MASONRY DAMP INVESTIGATION OF BASEMENT AT THE OLD RECTORY

JOB NO. 157-85 **Rev A**

NICK HILL AND JANE OSBORNE-HILL

10 AND 11 JANUARY 2023

Prepared by:	Technical review by:	Administration by:
Will Woodward *BSc (Hons)*	Matt Smith *MA, MSc*	Kim Meredith

CONTENTS

Appendices

Hutton+Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA,

Tel: 01483 203221 Email: ei@handr.co.uk Web: www.handr.co.uk

1 INTRODUCTION

1.1 AUTHORITY AND REFERENCE

Hutton+Rostron Environmental Investigations Limited carried out a masonry damp investigation of the basement at The Old Rectory, Drinkstone, Suffolk IP30 9SR on 10-11 January 2023 in accordance with instructions received from Louise Herbert by email dated 14 December 2022. Reference was made to drawings supplied by the Architect for the identification of structures. For the purpose of orientation in this report, the front of the property was taken as facing west

1.2 AIM

The aim of this investigation was to identify damp and decay problems or relevant building defects and to give recommendations on any remedial works required to correct such problems and prevent damp or decay problems in the future

1.3 LIMITATIONS

Structures were not examined in detail except as described in this report, and no liability can be accepted for defects that may exist in other parts of the building. We have not inspected any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect or in the event that such part of the property is not free from defect it will not contaminate and/or affect any other part of the property. Any design work carried out in conjunction with this report has taken account of available pre-construction or construction phase information to assist in the management of health and safety risks. The sample remedial details and other recommendations in this report are included to advise and inform the design team appointed by the client. The contents of this report do not imply the adoption of the role of Principal Designer by H+R for the purposes of the Construction (Design and Management) (CDM) Regulations 2015

1.4 H+R STAFF ON SITE

Andy Wade
Will Woodward

1.5 PERSONNEL CONTACTED

Nick Hill and Jane Osborne-Hill – Homeowners

2 EXECUTIVE SUMMARY

2.1 OBSERVATIONS AND RECOMMENDATIONS

2.1.1 Residual moisture in masonry

Earth retaining walls on the west and east sides of the basement were found to be either wet or saturated to the height of external paving. Isolated masonry masses showed raised residual moisture contents where services pipes were actively leaking or where external rainwater goods were known to have failed. However, the existing concrete slab and basement load bearing walls were found to be generally dry, indicating that the structure was not inherently vulnerable to water penetration from below ground, despite the absence of any provision for physical horizontal damp-proofing

No chemical injected or physical remedial damp-proof courses are required or recommended. The use of high-strength cementitious render or other directly applied waterproofing membranes should also be avoided. Wall surfaces should be left exposed or finished in 'breathable' and salt resistant materials, so as to allow the residual moisture content of load bearing masonry mases throughout the basement to reduce and stabilise over time, after refurbishment. Works should be considered to reduce external ground to historic levels and in line with improvements to external ground and surface drainage. Alternatively or additionally, precautionary drainage along west and east walls at the level of the footings may be required in conjunction with ventilated dry linings, placed over studded plastic isolating membranes, to protect joinery and vulnerable materials from salt and moisture affected wall and floor structures

2.1.2 Risk management and remedial damp-proofing works

It was reported to H+R that water had drained intermittently through the bases of earth retaining walls on the west and south-west sides of the basement since current occupancy. Faulty rainwater goods, significantly raised external landscaping and unknown land drain provision or condition below the west paving terrace make it highly likely that earth retaining structures will continue to be vulnerable to liquid water penetration at low level; exacerbated by a lack of fall of ground away from the property on the west and south sides

H+R understand that there is a desire to excavate the west external terrace in line with the reinstatement of window openings as part of the proposed refurbishment. These works are recommended and (subject to Listed Building Consent) should be carried out in line with the other recommendations below. Allowance should also be made for improving the drainage systems for the south and east terraces, to reduce the risk of perched water below the terrace coming to bear against basement structures. If a new limecrete floor is to be installed, H+R recommend the installation of a base drain channel on the west side of the basement, to intercept water draining through the footings and protect vulnerable flooring materials and finishes, in combination with replacement ventilated isolating wall membranes, as shown on plans at Appendix B and sketch details at Appendix D

3 OBSERVATIONS AND *RECOMMENDATIONS*

3.1 EXTERIORS

3.1.1 West front elevation

1 Roof drainage: Roof drainage was not inspected in detail at the time of survey. Eaves guttering serving the main roof discharged to a rainwater downpipe off-centre of the original elevation, at the internal dividing wall between the wine cellar and south-west room of the basement. The downpipe had a nominal diameter of 100mm. It was reported to H+R that this downpipe had been subject to intermittent failure during and current occupancy, allowing significant quantities of water to drain into ground surrounding the footings and basement structures. The downpipe discharged into a deep-set gulley which was blocked by vegetation at time of survey. A section of downpipe appeared to have corroded ~1.5m above ground and appeared to be allowing rainwater to discharge onto the brickwork behind. Additionally, staining to brickwork above this defect suggested that the sequential hopper had previously blocked, also causing an overflow of rainwater onto the façade

Roof drainage should be repaired/replaced and inspected for blockages and cleared to restore function, where necessary. Consideration should be given to a general re-design of the roof drainage system to improve provision for access, cleaning and maintenance. Consideration should also be given to undertaking roof drainage calculations based on up-to-date meteorological data to ensure that adequate drainage capacity is provided to discharge surface water clear of the structure at all times

2 External ground levels and drainage: A paving slab terrace and porch was in contact with the façade across its full width (with the exception of 2no. window openings), generally laid to an insufficient fall. Extensive biological growth and damp conditions gave evidence that surface drainage falls had been compromised, increasing the risk of surface water draining into structures at basement level below. The design of the terrace parapet wall created at 'bund,' which tended to obstruct drainage from the terrace to the driveway and landscaping to the west. The function and order of land drains and pipework serving the west elevation rainwater goods was not determined. The general grade of the driveway and landscaping to the west was approximately 700mm below ground floor level on the interior. Generally, the junction between the porch/terrace paving and the facade was not detailed with an adequate cementitious kicker or mortar fillet. This lack of detail was further allowing water to drain into basement structures

H+R understand that there is a desire to remove paving stones and other C20 landscaping along the west elevation in line with reinstating all infilled window openings within the basement. If these works are completed, appropriate falls and drainage for the reduced ground level must be incorporated to the design

If the terrace is not to be excavated, allowance should be made for detailed inspection of paving, pointing and fillets and for replacement in new or reclaimed materials as required where these are found to be loose or defective. Consideration should also be given to lifting the paving slabs and for relaying over new waterproof membranes applied direct to the refurbished terrace structure and laid to consistent falls from east *to west, with adequate provision for surface drainage. Drainage gullies or chutes should be provided at the balustrade line, to prevent water ponding on the terrace surface*

All below ground pipework serving surface drains should be inspected in detail, using CCTV as required and allowance should be made for all necessary cleaning, repair and upgrading to ensure that surface water is drained clear of the masonry and foundations of the structure at all times

3 Damp-proof course: Masonry was inspected at low level at various locations, including where existing small excavations had been made. Mortar courses were mechanically probed carefully, with no damp-proof course visually identified to the main house at the time of survey. However, given the age of the building (~1760) it can be assumed that there was no horizontal DPC present; with new properties not required to be constructed with a DPC until the Public Health Act of 1875

See the recommendations in 3.1.1(2) above

3.1.2 East and south elevations

1 Roof drainage: Roof drainage was not inspected in detail at the time of survey. Eaves guttering serving the main roof discharged to a rainwater downpipe at the north-east corner of the original east elevation; and centrally 2no. downpipes on the south elevation. Roof finishes over the 2no. bay windows on the south elevation appeared to have been refurbished in the recent past, though there was no provision for formal drainage; with rainwater shedding clear of the façade via the lead sheet edge. This was contributing to the volume of water penetrating basement structures on the south elevation. All rainwater goods were of cast iron, the condition of which is likely to require closer inspection, given the general state of goods elsewhere on the property

Roof drainage should be repaired/replaced and inspected for blockages and cleared to restore function, where necessary. Consideration should be given to a general re-design of the roof drainage system to ensure that there is formal provision for the bay roof structures, as well as to improve provision for access, cleaning and maintenance. Consideration should also be given to undertaking roof drainage calculations based on up-to-date meteorological data to ensure that adequate drainage capacity is provided to discharge surface water clear of the structure at all times

2 External ground levels and drainage: External landscaping was a continuation of that described on the west elevation, with paving slabs forming an extended terrace. Gravel was laid along the south and east masonry walls to slightly improve ground drainage. Gravel was locally excavated at the time of survey to ascertain whether a French drain had previously been installed as a water management measure, though no evidence was found. Both terraces appeared to have been laid with a slight fall away from the property, with fewer evidence of biological growth and soiled masonry compared to the west elevation supporting this observation. In a like manner to the west elevation, the heads of historic window openings were noted at low level, with external ground having been raised significantly since openings would have last been glazed

H+R understand that there is a desire to provide direct access to the basement via the east elevation. If these works are completed, appropriate falls and drainage for the reduced ground level must be incorporated to the design

Further, allowance should be made for the installation of a French/air drain system along south and east external walls, where gravel has already been laid. Refer to the sample remedial details at Appendix D. New drainage pipes should be connected to existing ground drainage or finished to suitable soakaways

All below ground pipework serving surface drains should be inspected in detail, using CCTV as required and allowance should be made for all necessary cleaning, repair and upgrading to ensure that surface water is drained clear of the masonry and foundations of the structure at all times

3.2 INTERIORS

3.2.1 Basement

1 South-west room and gym room (rooms 5 and 7): There was clear evidence of active water ingress into room 5 from above which had affected wall surfaces, with an extensive accumulation of liquid water seen ponding on the concrete slab floor. Stored possessions were damp-affected. The defective downpipe and associated ground drainage was believed to be the primary source, with other external observations described in 3.1.1 above contributing factors. Room 7 had been economically drylined with modern floor finishes during a previous refurbishment, with any potential defects concealed by polythene and plasterboard.

