



FLOOD DOCTOR
WATER DAMAGE RESTORATION SPECIALIST

TECHNICAL REPORT

Prepared for:
Mr



Private & Confidential

Client Details

Surveyed property		Customer details		Flood Doctor	
				<i>(office annotations)</i>	
				Your ref.	
				Our ref.	
				Assessor	Pawel Szczepaniak
				Survey date	
				Time	10:15 AM
Postcode		Postcode		Report date	

The content of this document contains the collected data and considered opinions as interpreted by the technical author. Any thermal images and moisture readings obtained during the inspection and investigation are relevant to the areas inspected and surveyed and date and time of testing only stated above and throughout this report.

Whilst reasonable skill and care has been exercised in the undertaking of this inspection and moisture survey; it must be emphasised that some areas are concealed or inaccessible, and no warranty is given or implied.

This survey is not a dilapidation or defect survey. However, where any conditions exist as observed during the inspection and moisture survey, they will be mentioned within the report for consideration by the client.

The report is confidential to Flood Doctor Ltd, the client and their professional advisors and under no circumstances may it be passed on or reproduced in whole or in part, nor may it be relied upon by third parties for any use whatsoever.

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Flood Doctor Ltd.

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Instructions & Scope

Further to receipt of instructions from [REDACTED], we have visited the property on .

The purpose of this visit was to carry out a thorough inspection of the property to establish the cause behind outbreaks of abnormal microbial growth in multiple rooms and put forward a remediation proposal and recommendations to prevent further outbreaks.

Our evaluation was based on a visual and thermal imaging inspection and non-invasive moisture survey.

Property Details

The property is a one-bedroom flat located on the 2nd floor of a purpose-built block of flats. The exact age of the building is unknown.

Due to the nature of our survey, i.e. non-invasive the exact construction of the flat is unknown, however based on the approx. age of the building and our observations we assume the following:

The internal walls are built of brick/blockwork skimmed with plaster and finished with paint. Bathroom walls are semi-tiled.

The ceiling is of a solid concrete construction skimmed with plaster and finished with paint.

The floor consists of concrete slab, 50-70mm sand cement screed; carpets have been used as floor coverings except for the bathroom where vinyl floor covering has been installed.

The windows are single glazed; secondary glazing has been installed to improve thermal efficiency.

Summary

Upon our arrival at the property, we have been shown three areas of concern:

1. **Open plan kitchen/lounge** – Heavy mould contamination afforded to external walls.
2. **Bedroom** – Heavy mould contamination was afforded to external and partition wall dividing bedroom and kitchen.
3. **Bathroom** – Medium level mould contamination afforded to the external and partition walls mainly at a higher level.

The affected walls face either West or South as such; they should be receiving a fair amount of sunlight during the day as opposed to North facing walls that are usually colder and prone to condensation.

During our visit, we have also noted several electrical heaters in the property in addition to the existing electric central heating, at the time of our visit the temperature recorded at 20.2°C.

Visual Inspection

Kitchen/Lounge - Photos



As you can see from the above photos, the open plan kitchen lounge is heavily contaminated with mould, including behind the kitchen units.

Bedroom



Visible mould contamination to the entire external wall, most of the contamination appears to be located behind the wardrobe which is situated along the partition wall dividing bedroom and kitchen. Back of the wardrobe is also showing signs of mould contamination.

Bathroom



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Visible mould contamination mainly around the window although partition wall dividing bathroom and hallway has also been affected to a lesser extent.

General Notes

During this part of our inspection, we have noted the following:

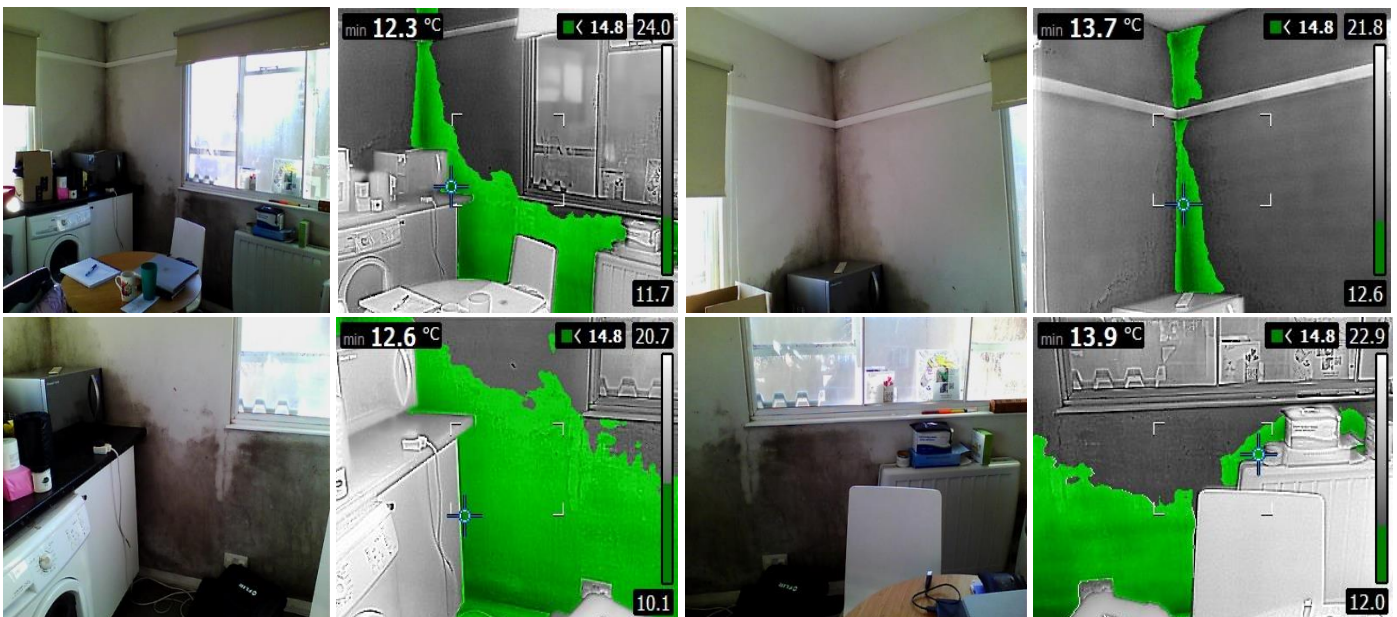
1. Our client has advised us that the kitchen hood is not working
2. Lack of extractor fan or vent in the bathroom
3. Single glazed windows

Thermography

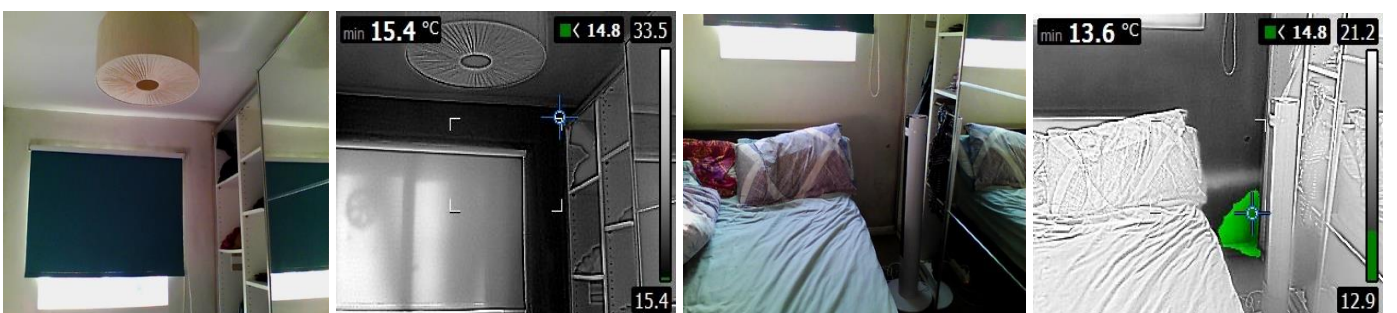
As part of our survey, we have inspected the affected areas using Thermal Camera Flir E4 320x240. Before we started this part of our inspection, we have measured atmospheric conditions in the property which recorded at 72.7% Relative Humidity, 20.2°C Temperature, 15.1°C Dewpoint, 10.65 g/kg Specific Humidity, and 1.70 kPA Vapour Pressure.

The above readings were entered into the thermal camera, which allowed us to identify the areas which are wet or might be prone to condensation.

