

Your reference:
Our reference: [3035]SCH
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By E-mail only to [REDACTED]

Dear Bob / David,

**Apartments 402 & 404 Middle Warehouse, Castle Quay
Independent Report & Advice on Rainwater Incursion Experienced**

Apologies it has taken so long for me to publish my findings. As you know, there have been a few challenges to overcome along the way, with cherry picker access (storm Dudley, Eunice and mechanical failure / breakdown) and latterly my own incapacitation with Covid. At the outset, I think it is only right for me to acknowledge that there is nothing obvious and no one "smoking gun" to which the problems encountered with rainwater incursion can be attributed. Notwithstanding, I am happy that I now have enough information from site to complete my Report and to present my findings for further discussion.

1. Purpose, Background & Scope of Report:

The purpose of this appointment is to provide a second independent opinion and diagnosis of the likely causes of rainwater incursion experienced and reported by Mr & Mrs Butterworth of Apartment 402 and the Owner of Apartment 404.

I have been into each of the apartments now on at least two occasions, for an initial recce in December 2021 and then on 10 February and 10 March 2022 and witnessed the water staining and damage occasioned to the internal décor as a result of rainwater ingress. I have also spoken to both owners to better understand the pattern and history of the problem.

You have also provided me with background information on those works and repairs completed over the last couple of years by the Landlord ("Landlord's Works") to address the reported ingress. And, you have asked that I comment on the Landlord's Works and determine whether they have addressed the source of rainwater incursion, and/or whether there remain further points where water can enter the fabric of the building affecting Apartments 402 and 404?

As I indicated at the outset, there is no one single obvious defect (e.g. a hole in the roof), that can be held up as the likely cause of rainwater ingress; there are potentially several points, primarily at construction junction details where water incursion might occur and with this in mind, I identified on my first visit in December 2021 six locations that required further examination, namely:

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- (1) The parapet wall and coping detail.
- (2) The back hidden gutter.
- (3) The balcony weathering details to the 5th floor apartments.
- (4) The capacity and integrity of the eaves guttering.
- (5) The window head weathering details.
- (6) The sub-sill details.

There was also a seventh item relating to plumbing defects e.g. the potential for push fit plastic waste pipes to becoming uncoupled from shower trays and/or washing machine to the 5th floor residences; however, this has been dismissed following the conversations I have had as to the pattern / frequency and nature of the incursion experienced in 402 and 404. In brief, the water incursion reportedly coincides with heavy rainfall and does not persist throughout the week / at the weekends due to the activities of the fifth-floor residents – plumbing defects tend to manifest as a continuous leak, irrespective of weather, which is not consistent with the reports from 402 and 404.

The check list of 6 locations upon which investigations were focussed is appended at Appendix 2, along with a couple of sketches showing the pattern of water staining internally correlated with the Floor Plans. At Appendix 1 I have annexed our standard Terms and Conditions and Limitations that apply to all our appointments and below I have identified those specific limitations encountered during the course of inspections, namely:

- We were permitted access to Apartments 502 and 501 on 10 February 2022, specifically to inspect the roof terraces and rear balconies; no access was available to the concealed eaves void internally.
- The rear elevation and parapet was inspected at close range from the basket of a cherry picker on 15 March 2022, with binoculars used to inspect the roof slopes beyond the outreach of the boom.
- We have not accessed the roof terraces to 503 and 504 but inspected them from the cherry picker basket.

2. Brief Description of the Building's Construction:

Unfortunately, we have no construction drawings for the residential conversion works undertaken in the 1990s. On that basis, I have been forced to make several assumptions based on my knowledge of contemporary construction details and visual clues.

The building was constructed as a canal warehouse in the 1820s/1830s and is Listed Grade II. From what I can see, there is a large amount of retained original fabric, such as the brick envelope and some of the internal reinforced concrete structure which appears to predate the redevelopment and conversion works undertaken in the 1990s.

The 5th Floor Penthouse Suites and the parapet section above the 4th Floor have all potentially been reconstructed and / or built to modern (current in the 1990s) construction techniques and this is explored further below.

From point of view of weathering – the focus of this Report - the building relies on both “overcoat” and “raincoat” principles to keep water out. The overcoat is the solid 2½ brick thick masonry walling to the lower sections and main elements of the building – in the same way that an overcoat soaks up water this brickwork by dint of its mass will have been designed in Victorian times to soak up driving rain and dry out naturally through evaporation once the rain has stopped. It is, therefore, important that the pointing and condition of the brickwork is maintained so that this element can breathe. The

use of strong Portland cements should be avoided, on the basis that this will prevent the easy evaporation of water through the brick joints and pointing.

