to consider completing the bathroom extractor installation and also consider utilizing a similar device in the kitchen because without a door fitted, an open window will not extract warm moist air but moreover, will simply remain stable unless there is a cross-flow of air from another open source.

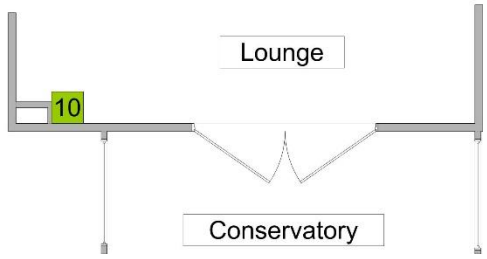
3.1 Recommendations:

Measures recommended to alleviate moisture related issues at the property and assist you in controlling internal atmospheric conditions include:

- Check the loft insulation for an even and adequate coverage TO the eaves but NOT in them. There must be a gap between the upper surface of the insulation and the sloping sarking felt roof to uphold air circulation from and across the eaves.
- Complete the bathroom extractor installation with the ducting taking the least length to exit to the exterior. And, when using the extractor, keep the door and the window closed to uphold its ability to clear the room.
- When cleaning mould, bleach products are not recommended as they do not readily kill the mycelium (mould root system). Whilst this may uphold a very clean visual surface, the roots remain dormant and, with the right conditions being upheld, will re-develop in less time than if the mould was a new outbreak.
- Where possible, move larger contents items away from colder external wall surfaces. In the absence of this, warm moist air will find its way behind all elements and, with little or no circulation, will come into contact with the colder walls leading to periods of condensation.
- When suitable, look to consider a detailed invasive investigation of the wall reveal in the mater bedroom to confirm its structural integrity.
- If in the future, mould develops on contents items, this is due to atmospheric conditions and not structural moisture. Hence, the importance of air circulation and extraction.

4.0 Property Profile
(not to scale):





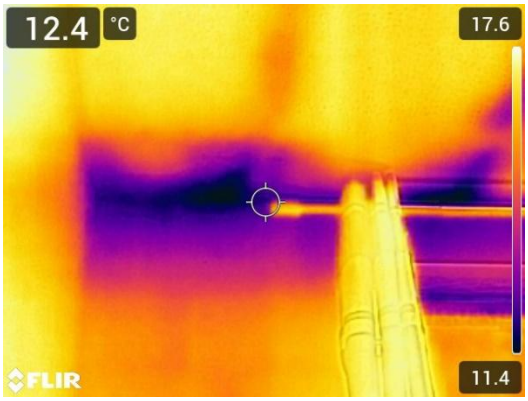
4.1 Structural wall readings:

Walls	Base of wall		Top of wall		%WME	Comments
Loc	%WME	REL(PS)	%WME	REL(PS)	Ceiling	
1			9.8			
2			9.1			
3				162	11.2	
4				185		Top of reveal
5				188		
6			19.8			RH reveal
7			12.2	165		
8			10.8	174		
9			11.1	170		
10	12.8	144				

4.2 Atmospheric conditions:

Location	Relative Humidity %	Air Temp. °C	Dew Point Temp. °C	Specific Humidity g/kg
Exterior	94.0	3.3	2.4	4.7
Ground floor	49.0	21.9	10.7	7.8
First floor	54.0	24.1	14.2	9.7

5.0 Thermal Survey:



5.1 Master bedroom:
The mould and thermal pattern aligns with gaps in the loft insulation which serve to cool these locations leading to uneven temperatures across the surface. The calculated dew point in the first floor was 14.2 C (see table 4.2) and the coldest temperature in the image was 11.4oC suggesting condensation (a key nutrient for mould) would have been occurring at certain times, particularly overnight.

5.1.1 Master bedroom:
Patterns across the window show repeat cold spots that will also align to differences in loft insulation cover and its effectivity.

5.2 Bedroom 2:
Clear colder bands are noted to the wall/ceiling junction and the insulation should be checked in this location also. However, it must be noted the main colder area is the upper wall lintel which straddles the top of the window. This element forms part of the exterior at all times and as such will always remain cold simply placing a greater emphasis on circulating internal air to reduce the potential for mould.

5.3 Bedroom 3 (Office):
As with the other bedroom, colder bands were observed across the ceiling close to the wall junction and aligns with gaps or reduced insulation in these areas leading to temperature differences and the dew point being met for condensation to occur the door closed and window open was also passed to the occupants.

6.0 Observations:

6.1 Mould:
The patterns appear consistent with colder areas to the respective ceilings as per the thermal survey and readily align with likely reduced or missing loft insulation.

6.2 Loft above bedroom 3:
Although not readily visible, the arrow points at where the insulation ends and the residual gap after it.

6.3 Loft above Master bedroom:
Again gaps were evident to areas close to the eaves.

6.4 Bedroom 2:
The insulation appears uneven in this area with a gap noted close to the edge with the eaves.

6.5 Loft above Bathroom:
When the ducting has been completed, the insulation needs to be reset close to the extraction location to minimize cold spots. And, consideration is to be given to the likely electrical elements when this task is undertaken to uphold safety requirements.