It is suggested that the recommendations listed are completed in a staggered approach, to ensure that the concealment of historic interiors is kept to a minimum, as required. As described in 3.1.1, the moisture source from above should first be addressed, with the excavation of the existing C20 terrace and reinstatement of basement window openings highly advised. If the terrace is not to be excavated, ensure that rainwater drains off of paving stones and away from the property; with suitable lime mortar fillets sealing wall/floor junctions. Adequate through and cross ventilation by fresh external air should be provided to allow water vapour from the structure to continue to disperse after refurbishment

No chemically injected horizontal damp-proof courses or cementitious render tanking systems are required or recommended. Allowance should be made for the replacement of ventilated dry linings with the gym room only, based on vertical studded plastic isolating membranes, to protect vulnerable materials and finishes during and after refurbishment. The dry lining voids should be provided with continuous ventilation at the upper and lower edges, using details provided by the Architect, approved by H+R and similar to those shown at Appendix D

If only minor alterations are made to external landscaping, allowance should be made for installing drained cavity waterproofing along the west wall of the gym room. Floor perimeter channels included in the system could be designed to discharge to the existing sump and pump within the plant room, thus avoiding the requirement for additional sumps and pumps. See plans at Appendix B. Details provided by the Architect, approved by H+R and similar to those included at Appendix D should be used throughout. H+R can provide further advice on remedial detailing if required

2 Plant room (room 1): The walls within room 1 were exposed brickwork finished with a limewash and/or modern paint. Soiling of masonry and surface migration of hygroscopic salts was noted in several areas with varying severity; with masonry in the south-west corner adjacent to an actively leaking services pipe being the worst affected. Adjacent masonry was affected on both faces of walls, with associated defects seen in room 2 and the vaulted archway into room 1. A sump and pump had been installed in the south-east corner and appeared to be connected to and serve plant installations. Historic water staining was noted north of the sump, though the pump appeared to be operational at the time of survey

The source of the active water leak should be addressed urgently. Allow for brushing down of soiled brickwork and for applying a new coat of limewash or breathable paint *system if desired. The plant room was suitable for retention in its current form with no waterproofing measures required. Allow for improvements to ventilation as described in 3.4 below*

3 South-east and south rooms (rooms 3 and 4): In a similar fashion to other areas of the basement, walls within rooms 3 and 4 were exposed brick which had mostly been limewashed in the past. The south external wall of room 4 appeared to have been finished with a cement slurry mix as a previous low-cost waterproofing measure. Minor and localised brick erosion and soiling was noted in the south-east corners of both rooms, with defects noted to be on earth-retaining walls and/or adjacent to roof drainage points. The floor finish of room 3 was currently compacted bare earth, which continued into room 2

No chemically injected horizontal damp-proof courses or cementitious render tanking systems are required or recommended. The recommendations at 3.1.2 should be addressed first. Allow for the brushing down of soiled brickwork and redecorating with limewash or a breathable paint. The use of film forming paint systems should be avoided on masonry which is vulnerable to historic damp penetration and salt migration. Mineral based 'clay paint' or vapour permeable silicate paint systems are preferred. If the proposed use of room 3 requires a greater level of finish, allowance should be made for installing a concrete or limecrete slab with underfloor heating (UFH). It may be practical to place a strip of studded membrane against the base of the wall while the floor screeds are cast, to isolate the screed material from damp and salt affected masonry. Details provided by the Architect, approved by H+R and similar to those included at Appendix D should be used throughout. H+R can provide further advice on remedial detailing if required

In regard to room 4, allow for the installation of a floating floor detail over the existing slab if desired. Allow for the brushing down of soiled brickwork and redecorating as described above. Adequate through and cross ventilation by fresh external air should be provided to allow water vapour from the structure to continue to disperse after refurbishment. Consideration may be given to installing ventilated dry linings to the external south wall if soiling to masonry is still observed after external landscaping improvements

4 Central vaulted rooms (rooms 2 and 6): Walls comprising rooms 2 and 6 were mostly internal and not earth-retaining and therefore were mostly free of defects. Both rooms had historically been limewashed, the finish of which was now inconsistent. A small area of erosion to brickwork was noted to the north wall of room 2, though this was believed to be attributed to the active water leak within room 1. Brickwork within the corridor passing in between rooms 2 and 6 was heavily coated in a film-forming, with evidence of localised failure from hygroscopic salts. Active water ingress was observed in room 6, which was believed to be associated with that seen in room 5 described above. Though less extensive, water staining was noted on the concrete slab floor and brickwork was soiled and stained in the south-west corner

The recommendations in 3.1.1 and 3.1.2 should be followed. Allow for the brushing down of soiled brickwork and redecorating using limewash or a breathable paint system. The central vaulted rooms were not considered to be suitable for dry lining and so should be used for low-value storage, as was historically intended. Consideration may be given to the installation of a small sump and pump within the wine cellar, to manage the ingress of water if improvements to the external envelope do not suffice

3.3 MASONRY MOISTURE ANALYSIS

3.3.1 Sampling

A total of 77 No. samples were extracted from the load bearing masonry structures of the basement, taking care to avoid drilling directly into historic brickwork.
Samples were double bagged on site and returned to H+R's laboratory for gravimetric analysis of available and hygroscopic moisture content, following procedures described in BRE Digest 245. Results are shown on plans at Appendix B and in a table at Appendix C

3.3.2 Results

1 General distribution of residual moisture: The majority of internal walls were found to be effectively dry on analysis of samples, with residual moisture contents below 2 per cent. This indicated that the structure was not generally vulnerable to penetrating damp from below ground

No general remedial waterproofing works are required. No chemical injected or other remedial damp-proof course installations are required or recommended and the application of cementitious waterproofing should not be undertaken in any area. Some localised damp protection measures are required as described below

2 West and south elevations: 11no. samples extracted from along the west and south elevations were classified as wet or saturated, with available moisture contents of over 5 per cent. All 11no. samples were believed to be earth-retaining, with the majority below the west terrace which was vulnerable to water ponding as described at 3.1.1(2). 3no. samples were adjacent to downpipes, with the west downpipe known to be defective and allowing water to saturate masonry structures. These findings were also consistent with the damage to wall surfaces noted, as described at 3.2.1

Allowance should be made for the replacement of ventilated dry lining details and improvements to external landscaping as described at 3.1 and 3.2.1 above and as shown on plans at Appendix B

3 East elevation and Plant room: Raised residual moisture contents were noted along the east elevation with 8no. samples found to be wet or saturated, due to similar circumstances to the west elevation – earth-retaining walls; raised external ground and downpipes/ground drainage with presumed defects. A further 8no. samples extracted from the south-west corner of the plant room were saturated, with an active moisture source confirmed at the time of survey to be a leaking service pipe. Refer to Appendix A for photographic evidence

Allowance should be made for improvements to external landscaping as described at 3.1 above and as directed by the Architect and Conservation Officer

3.4 CONDENSATION & VENTILATION

3.4.1 Basement conditions

Outside (external) and internal (within the basement rooms) environmental readings were taken to enable a comparison between dewpoints and temperatures of external air and air within the basement to enable an assessment of internal moisture load and effectiveness of ventilation. Relative humidity (RH), air temperature, and dewpoints were measured with spot readings by a calibrated digital thermos-hygrometer. On the day of the survey, inclement weather may have skewed the levels of RH and temperatures within the basement given the level of ventilation present (See 3.4.4, below). The locations of readings taken from within the basement are shown on the Plans at Attachment B

Location	Relative Humidity %	Air temperature (Celsius)	Dew point temperature (Celsius)	Surface wall temperature (Celsius)
External (outside)	83.8	9.1	6.6	n/a
1	65.6	16.9	10.5	18-19
2	60.4	15.6	8.0	13-14
3	61.0	15.1	7.7	11-12
4	65.5	14.2	7.8	11
5	63.3	14.4	7.4	9-10
6	70.5	14.3	8.0	11-13
7	68.5	14.3	8.6	12-14
Ground floor	55.7	17.8	9.1	n/a

The relative humidity, temperature and dew point were measured at the time of survey as shown in the table above. The relative humidity within all spaces was not elevated in comparison to that of the external air, suggesting that existing ventilation was adequate for current usage.