The raincoat elements of the building are, of course, the roof which is designed to be 100% watertight and some aspects of the 5th Floor Penthouse patio screens and envelope.

There is also a section of what might be cavity walling to the parapets – refer our comments below.

I have not gone into any more detail on the building's construction, on the basis that the focus of this Report is rainwater incursion and nothing more. There are, however, articles online and on the basis that the building is Grade II Listed there is a brief description contained in the Statutory Listing for the warehouse refer List Entry No. 1208653, if further information is required.

3. Pattern of Staining Internally to Ceilings & Walls:

Attached at Appendix 2 are a couple of sketch plans of the ceilings and walls within the two apartments. Rainwater staining has been recorded on the Floor Plans, contained at Appendix 2.

The ceilings appear to be false ceilings. Plaster does not appear to have been bonded directly to the underside of the structure and the vaulted ceilings evident are created with plasterboard. A section of this has been cut out to the ceiling within the Master Bedroom to 404 and the underside of modern (1990s) 5th Floor structure can be seen, several centimetres above the ceiling finish.

This is relevant insofar as there might not be a direct correlation externally with the staining manifest to the ceiling plasterboard. In simple terms, water might enter several metres away from the actual point where it drips down onto the plasterboard ceiling. Rainwater tends to track to either a construction joint or break in the construction and then gravity will bring it down at that point, sometimes a distance from the point of entry or defect externally. The investigations I have undertaken, therefore, have not been limited to an area immediately above the stained ceilings.

4. Findings from our Inspections:

I have set out below my findings in the same order as the check list I generated, i.e. Items (1) to (6), on the basis that this is the process of elimination that has been adopted to try and cover off all potential sources. Accordingly, my findings in each scenario are noted below:

(1) Parapet wall and coping detail.

First impressions from pavement level through binoculars were that the parapet, being constructed of identical materials and (apparently) to an English Garden Wall bond, was an original element of solid masonry, but upon closer inspection there is evidence to suggest that this has been constructed new with reclaimed materials when the Premises was redeveloped in the 1990s. I have also now found an historic photograph online that support this theory, and indicates the original brick elevation terminated below the concrete ring beam, with the 5th Floor being an additional storey, i.e. a 1990s intervention.

There is an obvious clear distinction between this section of parapet wall construction and the original 2½ brick thick solid masonry walls below.



Initial query as to the age of the parapet now answered.



New build (1990s) construction above concrete ring beam.



Open perpend (weep holes) commensurate with cavity wall construction i.e. cavity wall tray and drainage.



Leading edge to modern polymer polyethylene dpc / tray visible above the lead cover flashing.



Solid masonry (English Garden Wall Bond) below concrete ring beam – note old rusted fixing bolt holes to former hopper head.



Assumed cavity wall parapet reliant on coping / dpc beneath to keep out rainwater and tray at base drain the cavity.

The above photos illustrate several modern construction techniques that could not have been introduced retrospectively. Note the reinforced polythene / plastic DPC and the provision of open perpend, indicative of contemporary 1990s cavity wall construction, possibly with snapped headers.

If this is indeed how the wall has been constructed at this point, then potentially any movement or poor installation of the cavity tray at the base of this section of cavity wall will give rise to water incursion. On that basis we have highlighted the base of the parapet and indeed, the head of the

wall for further intrusive investigations. The integrity of the trays and the damp proof course beneath the coping need to be checked.

(2) Back parapet gutters.

Hidden behind the rear parapet wall is a traditional back gutter or parapet gutter that the main rear roof slope drains into. The rear roof slope runs down to eaves level at this point and is concealed behind the parapet wall. The eaves guttering further up slope, where the roof slope has been cut back to create the roof terraces also discharges rainwater into some of these back gutters. You will note in the photographs below the rainwater pipe that has been diverted and now transfers run-off from the eaves guttering above the roof terrace to 503. This would be a significant volume of rainwater transferred to the back gutter during heavy rainfall and flash flood conditions.



The rear roof slope drains to eaves guttering where cut-back to form the roof terraces.



And to the hidden parapet gutters.



General arrangement of the back gutter.



