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Project. Existing soil retaining walls, floor slab/s and lightwells, Victoria Mill, Miles Platting, Manchester.

Further to our emails, discussions, and site visit by my colleague Kevin Topping, where we discussed structural waterproofing for the above project and the drawings you provided. Please find below our waterproof for the existing soil retaining walls, floor slab/s and Lightwells.

Wykamol have been asked to propose a design for the Type A & Type C waterproof systems in accordance with BS8102 2022.

We have not been informed of any ground gas or ground contaminants; therefore, our proposal is for waterproofing only.

To confirm that we have understood and interpreted your drawing/our discussion and waterproof documents correctly:

- Design requirement - To conform with the current and relevant British Standards and requirements for below ground waterproofing.
- Internal Use and required Grade - The internal space is a habitable space and requires a Grade 3 environment (BS 8102:2022)
- Guarantee - An installation and an insurance backed guarantee for the waterproofing installation is required.

Please let us know if we have misinterpreted any of the information or the drawings regarding the scope of work that we have recommended in this initial proposal.

With the above borne in mind we also take in to consideration the following information when compiling a waterproofing rationale:

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The Code of Practice for the protection of below ground structures against water (BS 8102:2022) and NHBC Chapter 5.4 'Waterproofing of basements and other below ground structures' outline four grades of waterproofing protection or performance levels:

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Table 2 — Waterproofing protection – Grades of performance for below ground spaces
Grade A) Performance definition

1a Seepage and damp areas from internal and external sources are tolerable, where this does not impact on the proposed use of below ground structure.

Internal drainage might be necessary to deal with seepage.

1b No seepage. Damp areas) from internal and external sources are tolerable.

2 No seepage is acceptable. Damp areas as a result of internal air moisture/condensation are tolerable; measures might be required to manage water vapour/condensation.

3 No water ingress or damp areas is acceptable.

Ventilation, dehumidification, or air conditioning necessary; appropriate to the intended use.

The documents also outline three types of waterproofing system:

- Type A (barrier protection)
- Type B (structurally integral protection)
- Type C (drained protection)

With all systems, although the products themselves are often tested and certified, it is the design and installation that lets them down and it is widely acknowledged that 100% perfection is not possible regarding installation.

This stems from case history, as shown in the 'Outwing vs Weatherald' case. We therefore design with the possibility of defects in mind.

Defects occurring in Type A systems include poorly sealed and/or badly detailed laps, damage during application, difficulty of application due to site conditions and penetrations caused by ongoing trades.

Defects in Type B construction can be poor compaction leaving voids, poor/high water cement ratios again leaving voids in the form of open capillaries, badly installed construction joint accessories, plus the many forms of cracking.

Defects in Type C systems can be poorly sealed and/or badly detailed laps which do not weather against possible flow of water, systems installed which are not maintainable and can clog up with lime and silt, and poorly installed/designed pumping and backup systems.

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Furthermore BS 8102:2022 recommends consideration should be given to the use of combined protection (i.e., Type A and Type B, Type A and Type C, Type B and Type C Type A & Type A) where in a single system:

- a) The likelihood of leaking is high.
- b) The consequences of leakage are unacceptable.
- c) Additional vapour checks are necessary for a system where unacceptable water vapour transmission could otherwise occur.

Type A (barrier) protection

Type A is a form of waterproofing defined within BS8102 2022 (Protection of below ground structures against water, as a barrier protection).

Barrier-specific properties should also be evaluated, allowing for any predicted cracking from the structure. The waterproofing barrier should be capable of providing the appropriate protection against water and water vapour without disruption or decay.

Although some barrier materials accept local strains and can accommodate a crack opening in the supporting structure, it should be noted that others might be damaged by differential movement or cracking.

The waterproofing barrier should, in most instances, be continuous around the structure. In order to maintain the continuity of the barrier, penetrations through walls or floors that are to be protected (e.g., openings for services, pipes, cables) should be avoided, wherever possible. Where it is essential to provide such openings, special treatment around the penetration should be provided and reference should be made to the manufacturer's instructions and specialist advice. Similarly, where fixings through the barrier are necessary, the manufacturer's instructions should be followed.