3.4.2 Surface temperature and condensation risk

1 Surface temperature assessment: A survey of surface temperatures was undertaken with a thermographic camera (see Appendix A for selection of images) which pinpoints minimum surface temperature in the given aperture and IR thermometer. Results are set out in the table above

2 Assessment of potential for surface condensation and mould growth: In conjunction with the measurements described at 1, above, the surface temperature measurements were used to assess the potential for excessive surface humidity and condensation accumulation where surface temperature was found to be below the dewpoint temperature of the corresponding space, indicating the existence of surface condensation conditions

3 Results: Surface temperatures of the internal walls were generally found to be between 10 and 14 ^{o}C. these were all well above the corresponding dew point temperatures in the rooms, indicating limited vulnerability to surface condensation formation. However, partially as a result of distribution of heating (see 3.4.5, below), the surface temperature of some of the walls in the south rooms were associated with surface RH above 80%, and thus risk of deliquescence of soluble hygroscopic salts or mould growth depending on the surface finish (generally painted brisk in the relevant locations, so cyclical

efflorescence and deliquescence more likely)

Where brick is intended to be exposed without drained/ventilated drylining, consideration should be given to removal of damaged/flaking/blistered film forming paint and re-coating with a mineral based paint such as silicate paint. Improved ventilation to mitigate potential condensation conditions may initially result in increased efflorescence of hygroscopic salts from brickwork before conditions stabilise. A management plan to vacuum brush down vault walls and re-coating of exposed masonry delayed to allow initial efflorescence to occur over at least one heating season is recommended

3.4.3 Timber moisture content

Wood moisture contents were taken from available timber skirting and architraves to assess the relative moisture contents of the masonry behind and guide sampling as at 3.3, above and assess long term trends in RH. This was undertaken using a resistance-based moisture meter. Wood moisture contents of skirting were found to be generally around 14 per cent. This was below the threshold of around 22 per cent at which timber decay can occur and indicated that the plaster/masonry behind was dry. Timber moisture content is also a good indication of longer term trends in environmental conditions. The results suggest that conditions have been benign for an extended period where not immediately adjacent to standing water and saturated masonry. Within the central vaulted corridor, a small section of skirting was found to be at 19 per cent, however the adjacent masonry sample was found to be ‘dry’

Any new timber windows/doors in the basement should be isolated from potentially damp masonry by EPDM separation layers

3.4.4 Ventilation

There was no dedicated extract ventilation to the basement. Adventitious background ventilation was provided via air bricks within the zone of the ground floor timber floor structure to the south and west corner with some cross ventilation to the windows at north-west and the louvred lightwell cover for the plant room at north-east. When in operation, it is likely that the boilers will contribute to ventilation via localised convection and combustion draw (assumed open flue boilers). Several former openings had been bricked up, thereby reducing cross-ventilation of the space, so stagnant areas of air were present and there was significant variation in environmental conditions between adjacent spaces in the basement (see 3.4.1, above). However, the measurements suggest ventilation was meeting present needs despite the high moisture load from the services leak, seepage of water through the west wall and gym activities.

Lack of adequate heating and/or ventilation can be a considerable contributing factor to levels of damp within basement structures. Conditions described above leave cooler internal wall surfaces vulnerable to the formation of condensation. With the structure being underground, the earth-retaining walls are in contact with damp solum providing the conditions for lateral damp penetration into the interior. If occupancy intensifies without sufficient heating or ventilation to aid the removal of moisture-laden air, the basement may be left with a relatively high accumulation of damp within the air which would exacerbate problems of damp to the faces of the masonry and anything stored within the basement. This would be worsened with high levels of hygroscopic salts in the masonry (see section 3.3 above). High concentrations of hygroscopic salt tend to draw airborne moisture into the wall surface intermittently, supporting cyclical salt efflorescence and deliquescence and damaging surface finishes

H+R assume that refurbishment works will include a review of the current provisions for ventilation to meet requirements set out in Approved Document Part F of the building Regulations if occupancy of the basement is intended to increase. All risks associated with condensation are reduced by effective ventilation and heating.

1. *Extract: The provision for mechanical extract ventilation on occupancy should be reviewed to ensure the effective discharge of warm moisture laden air to the exterior direct from the points of generation, such as from the proposed WC, generally to exceed the provisions in Approved Document F of the current Building Regulations (given the potential for contribution to the internal moisture load from ground retaining masonry) . A System 3 ventilation strategy (according to AD-F) should be considered with continuous trickle extract ventilation at source with switched or humidity controlled boost. If a gym is re-instated, consideration could be given to intermittent extract from this space*

2. *Background: Care should be taken to provide adequate background ventilation to provide 'make-up' air to allow the efficient operation of extractor fans. Proposed new windows/door should include trickle vents for background ventilation. Occupants should be advised to maintain adequate levels of through and cross ventilation with fresh external air for the control of moisture and condensation by refraining from closing trickle vents.*

3. *Cross ventilation: Through ventilation within the basement should be provided by means of door undercuts according to AD Part F. This may be done by forming a vent gap of at least 10mm wide beneath internal door openings after laying of floor surfaces and finishes or multiple hole saw cuts through storeroom doors*

4. *Natural ventilation to the exterior is recommended for the wine cellar by means of the introduction of air bricks (assuming climate conditioning is not proposed)*

3.4.5 Heating

The gym was heated by a radiator, and background residual heating was provided by the boilers in the plant room. This would result in warmer areas to the north and cooler spaces to the south, with knock-on effects of excessive surface RH and associated surface mould and/or salt efflorescence

It is assumed that increased heating provision of the basement will go hand in hand with increased occupancy to provide normal 'comfort' conditions, and internal humidity levels as defined in Appendix A of AD Part F of the building regulations are maintained. All areas designated for occupation should be included in the overall building services strategy to allow effective control of relative humidity and temperature for the control and prevention of condensation and associated problems of damp, mould growth and decay. Any draught proofing measures should be compensated for within the ventilation strategy, possibly requiring introduction of a continuously running balanced ventilation system, especially if any ground retaining walls remain unlined during occupancy and therefore contribute to the internal moisture load

4 GENERAL RECOMMENDATIONS

All new and refurbishment detailing should be assessed for its effect on environmental and structural health. General principles are set out below. Special care is required when introducing new materials, moisture sources or heating and ventilation systems, for example air conditioning

4.1 ROOF AND SURFACE DRAINAGE

4.1.1 Maintenance

All guttering, hopperheads and outlets should be regularly checked and cleared to keep them free of debris, especially during the autumn months

4.1.2 Protection

Hopperheads, gutter outlets and ground gullies should be protected with metal mesh cages so as to prevent blockage and overflow. These should extend higher than the expected water level to reduce the tendency to block and should be easily removable to allow cleaning and maintenance

4.1.3 Overflows

Hopperheads, parapet gutter outlets and valley gutter outlets should be fitted with overflow pipes to drain water clear of the structure in case of blockage. These should be at a level below that at which water would overflow the roof flashings

4.1.4 Roof drainage calculations

Roof drainage calculations should be made to check the adequacy of gutters, drains and downpipes so that their capacities may be increased if necessary, during refurbishment. H+R can carry out these calculations if required

4.1.5 Monitoring

The installation of an automatic monitoring and alarm system should be considered to give warning of blockage or overflow in the roof drainage system

4.2 VENTILATION

4.2.1 Structural voids

All structural voids within the building should be provided with adequate through ventilation so as to prevent moisture build-up. This must be done with regard to the applicable fire regulations

4.2.2 Chimneys

All chimneys not in use should be capped so as to minimise water ingress but so as to allow maximum ventilation of the flues. Flues should be cleared and cleaned to remove blockages. Fireplaces and chimney breasts should be opened or vented to allow through-ventilation of the flues. This prevents moisture build-up in the flues and helps interior ventilation by the stack effect

4.2.3 Bathrooms and kitchens

All bathrooms and kitchens should be fitted with adequate extractor fan systems. These should run for at least fifteen minutes after occupancy to prevent condensation. The installation of floor drains should be considered in these rooms in case of overflow

4.2.4 Roof spaces

All roof spaces, including flat roof areas and gutter soles, should be provided with adequate through-ventilation. This may occur via the gaps between slates in unsarked pitched roofs. However, flat roofs and pitched roofs with sarking or insulation will require the installation of vents through the roof surfaces or at the eaves and ridges. Insulation material in roof spaces should be kept clear of external walls, gutter soles or timbers in contact with damp or potentially damp masonry

4.2.5 Windows

Windows should be refurbished so as to allow easy and convenient opening and closing by occupants in order to encourage proper ventilation of the building. This is important both for environmental and structural health. Windows should be fitted with security locks so as to allow secure locking in a partially opened position

4.3 STRUCTURAL DETAILING

4.3.1 New timbers

New timbers should be isolated from any damp or potentially damp masonry with a damp proof material or ventilated air gap

4.3.2 Timber repairs

Structurally decayed timbers should be removed or cut back to sound timber unless required for aesthetic reasons. Timbers should then be partnered or spliced as in section 4.3.1 above. If steel plates or hangers are used, they should be detailed so as to allow sufficient ventilated air gaps and drainage to prevent moisture build-up due to condensation. No timber preservation or remedial treatments should be required