Kitchen / Lounge



Bedroom



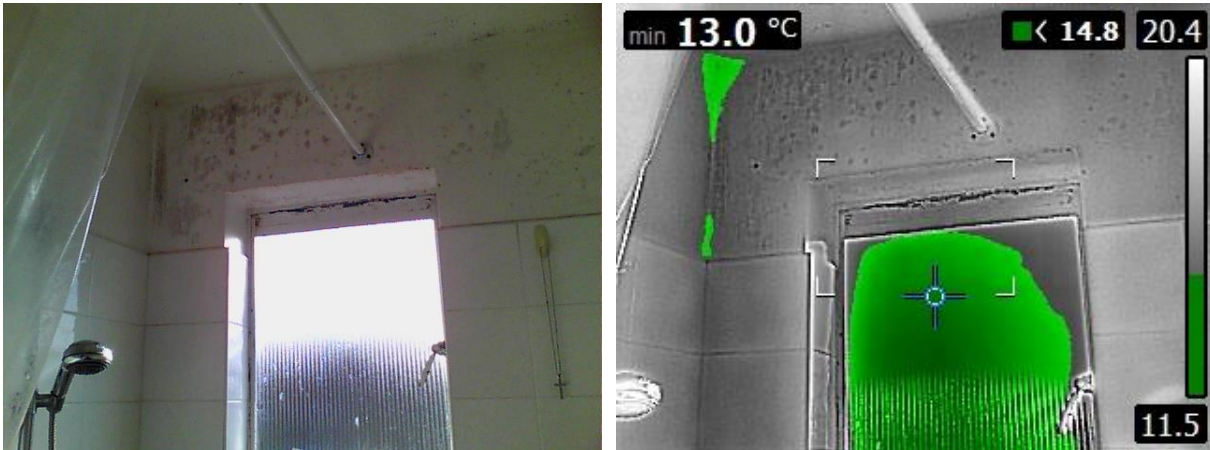
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Bathroom



General Notes

During this part of our inspection, we have identified several areas which at the time of our visit registered as “at risk of condensation.” Please note that this should be seen as a snapshot in time as environmental conditions change continuously.

Bathroom:

At the time of our visit, the only areas prone to condensation in the bathroom were a window and a small section of the wall in the corner. This indicates that the outbreak of mould in this area is most likely due to a single glazed window and lack of extractor fan.

Bedroom:

Similarly, as in the bathroom at the time of our visit, the only area which showed as at risk of condensation was a lower wall behind the wardrobe. In our opinion, there are several factors behind the outbreak in this area:

1. A leak in the adjacent kitchen due to faulty seal around the sink. More information about this in the Moisture Survey section of this report.
2. The wardrobe is restricting air circulation in this area; this leads to a build-up of condensation on the wall, which contributed to some extent to the outbreak of mould growth in this room.
3. A single glazed window which is prone to condensation
4. Roller blind which is restricting airflow through the window vent

Kitchen/Lounge:

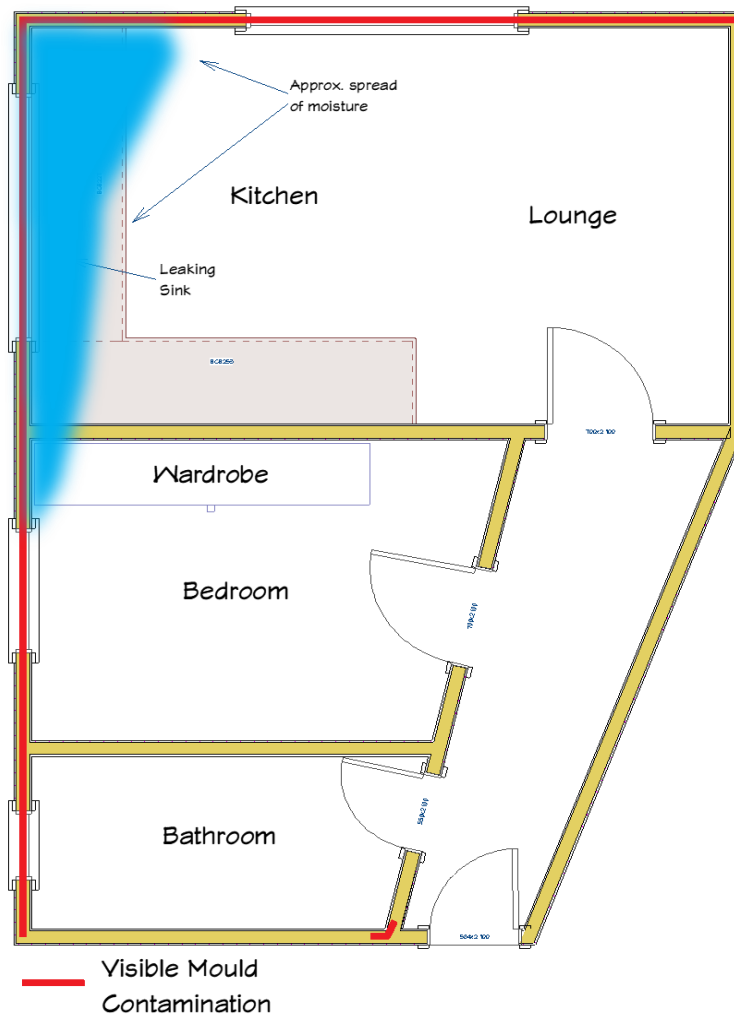
Water is detected with a thermal imager due to temperature differences caused by evaporation, capacitance, or conduction.

