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Dear Mr Harrington

Re. Structural Waterproofing Conservation Considerations – Mansfields Chambers

Objectives

You have asked me to provide an explanation concerning proposals by Peter Cox Limited to waterproof the existing basement level to form a plant room and staff areas.

I understand your request for my design proposal and reasoning came due to recent correspondence which you received from the Conservation Officer at Manchester City Council.

The Conservation Officer noted concerns which centre around any impact that the proposed structural waterproofing proposals would have on the existing fabric of the basement in this Grade II listed heritage asset building.

In accordance with their responsibilities, it seems that Manchester City Council are conducting a conscientious due diligence approach by requesting that we investigate the proposals and report back with considered findings, particularly given in their view that limited or no waterproofing works should take place.

In terms of credentials, I confirm that I have a background in architecture as an architectural technologist and am CSSW and CSSW qualifications which relate to dampness and structural waterproofing of below-ground structures. I have twenty-seven years of diverse professional experience in this field, having also been involved in heritage projects in the past using the same kind of Type C cavity drained protection solutions proposed.

Scope

This letter will set out my reasoning with regards: -

- Existing conditions in terms of damp and water ingress and possible source(s) of the penetrating water.
- An analysis of the likely impact of the structural waterproofing proposals on the fabric of the existing cellar.
- Due consideration of possible alternative options for waterproofing the existing cellar.
- Conclusions and recommendations moving forward.
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Considerations

I draw attention to paragraph 2 of the NPPF (National Planning Policy Framework 2012/2021):

“Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use”

I think we can all accept that the areas within the cellar we have been instructed to inspect in its current form and condition is unfit for any kind of habitable or semi-habitable use given the damp environment. It could even be argued that in its current condition, it could pose a potential hazard to health because it may contribute to a microclimate which could favour propagation of algae, bacteria, that the smell is unpleasant and as a source of water ingress and dampness it has the potential to increase atmospheric moisture content and therefore increase risk of condensation elsewhere in the building. The current conditions therefore need to be addressed.

Accepting that the existing basement will need to be waterproofed to produce the benefit of a usable space, the question then becomes “what form or system of waterproofing would produce the safest and most reliable solution combined with the least invasive/least harmful implications for the existing fabric of the cellar?”. To answer this question, we need to consider the options:

Assessment of potential forms of waterproofing

BS8102:2009/2022 Protection of below ground structures against water ingress (recently updated) is the benchmark standard for the industry. It defines different options for forms of waterproofing, and it defines the “performance requirement” or internal standard of environment for basement spaces for various occupational uses. See **Table 2** below:

Table 2 Grades of waterproofing protection

Grade	Example of use of structure ^{A)}	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use ^{B)} Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a drier environment (than Grade 1); storage areas	No water penetration acceptable Damp areas tolerable; ventilation might be required
3	Ventilated residential and commercial areas, including offices, restaurants etc.; leisure centres	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

^{A)} The previous edition of this standard referred to Grade 4 environments. However, this grade has not been retained as its only difference from Grade 3 is the performance level related to ventilation, dehumidification or air conditioning (see BS 5454 for recommendations for the storage and exhibition of archival documents). The structural form for Grade 4 could be the same or similar to Grade 3.

^{B)} Seepage and damp areas for some forms of construction can be quantified by reference to industry standards, such as the ICE's *Specification for piling and embedded retaining walls* [1].

The performance requirement for the proposed treatment areas would fall under **Grade 3**, because this would constitute a habitable space where a “dry” environment would be required.

BS8102 defines three forms of waterproofing protection:

Type A barrier protection where a separate membrane or coating is applied to the structure internally or externally to physically block water out.

Type B integrally watertight construction where the structure itself is designed to be waterproof (this is not relevant here, because integrally watertight construction generally refers to in-situ reinforced concrete designed to BS EN:1992 or incorporating a chemical waterproofing additive in the mix).

Type C drained protection where the existing structure acts to slow down and regulate the passage of ground water and the internal faces of the structure are lined with dimpled cavity drainage membranes which act as a drainage space to control and divert water into a maintainable system of internal perimeter channels, connected to a sump & pump system with high water alarm and battery backup.

In consideration for use of any potential Type A barrier waterproofing system for the existing cellar: The option here would involve the continuous lining of the internal faces of the existing walls and new slab using a cementitious multi-coat render or in-depth crystalline waterproofing slurry. Success of such a system on the internal faces of the existing basement would rely completely on “perfect” substrate preparation. This would mean the removal of all existing paint finishes to expose the underlying brick work, the grinding out and re-pointing of existing mortar joints to allow a suitable slightly expanding cement-based repair mortar to be installed, the scabbling or sand blasting of the existing bricks to produce a sound and porous substrate to which the multicoat render or crystalline slurry could key to resist the negative forces of ground water moving through the walls (hydrostatic pressure).