4.3.3 Paint finishes

Moisture vapour permeable or 'microporous' paint finishes should be preferred for internal and external surfaces and woodwork. This is especially important on window timbers. To take advantage of the properties of such paints, the complete removal of old alkyd paint systems is recommended. Health and Safety: Special precautions should be taken during surface preparation of pre 1960's paint surfaces as they may contain harmful lead or other toxic materials

Appendix A

Fig 1:

Exterior; showing a general view of the west front elevation

Fig 2:

Exterior, west elevation; showing a view of the singular downpipe serving this elevation. Note the cast iron downpipe was found to have been oxidised and damaged approximately 1.5m above ground level. There was also evidence that the sequential hopper has previously overcharged down the masonry below

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 3:

Exterior, west elevation; showing a view of 20th century modern landscaping to the front door in reconstituted stone. Note this is significantly raised external ground levels relative to the basement below and adjacent to this front porch area

Fig 4:

Exterior, west elevation; showing a view of masonry at low level including previously bricked in window. Note the biological growth and general damp conditions of paving stones indicative of water ponding and tracking back into the masonry mass

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 5:

Exterior, west elevation; showing partial exposure works to better understand the external landscaping relative to basement window openings. Note further modern landscaping with concrete blockwork polythene lining and sand. This will potentially create moisture reservoirs which could become compromised and saturate lower ground masonry at a rapid rate

Fig 6:

Exterior, west elevation; showing water ponding below a window opening which has concrete blockwork and a cement base. Note wall masonry in this location is likely to be damp with any finishes also likely to be damp affected

Fig 7:

Exterior, west elevation; showing a close up view of wall masonry with extensive biological growth indicative of damp conditions due to water ponding and tracking back from modern landscaping

Fig 8:

Exterior, west elevation; showing a close up view of the cast iron downpipe which was found to be cracked and overcharging onto adjacent masonry

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 9:

Exterior, west elevation; showing a close up view of window sills which appeared to have drip rebates that had previously been overpainted thereby reducing their effectiveness. Note localised erosion of brickwork potentially due to damp masonry from external detailing

Fig 10:

Exterior, west elevation; showing a view of the surface gulley provision for the west downpipe. Note the gulley was partially blocked at the time of survey and it was not clear what the condition of below ground drainage was like nor where it drains to

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 11:

Exterior, west elevation; showing a view of modern provision for background ventilation. Also showing lead capping over a historic opening which would have previously provided ventilation into the basement structure

Fig 12:

Exterior, south-west corner; showing a view of what appeared to be provision for a partially constructed French drain detail. Note no perforated pipe was found so a geotextile sheet and sharp stones were used to improve drainage at the base of the elevation

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 13:

Exterior, west elevation; showing a close-up view of a lead chase joint displaced and locally allowing water penetration at the open joint

Fig 14:

Exterior, south elevation; showing a view of an excavated area used to investigate for the presence of a damp-proof course, with no evidence found

Fig 15:

Exterior, south elevation; showing a close-up view of the geo-textile sheeting and gravel laid against the property

Fig 16:

Exterior, south elevation; showing a general view of the elevation

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 17:

Exterior, south elevation; showing a view of modern external landscaping which was found to have been laid to a slight fall away from the property

Fig 18:

Exterior, south elevation; showing a view of localised cementitious re-pointing indicative of damp affected brickwork and subsequent erosion of previous pointing

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 19:

Exterior, south elevation; showing a view of provision for ventilation via a retrofitted air brick. Also showing the downpipe to ground drainage connection as well as a brick arch over a previous historic opening at basement level

Fig 20:

Exterior, south elevation; showing a view of raised external ground level. Also showing large fig tree and neighbouring tree of another species that was established very close to the property. Note this may present issues when reinstating the basement

Fig 21:

Exterior, south-east corner; showing a view of raised external ground due to modern landscaping

Fig 22:

Exterior, south-east corner; showing a close up view of localised masonry erosion and cementitious pointing repairs

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 23:

Exterior, east elevation; showing a general view of the elevation

Fig 24:

Exterior, east elevation; showing a view of the surface gulley in the south-east corner which appeared to contain standing water at the time of survey, suggesting that below ground drainage was not adequately draining away

Fig 25:

Exterior, east elevation; showing a view of localised brick repair using mismatched bricks and cementitious mortar

Fig 26:

Exterior, east elevation; showing a view of a tree growing in close proximity to the property. Also showing the location of a historic ventilation grate to the basement. Note the current modern structure over the grate provided limited ventilation into the basement

Fig 27:

Exterior, east elevation; showing a view of a concrete bund and surface gulley clear and operational at the time of the survey

Fig 28:

Exterior, east elevation; showing staining and local brick erosion to masonry at high level adjacent to the soil vent stack. Note it is possible that guttering has locally leaked from above

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 29:

Exterior, east elevation; showing localised biological staining to brickwork, below a window sill which may be discharging rainwater onto masonry. Note that guttering sections above were found to be leaking at the north-east corner

Fig 30:

Exterior, east elevation; showing the existing ground drainage detail at the base of the elevation

Fig 31:

Exterior, east elevation; showing a general view of the elevation. Also showing the gradient of the landscaping, which appeared to fall back toward the property

Fig 32:

Exterior, east elevation; showing a close-up view of biological growth, open mortar joints and areas of repointing

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 33:

Exterior, east elevation; showing the presence of a slate damp-proof course (DPC), which was found at the north-east corner, at the base of the more contemporary wing

Fig 34:

Exterior, east elevation; showing a view of below ground drainage at an inspection point, with no evidence of blockage and minimal debris within the clay pipework

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221   Email: ei@handr.co.uk

Fig 35:

Exterior, east elevation; showing a close-up view of a cement shoulder of the inspection point, which required repair to prevent the risk of the manhole cover collapsing and causing injury

Fig 36:

Exterior, west elevation; showing one of the existing basement windows which appeared to be vulnerable to surface flooding due to the fall of landscaping and lack of drainage provision

Fig 37:

Exterior, west elevation; showing a view of existing ground drainage provision

Fig 38:

Interior, basement; showing a view of the stairwell which provided access to the basement

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 39:

Interior, basement, stairwell ; showing the existing dry lining detail at the base of the wall

Fig 40:

Interior, basement, gym room; showing a general view

Fig 41:

Interior, basement, gym room; showing a view of the existing dry lining detail at high level

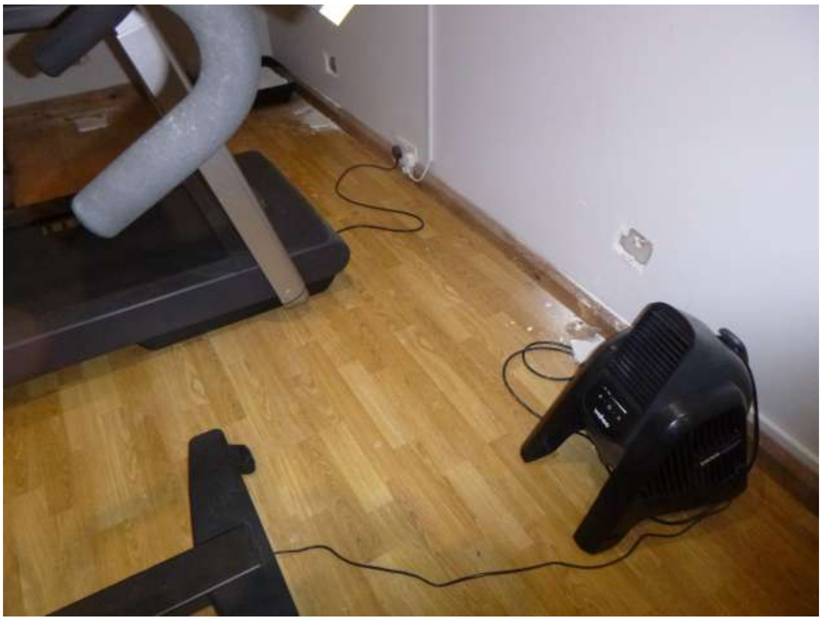


Fig 42:

Interior, basement, gym room; showing a view of the existing floor finish

Fig 43:

Interior, basement, boiler room; showing a view of the vaulted access passageway

Fig 44:

Interior, basement, boiler room; showing a view of soiling to brickwork due to the migration of hygroscopic salts and associated with the active services leak on the other side of the masonry mass (see Fig 52 below)

Fig 45:

Interior, basement, boiler room; showing a general view

Fig 46:

Interior, basement, boiler room; showing a view of a steel grate, which would have historically provided ventilation into the basement

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 47:

Interior, basement, boiler room; showing an existing sump and pipe provision for managing the accumulation of liquid water within the boiler room

Fig 48:

Interior, basement, boiler room; showing a close-up view of the sump and pump, which appeared to be operational at the time of survey

Fig 49:

Interior, basement, boiler room; showing evidence of water staining to the concrete slab, likely from a historic services leak

Fig 50:

Interior, basement, boiler room; showing a view of soiling to brickwork due to the migration of hygroscopic salts

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221   Email: ei@handr.co.uk

Fig 51:

Interior, basement, boiler room; showing localised water ponding and buckets used to collect water from a leaking services pipe above

Fig 52:

Interior, basement, boiler room; showing a close-up view of a leaking services pipe, which was saturating adjacent masonry and causing soiling to brickwork

Fig 53:

Interior, basement, boiler room; showing water tracking and staining, believed to be associated with the nearby ongoing services leak

Fig 54:

Interior, basement, central corridor; showing a general view

Fig 55:

Interior, basement, central corridor; showing localised failure of film-forming paint at low level

Fig 56:

Interior, basement, wine cellar; showing a general view

Fig 57:

Interior, basement, wine cellar; showing a view of salt-affected cementitious mortar

Fig 58:

Interior, basement, wine cellar; showing a view of moisture movement and associated staining and soiling to brickwork

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 59:

Interior, basement, wine cellar; showing a view of soiling to brickwork. Also showing evidence of multiple penetrations through the brickwork, which may be from previous inspections or attempted chemical injections

Fig 60:

Interior, basement, south room; showing a general view

Fig 61:

Interior, basement, south room; showing evidence of a cement slurry wash applied to the external wall

Fig 62:

Interior, basement, south room; showing a close-up view of minor damage to wall finishes

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 63:

Interior, basement, south-east room; showing a general view

Fig 64:

Interior, basement, south-east room; showing a view of the east wall where secondary access is proposed. Note the existing historic opening which has previously been infilled with brick

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 65:

Interior, basement, south-east room; showing a view of soiling to brickwork at low level in the south-east corner

Fig 66:

Interior, basement, vaulted east room; showing a general view

Fig 67:

Interior, basement, vaulted east room; showing a view of a failed cementitious render applied to brickwork at low level

Fig 68:

Interior, basement, south-west room; showing a general view

Fig 69:

Interior, basement, south-west room; showing a view of moisture movement across the existing concrete slab

Fig 70:

Interior, basement, south-west room; showing a view of soiling to brickwork. Also showing evidence of multiple penetrations through the brickwork, which may be from previous inspections or attempted chemical injections

Fig 71:

Interior, basement; showing a view within the plant room. Walls were generally earth retaining and of solid wall construction with no insulation visible. Generally walls were free from significant damp although there was evidence of intermittent superficial water ingress which was unsurprising due to the earth retaining nature of the wall

Fig 72:

Interior, basement; showing a view within the plant room. Walls were generally earth retaining and of solid wall construction with no insulation visible. Generally walls were free from significant damp although there was evidence of intermittent superficial water ingress which was unsurprising due to the earth retaining nature of the wall

Fig 73:

Interior, basement; showing a view of the sump pump serving the plant room

Fig 74:

Interior, basement; showing a close up view of the single sump pump within the plant room. Although not seen working at the time of the survey the homeowner stated that it was functioning correctly

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 75:

Interior, basement; showing a view of the ingress point of the sump pump. It should be noted that there was no mechanical ventilation within the plant room as well as no pathway for air to circulate

Fig 76:

Interior, basement; showing a view of the floor structure of the plant room which was a mixture of brick setts and solid concrete

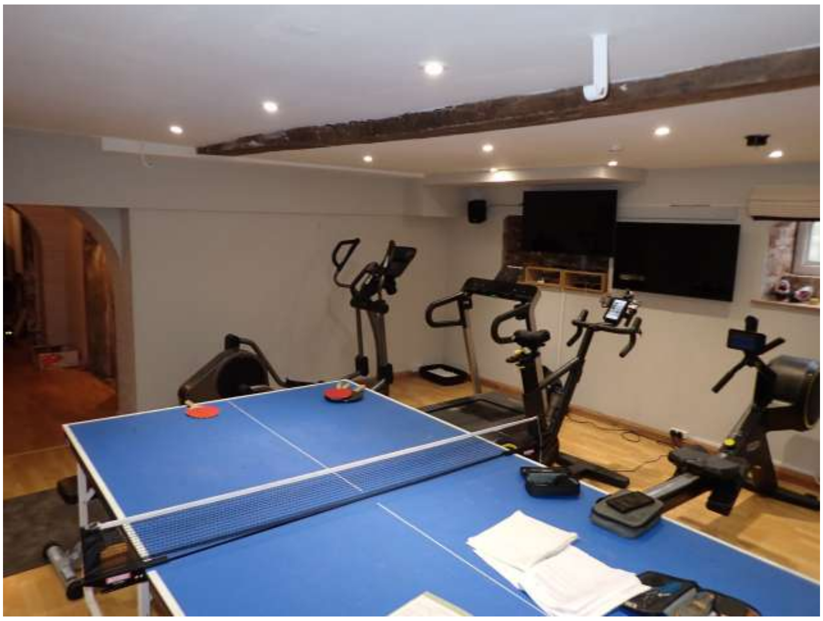


Fig 77:

Interior, basement; showing a general view of the room at the north-west corner. The room was generally dry-lined and had a suspended timber floor over the solid concrete floor structure. Both features separate the internal finishes from potentially damp masonry/ concrete floor however, these features also prevented viewing of any damp or ventilation problems

Fig 78:

Interior, basement; showing a view of a typical window found within the basement. There was no provision for ventilation including trickle vents around the window frame

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 79:

Interior, basement; showing a view of the reveal of one of the windows which was of fair faced brickwork which was understood to be of solid construction with no cavity

Fig 80:

Interior, basement; showing another window type within the basement which also did not feature any provision for ventilation although to the age and construction adventitious ventilation may be occurring through poor fittings between the window casements and frame

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221   Email: ei@handr.co.uk

Fig 81:

Interior, basement; showing a view of a grille to the plasterboard. It was not understood if there was any ventilation behind providing air exchange between the exterior and the interior

Fig 82:

Interior, basement; showing a view within an opening made prior to H+R's survey. The plasterboard was backed with plastic sheeting onto timber batons secured to the wall. There appeared to be cementitious tanking over the brickwork which was failing/past its useful service life

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 83:

Interior, basement; showing a view of masonry within the corridor which was painted brickwork

Fig 84:

Interior, basement; showing a view within the cellar room. There was no provision for any forms of ventilation. The ongoing water ingress into the area will be increasing the water vapour content within the room which may lead to timber decay and other defects

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 85:

Interior, basement; showing a view within a storage room at the south-west corner. Ongoing liquid water ingress was occurring which encourages the damp environment and due to the lack of ventilation in the basement area may lead to problems of damp and decay

Fig 86:

Interior, basement; showing a view along the ground floor floor joists. A breeze was felt and there may be ventilation occurring through openings at the bearing ends of the floor joists. However, if open this may be allowing water ingress into the structure from wind driven rain and other periods of damp weather

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 87:

Interior, basement; showing a view of failing paint finishes to a brick wall. This indicated problems of damp and salt efflorescence. Damp will be exacerbated by the lack of ventilation within the area

Fig 88:

Interior, basement; showing a view of the solid floor structure which was believed to be poured concrete but the construction was not known and it was not known if there was insulation or damp-proof membrane beneath

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 89:

Interior, basement; showing a view of the room at the south-east corner. Again there was no provision for ventilation and fair faced brickwork showed signs of damp and salt efflorescence which may impact design solutions for the interior decoration

Fig 90:

Interior, basement; showing a view of the unmade ground/dirt floor within the room which left it vulnerable to damp penetration from beneath

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 91:

Interior, basement; showing a further view of the room at the south-east corner which was constructed in the same way as described previously

Fig 92:

Interior, basement; showing a thermal image within the plant room with no obvious areas of cold-bridging

Fig 93:

Interior, basement; showing a thermal image within the plant room with cooler masonry which may pose a condensation risk with increased occupancy

Fig 94:

Interior, basement; showing a thermal image within the plant room with cooler masonry which may pose a condensation risk with increased occupancy

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

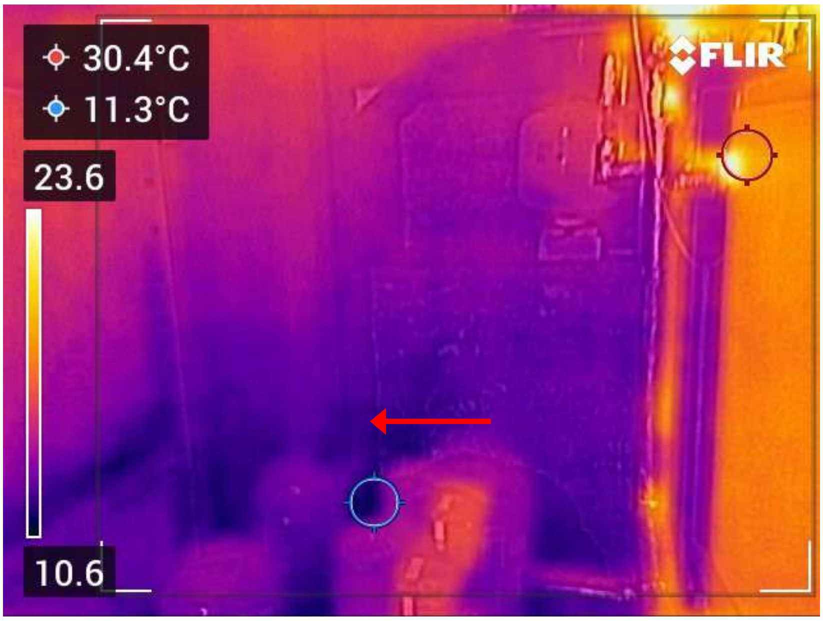


Fig 95:

Interior, basement; showing a thermal image of cooler temperatures at low level

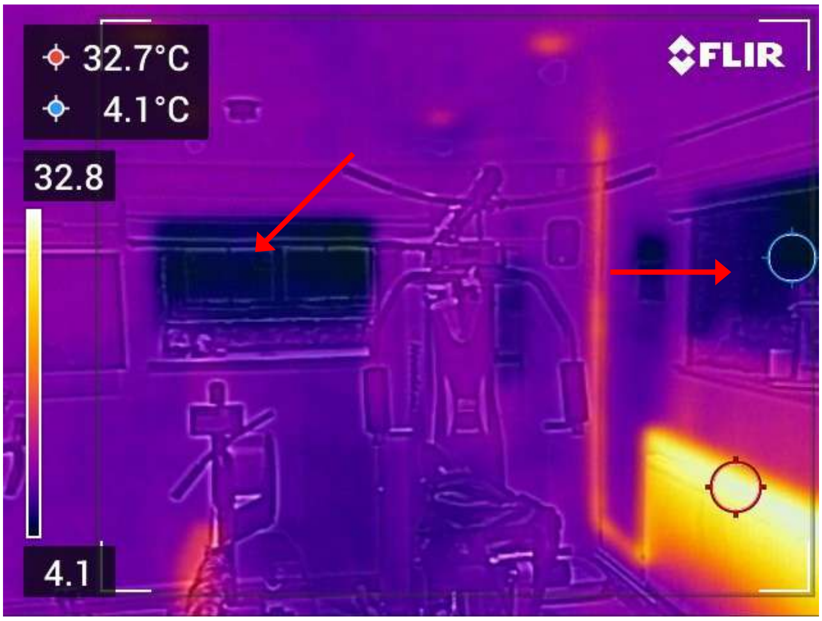


Fig 96:

Interior, basement; showing a thermal image within the gym room with cooler temperatures at the glazing which may pose a condensation risk with increased occupancy

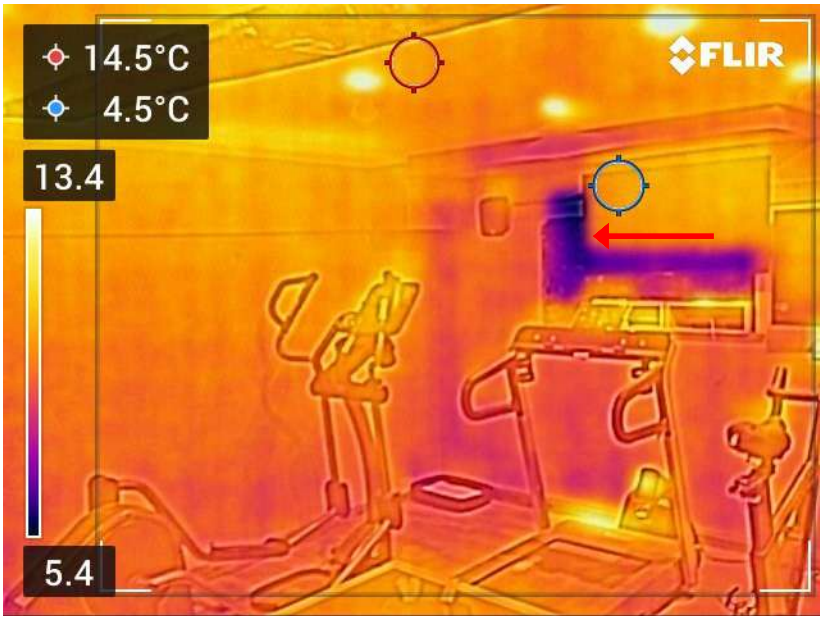


Fig 97:

Interior, basement; showing a thermal image of cooler temperatures at low level

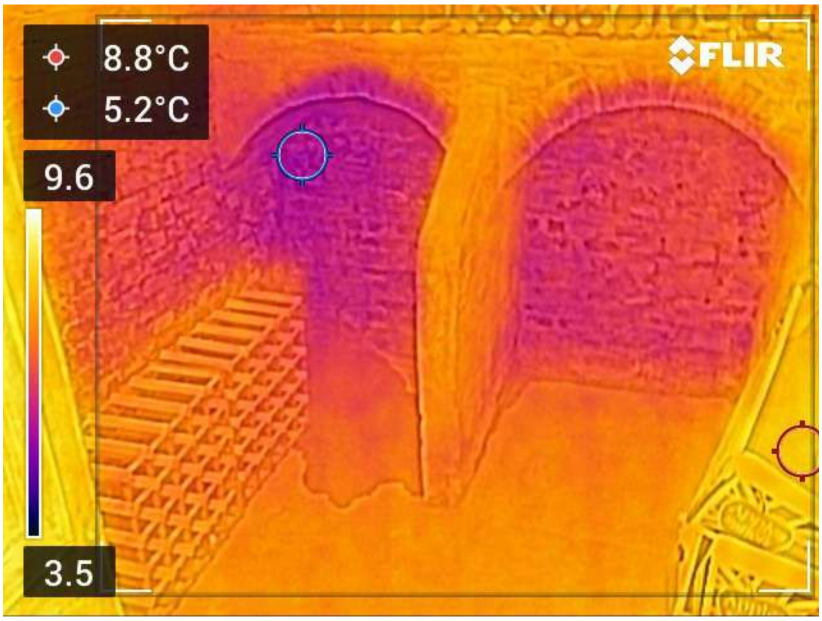


Fig 98:

Interior, basement; showing a thermal image of masonry with no significant variation in temperature

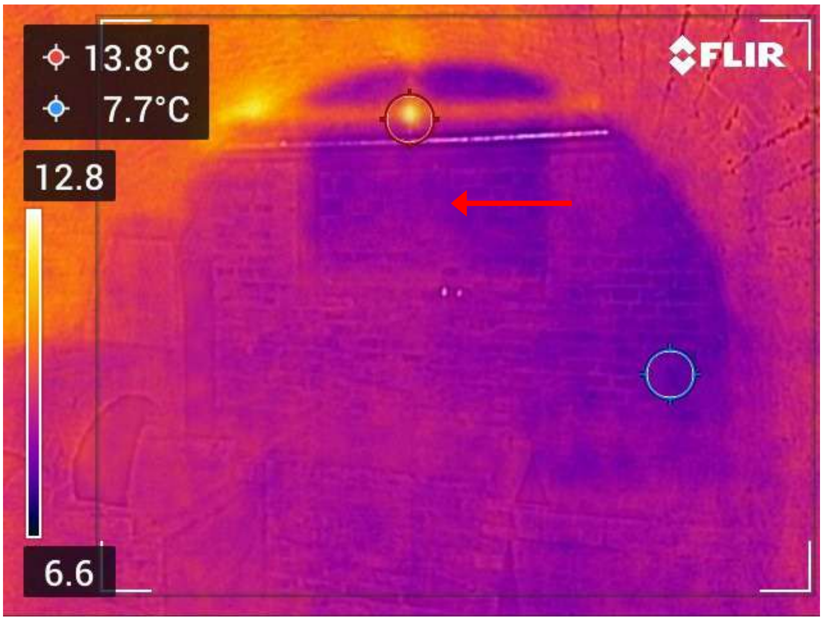


Fig 99:

Interior, basement; showing a thermal image within the plant room with cooler masonry which may pose a condensation risk with increased occupancy

Fig 100:

Interior, basement; showing a thermal image of cooler areas likely to be a result of cooler air from the outside entering the basement through openings in the wall

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 101:

Interior, basement, south-west room; showing a historic casement window, which was operational and able to provide necessary ventilation into the structure

Fig 102:

Interior, basement, south-west room; showing a view of the historic grate over the lightwell. Note this had been enclosed in the recent past, reducing airflow into the basement

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Fig 103:

Interior, basement, south-west room; showing a close-up view of salt damage to paint finishes at high level