A “wet” building materials will be cooler than surrounding “dry” building materials. Therefore wet building materials may be more prone to condensation due to lower temperature. In this case, we have found that a large section of the external wall appears to be at risk of condensation however upon closer inspection we have noted that the walls, skirting boards and the floor along the affected walls are wet.

Moisture Survey

As part of our survey, we have taken a number of moisture readings throughout the property. We have found a leak from the kitchen sink during this part of our investigation.

Please note that the leak is relatively small; however every time the sink is in use a small amount of water is penetrating below the worktop and behind the kitchen units. Furthermore, the leak was impossible to notice without removing all of the contents of the cupboard below the sink.



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As you can see from the above photos at the time of our visit, we have recorded elevated to very high moisture readings on the lower external wall, floor, base cupboard side panel (which is water stained), and back of the sink cupboard.

Conclusions & Recommendations

Taking all of the above into consideration, we conclude the property has suffered from an outbreak of abnormal microbial growth due to:

- A leak from the kitchen sink
- Non- working kitchen hood
- Lack of extractor fan/vent in the bathroom
- Single glazed windows

In our opinion, the primary reason behind the outbreak of abnormal microbial growth in the kitchen and bedroom is the leak from the kitchen sink. Based on the level of corrosion to the underside of the sink and damage to the underside of the worktop as well as the back of the cupboard, the leak must have been on-going for some time.

Due to the leak, the moisture levels within the floor and external walls increased, which resulted in the secondary damage in the form of mould growth. As we have already explained, likely, the walls may have also suffered from condensation due to a decrease in temperature when building materials became wet. A section of the bedroom has also been affected by the incident.

In our opinion, the outbreak of abnormal microbial growth in the bathroom is not related to the issues affecting the kitchen and bedroom. The bathroom has no extractor fan or a vent and only a single glazed window. This would lead to a build-up of condensation and humidity levels in this room, which resulted in the outbreak of mould growth over time.

With regard to the blinds installed, it is likely when draw down these will prevent the window and frames benefiting from the heating in the flat creating an area of cold adjacent to the window significantly increasing the likelihood of condensation occurring.

Please note that we haven't been instructed to carry out any air or surface sampling as part of our survey however based on the size of the affected area we conclude that the property should be deemed as uninhabitable until the issues which lead to mould contamination are resolved, and affected areas are thoroughly cleaned, sanitized and dried (where applicable). Environmental sampling should be carried out as part of the remediation process to validate cleaning method.

Mould spores are all around us in the home, on our clothes and hair and enter the building with air through infiltration or on clothes. Therefore, there are always spores present and cannot ever be completely removed from an environment outside of laboratory settings.

All types of fungi and mould infestation can be of significance for indoor air quality in buildings. The levels of moulds in the air vary widely in time and space, both quantitatively and qualitatively. The levels are strongly influenced by the characteristics of the organisms and by environmental factors.

The most important detrimental health effects are increased prevalence of respiratory symptoms, allergies and asthma as well as perturbation of the immunological system. WHO guidelines for protecting public health & for avoiding adverse health effects stress the prevention or minimising of persistent dampness and microbial growth on interior surfaces and in building structures (WHO 2009: Guidelines for indoor air quality: dampness and mould). Excess moisture on almost all indoor surfaces, materials, and contents leads to growth of mould, fungi and bacteria, which subsequently emit spores, cells, fragments and volatile organic compounds into indoor air. Moreover, dampness initiates chemical or biological degradation of materials, which also pollutes indoor air.

Microbes propagate rapidly wherever water is available. The dust and dirt normally present in most indoor spaces provide sufficient nutrients to support extensive microbial growth. Microbial growth may result in greater numbers of spores, cell fragments, allergens, mycotoxins, endotoxins, β -glucans and volatile organic compounds in indoor air. The causative agents of adverse health effects have not been identified conclusively, but an excess level of any of these agents in the indoor environment is a potential health hazard (WHO 1990 & 2009).