Once the waterproofing render has been applied, it would be impossible to remove because it would have become an integral part of the existing structure. Therefore, the “harm” resulting from the application would be irreversible and the substrate could never be returned to its formed condition and properties. I do not think that application of such a system would be in the interests of conservation, and I think that the application of such a cementitious waterproofing system here would be at high risk of failure from a waterproofing point of view. Internal systems on the negative face of the structure which rely on blocking out water forever are notoriously prone to failure because they rely on near perfect substrate assessment and preparation and perfect product application to work. Perfection is a standard which is difficult to achieve under building site conditions.

Were any type of external installation of a Type A waterproofing system to be attempted, this would fail because it would be impossible to dig out externally and achieve waterproofing continuity right around the basement and there could be no continuity of external waterproofing beneath the existing footings and beneath the existing slab.

In consideration for use of any potential Type B waterproofing system for the existing cellar:

Type B waterproofing where the structure itself is designed to be waterproof is used only in new-build construction, so is not relevant here.

In consideration for use of any potential Type C drained protection waterproofing system for the existing cellar: This is the form of Limited waterproofing which is being proposed by Peter Cox Ltd. The internal faces of the existing walls would be cleaned down/lightly brushed to remove any loose and friable material and then lined using dimpled membranes with studs on the back, known as cavity drainage membranes.

The existing concrete floor slab would have a min. 100mm deep x 100mm wide channel chases rebate cut into it all around the perimeter, into which a maintainable system of maintainable plastic perimeter channels would be installed, leading to sump and pump chambers with battery backups and high-water alarms.

In this way, any water from external sources migrating through the walls would be controlled, diverted, and pumped away periodically as and when enough water had accumulated in the sump chamber to activate the float switches on the pumps.

The advantages from a conservation and least harm point of view over options for other waterproofing systems such as Type A barrier protection are considerable:

Type C cavity drainage wall membranes represent “passive” waterproofing protection as they are drainage based and do not fundamentally alter the form and finishes of the existing structure. The wall membranes are generally point-fixed using 60mm-long sealed plastic plugs at min. 600mm centres, or sometimes greater than 600mm centres. Except for brushing loose and friable materials from the faces of the walls which could otherwise act to clog the drainage channel system over time, the existing lime wash could stay on. This means that in future generations, the system could be substantially “reversed” with removal of the wall membranes, and the sensitive pointing in and concealment of the 10mm holes drilled for the fixing plugs.

The cavity drainage membranes proposed for the walls would be left open at the top to encourage passive air flow and air exchange. Cavity drainage membranes form an air gap as well as a drainage space. They do not produce the same effect as lining over a structure using a flat profile membrane, which would act to trap moisture within the existing substrates, potentially causing the moisture levels to rise within them.

Conclusions

Having inspected the existing proposals, understood your purposes for intended use and having evaluated various waterproofing options available to you, I state the following:

The waterproofing option which would represent an option which could be seen as resulting in less than substantial harm but at the same time acting to maintain both public and private benefit would be the installation of the Limited Type C drained protection system as proposed by us. The reasons for this are stated in the section of my letter beginning: **In consideration for use of any potential Type C drained protection waterproofing system for the existing cellar** above.

The Type C system would act to preserve the features of the existing structure and the existing finishes in the most sympathetic way from a conservation point of view, but it would also offer you the safest and most reliable option from a structural waterproofing point of view.

As stated, the proposed Type C system could be seen as being largely “reversible”. If the stakeholder’s ownership of the building should end at some point in the future, then subsequent generations could enjoy the benefit of having the cavity drainage membranes removed with minimal repairs and having the original walls and features revealed for display.

The installation of Type C cavity drainage systems in basements of Grade II listed buildings as the least invasive and most conservation friendly waterproofing option has firm precedent in many conservation-related renovations. I have therefore included two heritage case study examples.

The products proposed for use in this particular instance are from Delta Membranes, I deferred to Delta Membrane Systems for a list of conservation projects they have been involved in, and this list is also included below.

I realise that some of the references may contain technical jargon or may raise questions in your mind which may require clarification of further explanation. Please do not hesitate to ask or to query any of the points I have raised.