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk

Appendix B

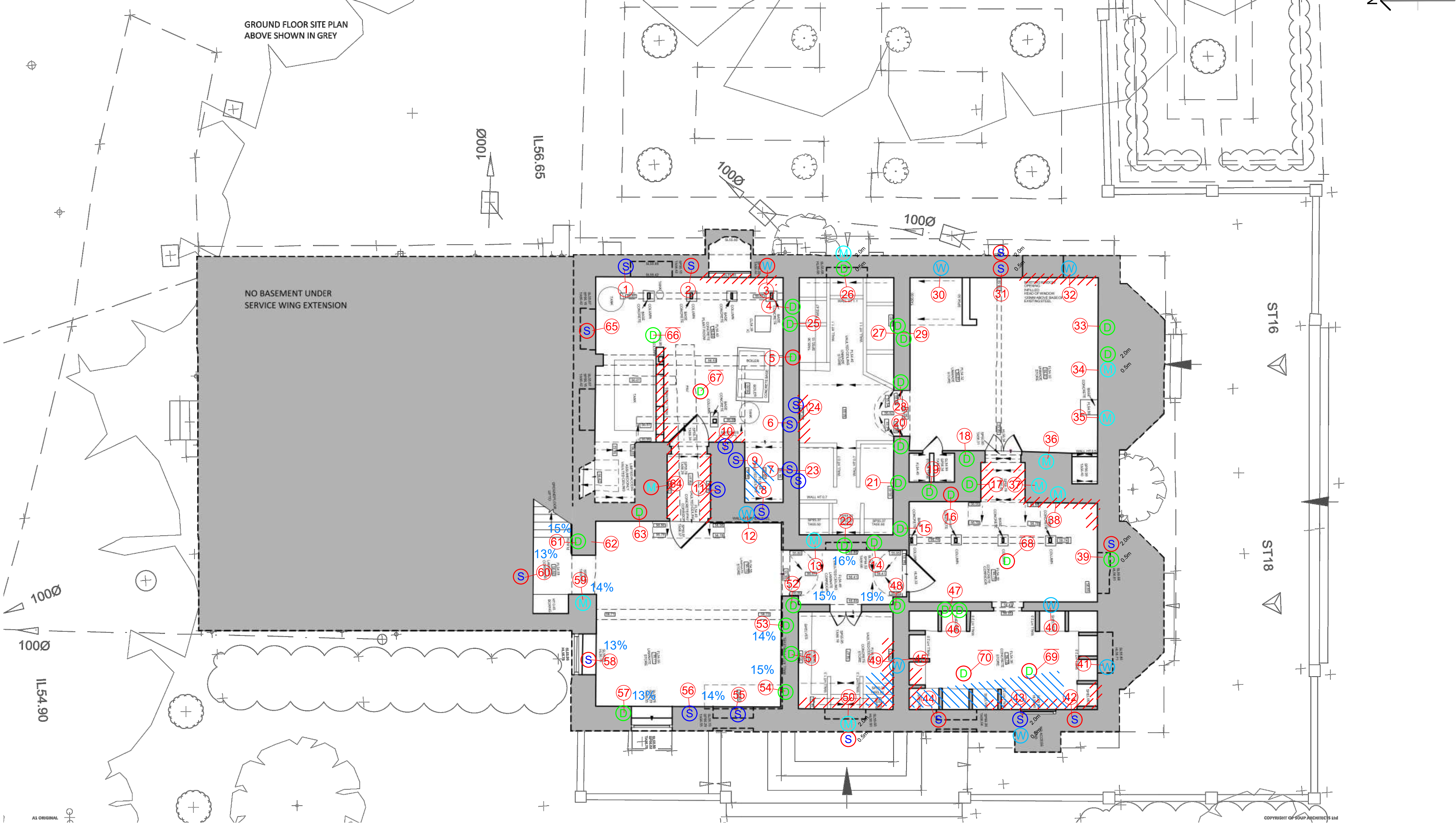
Studio 201, 1 Thane Villas, London N7 7PH
T 020 7354 1729
E studio@souparchitects.com

EXISTING BASEMENT PLAN

0 1 2 3 4 5 10

SCALE 1:100 @ A3

417_090_S01



The Old Rectory - Basement Plan

Masonry damp investigation of basement

10-11 January 2023

Hutton + Rostron Environmental Investigations Ltd
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221

Key:

- (1) Masonry sample location
- (1) Masonry sample location from floor
- Area of damage to wall finishes
- Area subject to water penetration providing the conditions for damp and decay
- <10% Level of moisture content

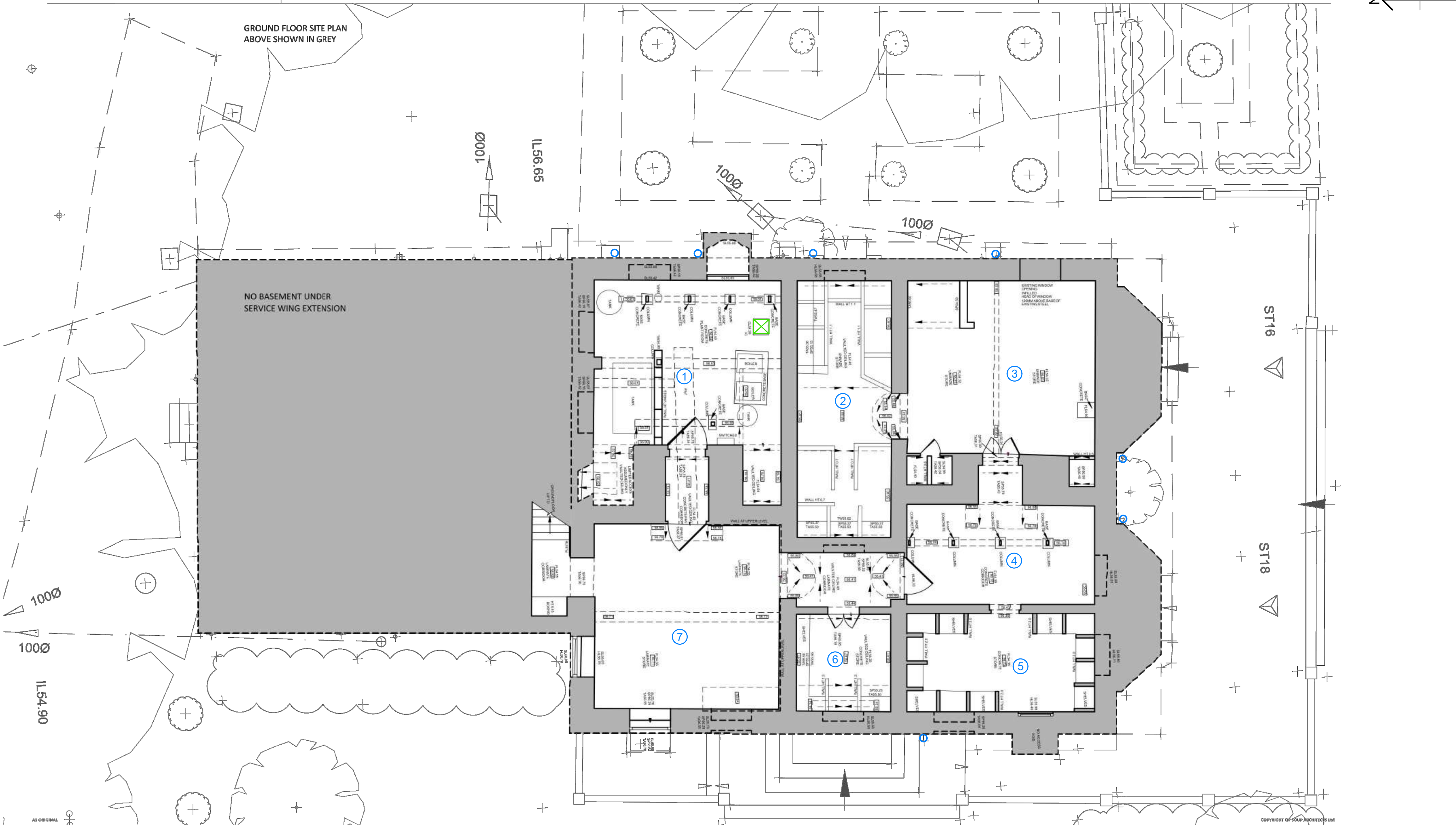
	High salt content	Low salt content	
Dry	D	D	0-2% w/w available moisture content
Moist	M	M	2-5% w/w available moisture content
Wet	W	W	5-8% w/w available moisture content
Saturated	S	S	8+% w/w available moisture content
Super Saturated	SS	SS	20+% w/w available moisture content

Studio 201, 1 Thane Villas, London N7 7PH
T 020 7354 1729
E studio@souparchitects.com