Movement joints below ground should not be used unless unavoidable; in such cases these should be waterproofed in accordance with the manufacturer's instructions.

Where a waterproofing barrier is required for a structure supported on piled foundations, special consideration should be given to the detailing so that structural continuity is not compromised and reference should be made to the manufacturer's instructions.

Cementitious crystallization barriers are blends of Portland cement, treated quartz sands and active chemicals. They are supplied in powder form and are mixed with water to form a slurry, which is then applied directly to the prepared concrete surface.

The active chemicals combine with free lime and moisture present in the capillary tracts to form insoluble crystalline complexes which prevent water ingress.

Cementitious crystallization barriers should be applied to either internal or external surfaces of the concrete structure by brush or spray. They are suitable for use on both new and existing structures.

Surfaces should be prepared (in accordance with the manufacturer's instructions) so as to have a capillary open structure prior to the application of the barrier.

Cementitious crystallization barriers can be applied as a single coat slurry to hardened concrete or dry sprinkle and trowel-applied to fresh concrete.

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They can also be applied to concrete blinding immediately prior to the placing of overlaying concrete.

The installation of cementitious multi-coat renders, mortars and coatings should, unless otherwise advised by the manufacturer, be left until as much as practicable of the structure's dead load has been applied.

The substrate should be prepared in accordance with the manufacturer's instructions prior to the application of the system.

Details on the application method and rate, mixing, number of layers/coats and curing requirements should be sought from the manufacturer.

Existing substrates and structural elements should be assessed for suitability to withstand any increase in applied loads from water pressure

Type B – STRUCTURALLY INTEGRAL PROTECTION

'Type B' is a form of waterproofing defined within BS 8102:2022 (Protection of below ground structures against water), where the structure itself is constructed to be integrally waterproof and the primary resistance against water ingress. These types of structure are usually made of well-designed and well-placed reinforced concrete, with the steel reinforcement limiting flexural movement and crack widths.

Concrete structures leak where the concrete isn't, joints allow water to ingress so these joints need to be waterproofed with either hydrophilic waterbars, which swell on contact with water, or metal waterbars which form an actual physical barrier against water ingress. These can be supplemented with injection waterbars that have the capability to inject leak sealing resins to fill voids to porous and poorly compacted joints, as well for post-construction leak sealing.

There are several methods of construction, the most waterproof by design being where concrete walls are supported from a concrete raft foundation, so that the main joint between walls and floor is compressed by the full weight of the building. Design is often dictated by boundary restrictions and so piled walls with in-fill RC slabs are also common. Piles can be concrete or steel.

TYPE C – DRAINED PROTECTION

'Type C' is a form of waterproofing defined within BS 8102:2022 (Protection of below ground structures against water),

A 'Type C' System is a below ground, internal waterproofing system, comprising of membranes, drainage and, if required, pumping systems with battery backup and ancillary products. With this design, it is accepted that water could enter the building and an internal cavity is provided to depressurize, and manage the water, which is why they are sometimes referred to as 'water management systems. Once collected, water can be discharged from the property either via gravity to open elevations or removed by mechanical means.

Because the waterproofing is not holding back water pressure, it is regarded by most waterproofing professionals as the safest form of waterproofing available. It is also the form of waterproofing that is the most maintainable and repairable.

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'Type C' cavity drain waterproofing systems are suitable for use with all types of structure and to both new-build and for the refurbishment of existing structures where the waterproofing has failed.

The only risks to this form of waterproofing are where the drainage cavities become blocked, or where too much water is entering the structure for the system to deal with, or where there is no power for the pumping system.

It is also the Wykamol recommendation (based on BS8102 and NHBC guidance) that a dual system is utilised for dryer grades, and we would generally only recommend for Grade 3 environments the Type A and Type C, Type B and C, Type B and Type A or Type A & Type A combinations, with the use of construction joint accessories.

Our reasoning for this is that it is understood that Types A and B are both resisting the hydrostatic pressure and any defect will allow ingress.

When we are designing for habitable space, we will generally require a completely dry internal environment defined as a 'Grade 3' by the BS8102. Whichever combination of waterproofing is chosen to achieve the Grade 3 environment we would always recommend that one of the forms of waterproofing is an internal cavity drain membrane system (Type C). The choice of the other system is largely dictated by the type of structure.