6.6 Condensation:
Whilst condensation can be regarded as a 'normal' winter phenomena, it is important the windows are wiped clear every morning to reduce the potential for increased atmospheric moisture particularly in the reveal area. In addition, leaving the visual element can result in the noted mould present on the uPVC which aligns to atmospheric moisture conditions and not a structural issue.

7.0 Mould Activity:
The main driver which allows moulds to develop and flourish in and on the materials within a structure is moisture or, to be precise, water activity. Materials can become damp in a number of ways, directly being wetted, moisture penetrating materials through capillary action, physical contact and hygroscopic materials absorbing moisture directly from the atmosphere.
There are many hundreds of mould varieties each requiring different levels of water activity to allow them to develop and flourish. The lowest known level of water activity at which mould can be active is 0.61. In general, this level collates to an atmospheric relative humidity (RH) of 61%. Condensation does not have to form on a surface. For there to be sufficient moisture to allow mould to become established at the point where condensation occurs, the relative humidity will be 100%.

Moulds are simple fungi from several groupings in the fungal classification system. Sexual reproduction in some fungi allows genetic modification to adapt and tolerate changes in the environment such as humidity, temperature, and food requirements.

There are three principal features common to the broad range of mould:

1. Simple food requirements: able to exist on non-nutrient materials such as plaster and brick which have traces of contaminating organic matter.
2. Produce vast number of spores which allow rapid adaptation to particular environments conditions and rapid colonization of other suitable locations within an enclosed environment.
3. Grow very quickly under suitable conditions. The main requirement for the development and growth is a source of moisture although food, oxygen and a suitable temperature are also important.

Moulds can be regarded as hydrophilic fungi (tolerating high water availability) although individual species have their own optimum requirements for moisture. In most situations where surface condensation occurs and or the relative humidity of the internal atmosphere exceeds 70% (0.7 aw) for an extended period, mould growth will be established. And, is opportunist and once established in a property will quickly colonize areas with appropriate conditions. Most properties through their normal occupational cycle will have periods of high occupational moisture however, it is the prolonged periods which will allow mould to develop. Once mould is present in a structure the period of time it will take to colonize new areas is reduced due to the increased level of spores being produced in an enclosed area. In many cases a process of mould removal is required to allow a satisfactory outcome to change in occupational activity when trying to prevent further mould activity.

8.0 Survey Equipment:

Non-destructive moisture readings using:

Protimeter Surveymaster on search mode using radio frequency survey method with readings given numerically from 0 to 999 REL. Survey depth is approximately 5 to 15 mm depending on material characteristics. **Please note** the readings are subjective and open for interpretation, therefore they **should not** be used to indicate actual moisture content.

Tramex MRH using electrical impedance survey method on non-wood materials the readings are given numerically from 0 to 99. **Please note** the readings are subjective and open for interpretation, therefore they **should not** be used to indicate actual moisture content. Readings taken from wood are given as a %mc the unit can be calibrated to wood species the readings indicated can be taken as an indication of wood moisture content. Survey depth up to 30 mm depending on material characteristics.

Invasive moisture readings have been taken using a Protimeter Surveymaster reading direct % moisture in wood and % wood moisture equivalent (%WME) in other materials.

Air moisture readings have been obtained using a Tramex MRH and a Protimeter Hygromaster measuring temperature in °C, % relative humidity and specific moisture content in g/Kg.

Note: all readings taken with electronic metering are a guide and should be viewed with all the available information to gauge the true condition. However, for the purposes of this report the following readings can be taken as an indication that the material checked could be said to be dry back to a satisfactory level.

Non-destructive Protimeter Surveymaster	200 REL(PS) or below in masonry **guide only**
Non-destructive Tramex MRH Masonry scale	40 REL(TM) or below in masonry **guide only**
Invasive moisture readings	Plaster and Masonry WME 16% or below **guide only.**
Invasive wood readings	Below 15%
Normal indoor wood moisture content	10% – 12%
Air moisture readings in concrete	Below 11 g/Kg Dry Air (75 %ERH at 20 °C)
Thermal camera:	Flir E5 Pro 160 x 120 Interpolation with MSX technology

Reference for Readings Table:

Non-destructive Protimeter Surveymaster		REL (PS)
Non-destructive Tramex MRH		REL (TM)
Invasive moisture readings:	Concrete:	% WME
	Wood:	% mc
		Calibrated at the time of the survey
Air moisture readings in concrete:		g/kg (DA)

Guide to moisture readings

	High Moisture Levels
	Moderate Moisture Levels
	Low Moisture Levels

9.0 Declaration:

The data collected and noted herein is pertinent to the time and duration of the survey alongside respective observations and qualifiable data measurement. No responsibility can be given for any changes made post the survey that can impact the report content as currently described.

Any recommendations or undertakings noted herein are based on a number of key factors and not a singular aspect to support adequate and confident solutions.

Equipment used are within calibration tolerances and, are recognized as a guidance notification only with detailed supporting data utilized to uphold any consequential recommendations and opinions.

Where used, moisture meters are utilised for a qualitative guidance purpose only supported by correlation readings in unaffected areas of the same construction, orientation and behaviour.

Any requirement for quantitative measures to endorse findings will be utilised where applicable to support the data capture and likely root causes.

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