Summary of hazardous fungal components

Fungal spores	<p>A general term referring to survival propagules produced by fungi under specific environmental conditions, typically ranging in size from 0.5 to 7 μm.</p> <ul style="list-style-type: none"> • Respiratory tract deposition hazard • Skin, eye, membrane and respiratory irritant • Surface allergens and enzymes contained on the spore coating • Structural toxins contained within the spore cell wall • Internal allergens, enzymes and toxins produced after germination
Fungal enzymes	<p>Fungal enzymes have been associated with adverse health effects including sensory and skin irritation, allergenic and asthmatic responses.</p>
Cellular debris (1-3 β -glucans)	<p>Beta-glucans are components of fungal cell walls recognised as having a relative ability to promote a negative response - for example to induce leukocyte activation and to produce inflammatory mediators.</p>

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Secondary metabolites	<p>Filamentous fungi produce a wide range of secondary metabolites after the fungus has completed its initial growth phase and is beginning a stage of development represented by the formation of spores. Secondary metabolites associated with sporulation:</p> <ol style="list-style-type: none"> 1. Metabolites that activate sporulation 2. Pigments required for sporulation structures 3. Toxic metabolites secreted by growing colonies at the approximate time of sporulation — including mycotoxins
Fungal Volatile Organic Compounds	<p>Volatile organic compounds (VOCs) are carbon-compounds that easily evaporate at room temperature.</p> <p>All fungi produce and emit blends of VOCs as a result of metabolism. Qualitative and quantitative composition varies with the species and environmental conditions.</p> <p>Include mixtures of alcohols, aldehydes, acids, ethers, esters, ketones, terpenes, thiols and their derivatives.</p> <p>Responsible for characteristic 'mouldy or musty odours'</p> <p>Known or suspected irritating and toxic effects</p>
Mycotoxins	<p>Fungal - mycotoxins are the result of secondary metabolism.</p> <p>Toxins are substance that, on ingestion, inhalation, absorption, injection, or development within the body, in relatively small amounts, may cause structural or functional disturbance.</p> <p>The most deleterious of natural products, in terms of negative health effects.</p>

Based on the results of our inspection, we are recommending the following works to be carried out as part of the remediation process:

General:

- Tenants to be moved to AA while works are taking place
- Air sampling & surface sampling to be carried out to clarify levels of mould spores in the air prior and post-cleaning process
- Installation of a negative pressure system to remove airborne contaminants while works are taking place to prevent cross-contamination
- Contents to be moved to storage or AA to prevent damage and/or cross-contamination while works are taking place.

Kitchen/Lounge:

- Kitchen units to be removed to facilitate cleaning, sanitation and drying of the walls and floor
- Carpet to be rolled back to facilitate cleaning, sanitation and drying.
- Elec. Radiator to be removed to facilitate cleaning and sanitation of the wall behind
- Skirting boards to be removed from water-damaged walls to facilitate drying
- All exposed surfaces to be cleaned using HEPA vacuum, followed by a chemical wash using a broad-spectrum biocide
- Installation of drying equipment to remove excess moisture from the affected areas

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Please note that due to the level of water damage it is unlikely that the worktop and some of the kitchen units will be salvageable.

Bedroom:

- Cleaning and sanitation of the affected surfaces
- Removal of skirting boards from the affected walls
- Installation of targeted drying regime to remove excess moisture from the affected walls and floor

Bathroom:

- Cleaning and sanitation of the affected surfaces

It is recommended the following works are undertaken to assist the tenant's in controlling the internal atmospheric moisture levels to prevent further outbreaks of mould growth:

- Replacing existing windows with double glazed windows with trickle vents
- Installation of an extractor fan in the bathroom
- Replacing faulty kitchen hood

Survey Equipment:

Non-destructive moisture readings using:

Protimeter MMS 2 on search mode using radiofrequency 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 indicate actual moisture content.

Tramex MEP using electrical impedance survey method on none 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 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 MMS 2 reading direct % moisture in wood and % wood moisture equivalent (%WME) in other materials.

Air moisture readings have been obtained using a Tramex MEP or a Protimeter MMS 2 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 MMS2	200 REL(PS) or below in masonry guide only
Non-destructive Tramex MEP 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)

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Reference for Readings Table:

Non-destructive Protimeter MMS2	REL (PS)
Non-destructive Tramex MEP	REL (TM)
Invasive moisture readings: Concrete:	% WME
Wood:	% mc
Air moisture readings in concrete:	g/kg (DA)

Thermal Imager:

FLIR E4 Thermal Imaging Camera

IR Sensor 320 x 240, Spectral Range 7.5–14 µm

Moisture reading guide:

	High Moisture Levels
	Moderate Moisture Levels
	Low Moisture Levels

We await further instructions should our services be required.

For & on behalf of Flood Doctor.Ltd

Pawel Szczepaniak Dew. BDMA Senior Technician

Technical Manager