It is widely accepted that a well-designed Type C system will depressurise any water which enters the structure as a result of a defect and will manage it accordingly hence most application defects will never be subjected to water pressure if a full and well-designed system is used.

The Type C system is acknowledged by most in the industry to be the most effective and trouble-free form of waterproofing as a standalone system and the failsafe system in waterproofing designs where completely dry internal environments are required to be guaranteed.

High quality cusped membranes, maintainable pre-formed perimeter drains at the vulnerable wall floor junction and pre-formed (void forming) floor drains to allow any water present to flow by its own hydraulic gradient to the chosen drainage medium. We can supply an expansive range of sumps, pumps and backup systems with power supplied by a range of inverter systems and control panels. We can even supply a generator backup system. To clarify our general recommendation would be to always recommend a sump and pump system be used to discharge water from a basement unless there is an option to discharge it naturally via gravity at an open elevation or to an existing or designed in drainage medium. These options would be conditional upon the invert levels being suitable and being sure that the drainage was completely safe i.e., that it would not back up or become blocked or defective in the future. If there is any doubt regarding the suitability of this type of drainage then we would recommend a sump and pump. With regards to the predominant system, the system which will withstand the main head of water pressure there is a choice between the Type A system and the Type B system. Regardless

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of the findings of soil reports, water table levels etc. we always design for water to the full height of the structure as it is a brave person that bets that water will never come to bear against a structure built below the ground at some time in its design life.

The inclusion of appropriate waterbars in the concrete construction joints to preclude water is also required. We would recommend an active water bar for most situations which swell and seal imperfections when hydrated.

NB. Our Specification Sheets and Technical Drawings cover the general waterproofing design and some of the most significant details in the project, but should be read in conjunction with the full construction drawing package provided by the Architects and Engineers.

With the above borne in mind and the property being an existing structure, it has been agreed, that the waterproofing is recommended as follows.

Type C Cavity Drain System.

Wykamol CM cavity drain membranes, with Butyl ropes, tapes, sealed fixings, perimeter drainage with flushing ports to natural gravity drainage points provided by the main contractor.

Type A Barrier system/s.

Wykamol crystalline cementitious tanking slurry, Universal mortar, and system ancillaries.

Type C systems.

Maintenance and Commissioning

1. Design in order to maximise the long-term integrity and effectiveness of a waterproofing system incorporating TYPE C protection, the waterproofing system should be designed to be maintainable. Access points that allow routine maintenance of channels and outlets should be incorporated into the design of the waterproofing system.
2. Installation and inspection immediately after the installation of a cavity drain system, drainage channels and sumps should be cleared out and tested. Pumping devices should be checked, tested and fully commissioned in accordance with the manufacturer's instructions. The servicing requirements for the waterproofing system should be clearly set out in the documentation supplied by the installer to the client, including the need for regular planned maintenance of the drainage and/or pumping systems, not less than once every year.

Items for Consideration

Item 1.) Defects in Type C systems can result from poor installation, lime and silt build up, poorly designed and installed pump stations, lack of backup systems and lack of maintenance of the pump stations.

Item 2.) Cavity drain systems do not change the loadings due to water on an existing structure, other than where remedial measures are taken to control water ingress.

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Item 3.) Where cavity drain membranes are used, the membrane forms a permanent cavity between the external elements of the structure and the internal wall/floor finishes. Such cavities vary in width, depending on the stud height or profile of the membrane, but are usually up to 20 mm.

Cavity drain membranes should be used in accordance with the manufacturer's instructions. In particular, the stud height or profile of the membrane should be selected in conjunction with the manufacturer's data and after considering the external hydrostatic pressure, the porosity of the structure and the predicted rates of water ingress through the structure's external fabric.

Cavity drain membranes can be used on surfaces that have been contaminated with impurities. However, in these situations, consultation should be undertaken with the local environmental agency regarding discharge from the system.

Item 4.) In circumstances where pumps are running for long periods of time, or where the system is subject to silting or the deposition of free lime, more frequent servicing may be necessary.

Specification.