Drainage redirected from the eaves guttering to 503 roof terrace to the back gutter of 502.

These back gutters are weathered with sheet lead dressed and laid into the sole with single lap joints (not weltd joints) formed between the lengths of sheet lead to allow for expansion and contraction of the material, all as per the technical guidance that would have been set out by the Lead Development Association / Lead Sheet Association, current at the time.

There is no evidence of lead welds or sealant to the joints.

Lead designed and installed as per LSA recommendations will perform perfectly well so long as the gutters are shedding water; however, as soon as water builds up in a gutter there is a risk that the jointing to the sheet lead will be breached – this type of jointed lead is not designed to hold or sit under water. Below are several photographs which show the joint details to the leadwork and a clear silt / algae line i.e. tide-mark, indicating that rainwater does build-up above and beyond the joint.



Given the length of the guttering the sections of lead have been jointed to prevent splitting.



Lap joint to sheet lead designed to accommodate thermal expansion and contraction in the material.



Standard joints to lengths of leadwork, sole and walls.



Potential for rainwater ingress to exploit the jointing to the lead sheet when the gutter is holding water.

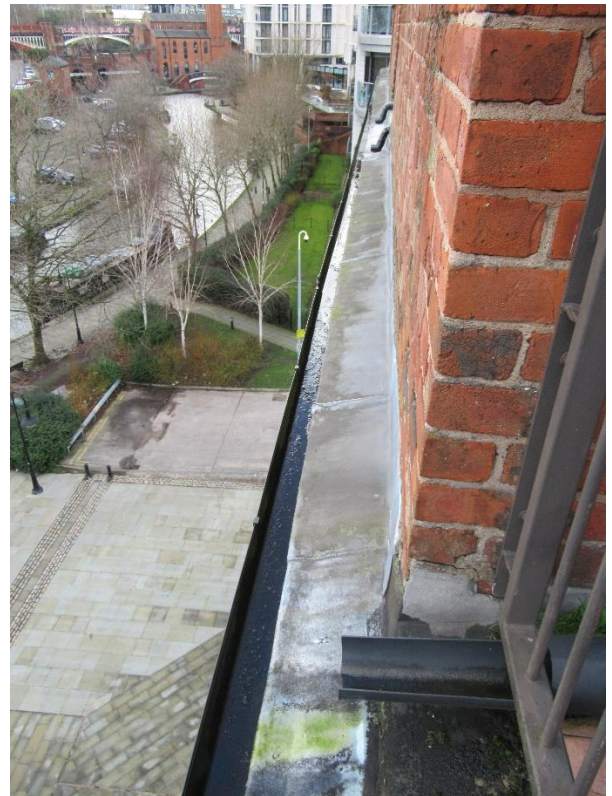
This is another element of construction that has been flagged for further investigation. If water builds-up within these gutters during heavy rainfall, which I suspect it does (evidence points to this), the lead weathering details will allow water to penetrate the fabric, unless there is a secondary weather-proofing barrier beneath this, which I doubt.

A simple solution in this case might be to cover the lead with a fleece and built-up liquid plastic waterproofing to form a seamless gutter, to eliminate the reliance on jointed sheet lead.

There does not appear to be a requirement for a weir overflow or spitter, on the basis that the end of the back gutter is open, with a further hopper and short section of pipe discharging to the 5th Floor roof terraces, as shown below.



Hopper to open end of parapet gutter.



Drainage from hopper downspout onto ring beam.

(3) The balcony weathering details to the 5th floor apartments.

There is a need to educate the owners of the 5th Floor apartments that their terraces are, first and foremost a roof rather than a patio. It is not unusual to find waterproofing membranes having been stripped and replaced with screed so that new tiling can be laid or fixings drilled into and through the waterproofing. In this case, the terraces appear to have been originally weathered with polymer modified mastic asphalt, a good long-term solution, albeit requiring routine maintenance to ensure that any splits, cracks or movement within the asphalt are repaired.

The photographs below show various states of disrepair to the original asphalt and one of the roof terraces to Apartment 502, which has been renewed /overlaid with a modern liquid plastic waterproofing system.



Typical example of cracked / fissured asphalt to the upstand skirting to 502 roof terrace.



New liquid plastic overlay completed to a good standard and providing a watertight deck.



Obvious splits and defects to the asphalt to 505 terrace – remote from both 402 and 404 but included for context.