Should you wish to discuss this letter or the proposed recommendations I have made, I can be contacted through this office or on 07775 702 856 any time up to 5.30pm.

Yours sincerely

A handwritten signature in black ink, appearing to read 'M. Jones', with a large, stylized circular flourish at the bottom.

Michael Jones CSRT CSSW
National Waterproofing Manager

SEE BELOW FOR APPENDIX

DELTA MEMBRANES – PROJECT REFERENCE LIST

The following list shows a selection of projects where Delta products have been used to provide waterproofing solutions.

PROJECT	PRODUCT
Holy Trinity Church, Bardsea, Cumbria.	DELTA-PT
RADA – London NW.1	MS-500, MS-20, PT.
Lewes Castle – Lewes, Sussex.	MS-500, PT.
Hampton Court – Richmond, Middx.	DELTA-PT
Cartmel Priory, Ulverston, Cumbria.	DELTA-PT
Fort Horsted, Chatham, Kent.	DELTA-PT, Delta-FM
Houses of Parliament (West Tower)	DELTA-PT
The Trocadero – London W.1	MS-500
Albury Theatre – London W.1	MS-500
Bush House, Aldwych, Strand, London.	MS-500
Freemasons admin. offices, Gt. Queen St., London.	MS-500
The Greenwich Observatory, Greenwich, London.	DELTA-PT
Castle Howard, North Yorks.	MS-500, PT.
Betty's Tea Rooms, Harrogate.	MS-500, PT
Harrow School, Middx.	MS-500, PT.
Gordonstoun School, Scotland.	MS-500
<u>L.U.L.</u> London underground stations: Various	Delta-PT
RTE stations, Ireland.	DELTA-PT, Geo-Drain
Royal Baths, Harrogate, Yorks.	MS-500
Comedy Store, Leicester Sq. W.1	MS-500
Royal Naval medical College, Gosport.	MS-500
Channel Tunnel, UK-France. + C.T.R.L. 320	MS-500, MS 20
Univ. of London, The Library, Gt.Titchfield St. WC1	MS-20, MS-500.
London College of Hygiene & Tropical Medicine	MS-500, DELTA-PT.
Kensington Palace, Flat 4, London SW.1	MS-500
<u>Railtrack</u> – Camden Station Arches, NW1.	MS-500
The Mechanics Institution, Huddersfield.	MS-500
Athenaeum Hotel, Piccadilly, W.1	MS-500
The BBC., Portland Place, WC.1	MS-500
Keeble College, Oxford.	MS-20, MS-500.
St. John's College, Oxford.	MS-500
Seagate House, Long Sutton, Lincs.	DELTA-PT.
Kodak Factory, Chester Rd., Manchester.	DELTA-PT., MS-500
Nat West Offices, St. James Sq. London W.1	DELTA-PT, MS, MS-20.
Heron House, The Strand, London W.1	DELTA-PT, MS-500
Langham Hilton Hotel, Portland Place, London.	MS-20, MS-500
English Football Academy, Bisham Abbey	DELTA-FM
Kilco Castle, Ballydehob, Co. Cork, Ireland.	DELTA-PT
Cor Castle, Innishannon, Co. Cork, Ireland.	DELTA-PT, MS-500
The Courts of Justice, Cork City, Ireland.	DELTA-PT, MS 20

DELTA MEMBRANE SYSTEMS LTD.

Heritage

Further to your recent enquiry in respect of Delta 'Air gap systems' Delta has been used in various Grade 1 and 2 listed structures. Delta is an 'air gap system' and is generally favoured by English heritage, the society for protection of ancient buildings (SPAB), as well as various local authority conservation officers. I would be surprised if your conservation experts refused this as our heritage credentials are second to none and we rely heavily on recommendation from the heritage fraternity.

Delta is not a replacement for lime renders. Delta is a compromise when lime renders are inadequate in given situations, for example on below ground structures, on structures that have heavy salt contamination and on structures that cannot be effectively repaired and waterproofed sympathetically and adequately from the outside for example where there are architectural features that cannot be waterproofed.

Delta is generally favoured for two main reasons: firstly because it is an air gap system that is sympathetic to heritage structures (because of the continuous air gap and ventilation provided) and secondly because it is a reversible process.

There are many examples around the UK and abroad where the system has been used please see project list attached. This is just a project sample list but it does include Kensington palace, Hylands house, Hampton court, Castle Howard. And the Houses of Parliament to name but a few

I hope that this information is of some assistance. If you need any further project references please do not hesitate in contacting me.

Yours sincerely

Mr C.S.Burbridge
Technical department

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