Design Requirements

- To conform to the current and relevant British Standards and build warranties.
- To supply a specialist waterproofing design of which Wykamol are the designers of the Type A & Type C waterproofing systems and installed by a recognised Wykamol waterproofing specialist, or a trained waterproof contractor with knowledge of waterproof systems.
- To ensure the design provides an internal environment at Grade 3, for habitable use, in accordance with BS8102:2022.
- Ensure all guidelines required for issue of insurance backed guarantee are met

N.B. Please let us know if we have misinterpreted any of the information regarding Wykamol's remit and the scope of work we have recommended in this proposal.

Investigation

1. The Wykamol Group Ltd have been provided with drawings showing the proposed layout and elevations.
2. The Wykamol Group Ltd have asked to provide a specification/proposal of the Type A & Type C waterproofing systems for the main soil retaining walls, floor slab/s and lightwells.

Discussion

A visual inspection of the documentation provided shows a waterproofing system is required to provide a habitable environment in accordance with BS8102:2022.

The grade of waterproofing required as per Table 2 "Grades of Waterproofing Protection" BS8102:2022, would be Grade 3, where performance is of a level that 'no water penetration is acceptable. Ventilation, dehumidification, or air conditioning necessary, appropriate to intended use.'

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N.B. Please speak to your ME engineer or specialist waterproof installer for further information on ventilation.

The following specification should be read in conjunction with the Wykamol Group's technical details and the architects and engineers drawing details.

Preparation.

All surfaces are to be fully clean and clear of all defects, debris, dust, and protrusions and the Wykamol waterproof systems installed in conjunction with the manufacturers data sheets and installation guidelines.

Type A Barrier system.

Lightwells.

Remove all existing render/plaster to the bricks, make good and point up, make good the slab/s.
Install Wykamol Universal mortar as a fairing coat to all walls
Install Wykamol Universal mortar as fillets to all angled joints
Install Wykamol Hydradry tanking slurry to all walls and floor slab/s
Install wall and floor finishes as protection for the tanking slurries. (Wall renders, floor screeds for example)

Note.

We have been informed that each lightwell has had adequate surface water drainage installed.

Internal Type C cavity drain system.

Preparation.

All surfaces are to be fully clean and clear of all defects, debris, dust and protrusions and the Wykamol waterproof systems installed in conjunction with the manufacturers data sheets and installation guidelines.

Note.

The floor slabs must be flood tested by the specialist installer prior to installing the Type C cavity drain system. Any defects or ponding should be taken out by either grinding the high points, or using suitable waterproof levelling compounds to make up any low points.

Anti-Lime sealer.

Install Wykamol Anti-Lime sealer to all concrete surfaces.

WYKAMOL INTERNAL TYPE C CAVITY DRAINAGE SYSTEM.

For installation methods, please refer to our Wykamol membrane and the Wykamol drainage installation guides.

Note.

A 100mm wide x 50mm deep pre formed channel in the concrete slab should be formed at the wall/floor junction to all soil retaining walls.

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Walls.

Install Wykamol CM8 membrane to the wall's full height and taking into the pre formed channel, using Wykamol sealed fixings, seal all joints.

Perimeter drains.

Install Wykamol perimeter drain with the pre formed channel, set dead level including swept bends jointers, 50mm flushing points, T Pieces, 50mm outlets and connected to the Wykamol sump stations or, natural drainage points.

Floors.

Install Wykamol CM8 membrane to the floors, seal all membrane joints.

Wall and floor finishes to be installed over the system.

Fully test the Type C cavity drain system in accordance with BS8102 2022, prior to handing over the waterproof system to the client.

All Wykamol waterproofing materials to be installed to the manufacturer's instructions including all joints, seals and overlaps and in conjunction with the Wykamol installation guides and data sheets.

Please note this design/proposal is only applicable to Wykamol products and assumes a specialist contractor, who has been trained by Wykamol, installs the systems.

Prior to carrying out structural waterproofing works check the structure to ensure that there is no significant water ingress through the building fabric since it should act as the primary resistance as detailed in BS8102:2022. If there is significant water ingress this may be reduced by applying Wykamol products but will require an additional visit to advise on a suitable course of action.

For and on behalf of The Wykamol Group

Reg MacDonald B.Sc. Eng. CSSW CRDS
National Waterproofing Manager

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