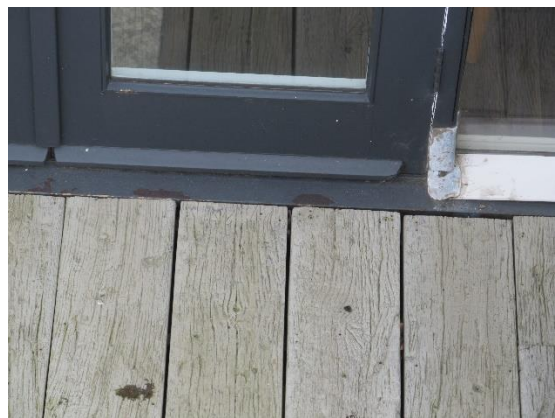
Retrospective lead saddle / bandage repair where electrical cables pass through the waterproofing to 504 Terrace.

Whilst there are several minor cracks and splits within the asphalt above 402, it seems unlikely that these would give rise to the reported issues post heavy rain. Notwithstanding, they need to be addressed and should be swept up with any future Planned Maintenance Works.

In respect of the ingress to 404, I cannot eliminate the roof terrace weathering details to 504 as a potential cause and certainly the repairs affected to the patio screen base rail with lead should be further investigated.



Further example of patch repairs to 504 Terrace.



As above and opposite - 504 Terrace.

(4) The capacity and integrity of the eaves guttering.

I have not carried out any calculations to determine the surface area and volume of rainwater that the eaves gutter planted to the rear wall drains, but I have seen several giveaway stains and deterioration to the brickwork beneath the guttering that convinces me that this gutter is undersized and during heavy rainfall will overspill or surcharge.

The question is whether this has caused the water incursion evident within the flats to the 4th Floor? I believe it to be unlikely, on the basis that the run-off from surcharges to this guttering are outside the building line and whilst it will saturate the brickwork, it will take some time for it to draw through to the walls internally. Much of the staining to the 4th Floor flats is coincidental or emanates from the 5th Floor (manifest to the ceilings) not through the walls.



Evidence of prolonged surcharges from the eaves guttering affecting the brickwork below.



Downspouts serving the rear roof slopes and hidden parapet gutters.

Again, the guttering is something that should be replaced and correctly sized. On the basis that the existing guttering is fabricated from PVCu and of nothing of great architectural importance, there should not be any issue in replacing this with the Conservation Officer.

(5) The window head detail.

The same comments apply as above. Water staining internally does not coincide with water tracking through the window heads. The same comments also apply to the sub-sills. The pointing is, in some instances, poor and I would question the mortar mix that has been used, but these items can be incorporated within the Planned Maintenance Schedule for action in due course.

(6) The sub-sill detail.

No further comments. The same logic on the pattern of staining to the ceilings applies.

Having completed my inspection at close range from the basket of a cherry picker, I have identified several other defects (beyond the original six) that if not attended to within the next few months will give rise to problems with water incursion. The photographs below illustrate these other defects.

The split GRP casings to the pergola stanchions, might, dependent upon the base detail to the steel, allow rainwater to run in and bypass the parapet wall weathering details, leading to rainwater to the 4th Floor apartments.



Split cement fibre ridge tiles and evidence elsewhere of slipped and missing slates to the rear roof slopes.



Open joints (typical) to GRP casings – potential source of rainwater to the parapet wall.

5. Summary & Conclusions:

Unfortunately, the absence of any construction drawings in particular to the modern aspects of the redevelopment, i.e. the roof terraces, is making the job of pinpointing where water incursion might occur difficult. I cannot give you a magic bullet on this. Hopefully, you will have picked up my caveats and assumptions that have been made on construction and understand that I cannot be definitive. It is going to be a process of elimination and I think the best thing to do at this point is focus on the back parapet gutter to create a seamless waterproofing detail to prevent water exploiting the joints to the sheet lead weathering and thereafter work through the following further investigations / repairs.

Flat 402 & 404	Investigate parapet wall cavity trays and below coping dpcs – repairs if required.
Flat 402 & 404	Seal GRP casings to pergola stanchions.
Flat 404	Investigate temporary waterproofing repairs to 504 Terrace – flood test and undertake repairs.

There are various other repairs (corrective maintenance) that should be carried through into the Planned Maintenance Programme.

I look forward to discussing with you further.

Kind regards,

Yours sincerely



Simon Hill
Director



Encl.