EXISTING BASEMENT PLAN

SCALE 1:100 @ A3

417_090_S01



The Old Rectory - Basement Plan

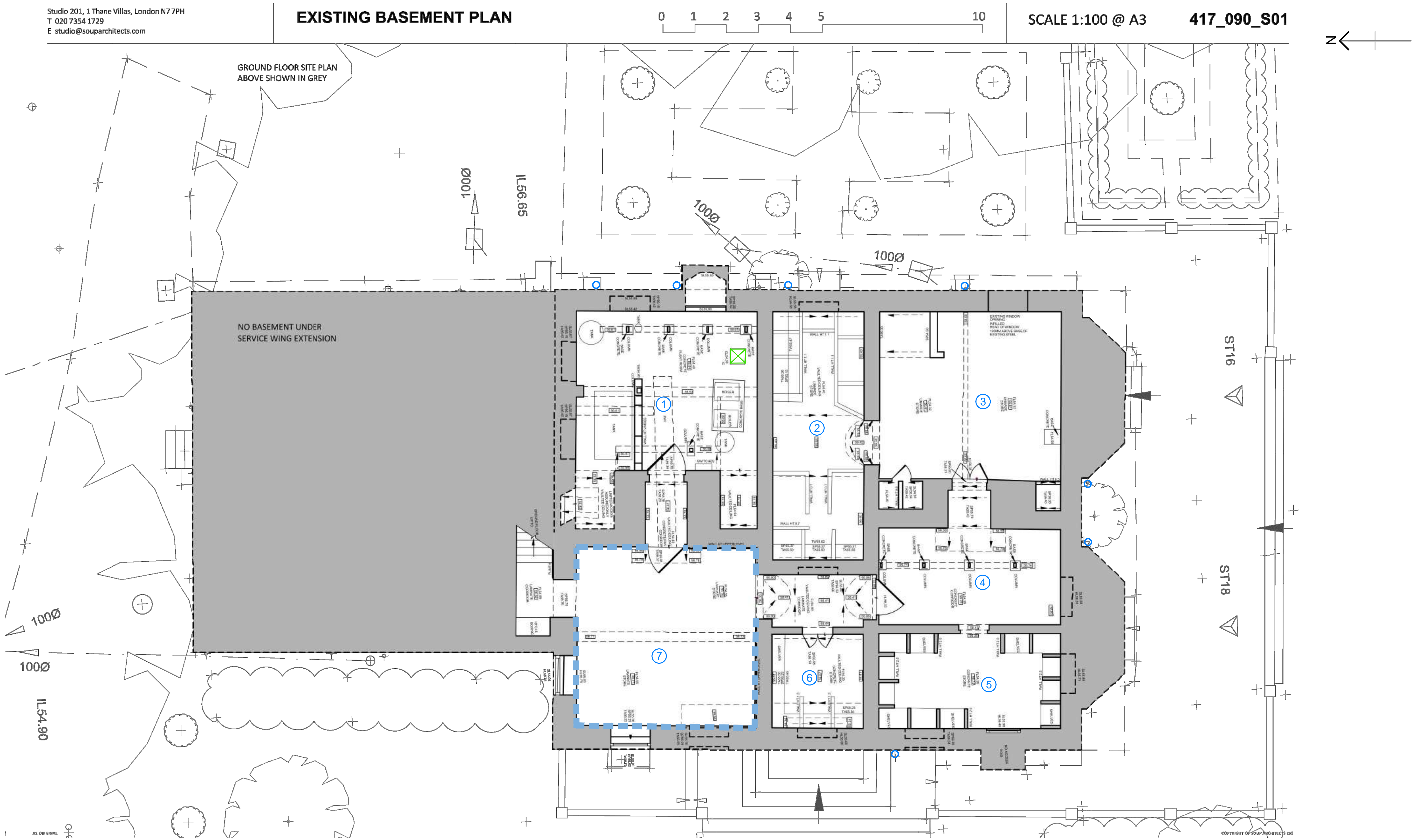
Masonry damp investigation of basement
10-11 January 2023

Key:

- Approximate location of rainwater downpipe
- Location of existing sump pump
- Room identification number

Hutton + Rostron Environmental Investigations Ltd
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221

157-85 Report - **Rev A** -Not to scale-



H+R

The Old Rectory - Basement Plan

Proposed remedial wall treatments

10-11 January 2023

Hutton + Rostron Environmental Investigations Ltd
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221

157-85 Report - **Rev A** -Not to scale-

Key: (see sample details at Appendix D)

▪▪▪▪ Replacement full height ventilated dry lining placed over low-profile (8-10mm) studded plastic vertical isolating and ventilating membrane. The upper edge of the membrane should be extended into the ceiling void and a minimum 6mm continuous ventilation provided at low level, through a suitable 'shadow' gap in the skirting profile

Appendix C

Table of material moisture contents **Appendix C**

Samples of masonry were drilled from walls in areas vulnerable to damp penetration. The samples were placed in sealed containers and tested at the H+R laboratory in accordance with the procedure for gravimetric measurement of moisture content as described in the appendix to BRE Digest 245

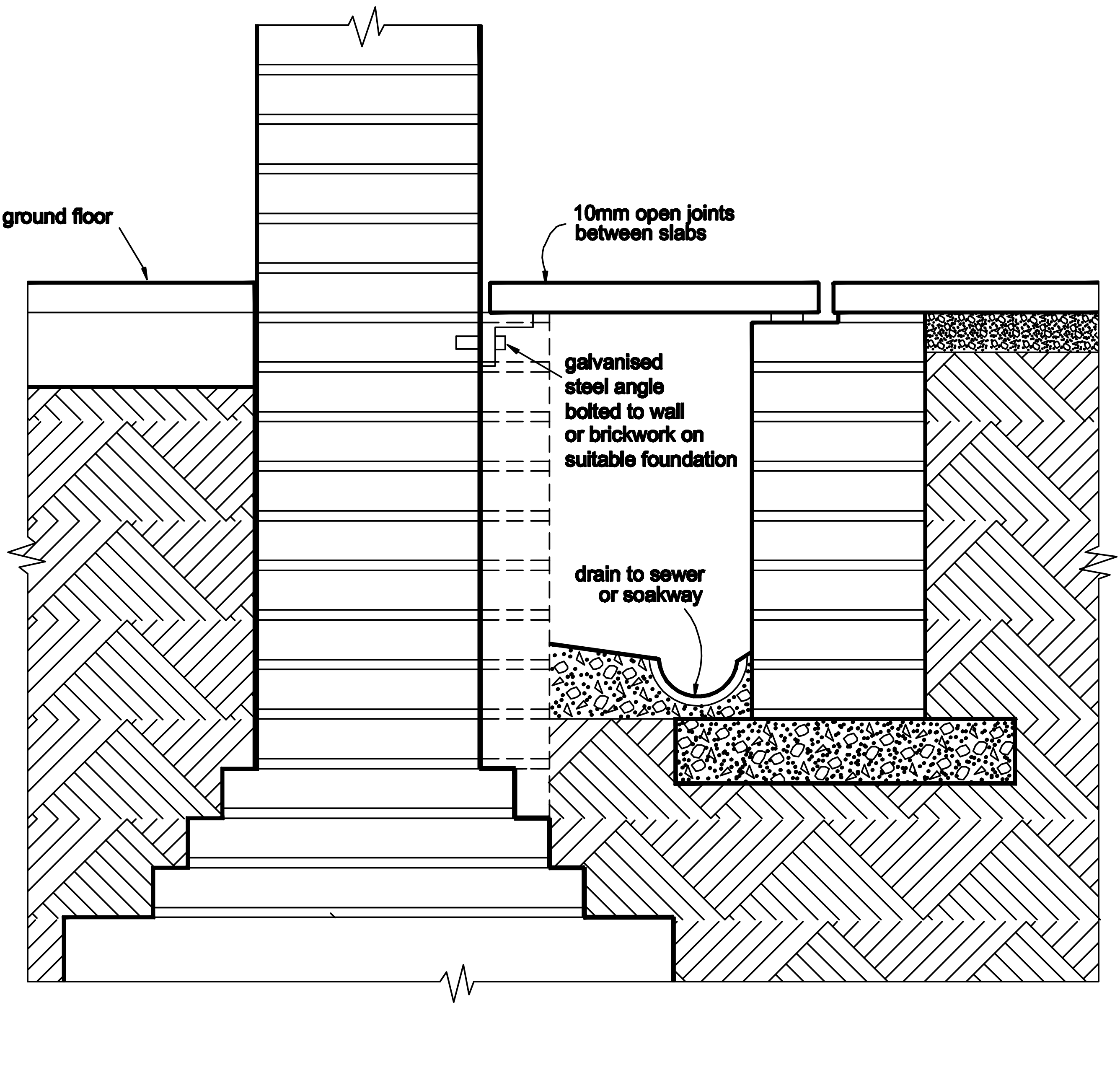
Sample Number/Location	Moisture content % w/w			Hygroscopic moisture content % w/w	Available moisture content % w/w
1	14.15	S		1.52	12.64
2	13.60	S	H	4.32	9.28
3	7.90	W	H	2.47	5.43
4	1.06	D		1.06	0.00
5	2.96	D	H	2.29	0.68
6	10.40	S		0.96	9.43
7	9.23	S		0.87	8.36
8	14.35	S		1.27	13.07
9	17.26	S		1.05	16.21
10	15.33	S		1.39	13.94
11	14.60	S		1.16	13.43
12	6.32	W		0.54	5.78
13	5.57	M		1.59	3.98
14	1.84	D		1.73	0.11
15	1.16	D		0.52	0.63
16	2.61	D	H	2.39	0.22
17	2.22	D		1.60	0.62
18	1.76	D		1.81	-0.05
19	0.52	D		0.32	0.20
20	1.64	D		1.79	-0.15
21	1.76	D		1.44	0.32
22	1.19	D		1.02	0.17
23	13.40	S		1.12	12.27
24	11.76	S		0.95	10.81

25	1.98	D		1.80	0.19
26	2.55	D		0.74	1.81
27	2.84	D		1.91	0.93
28	1.21	D		1.00	0.21
29	1.81	D		1.21	0.59
30	8.78	W		1.41	7.37
31	13.32	S	H	2.53	10.79
32	8.48	W		1.85	6.63
33	3.37	D		1.95	1.42
34	4.13	M		1.67	2.46
35	3.77	M		1.06	2.72
36	3.48	M		0.61	2.87
37	3.28	M		0.53	2.75
38	2.45	M		0.43	2.02
39	0.66	D		0.66	0.00
40	7.13	W		1.80	5.33
41	7.87	W		1.80	6.07
42	18.53	S	H	3.59	14.93
43	8.95	W		1.51	7.44
44	17.86	S	H	3.04	14.82
45	#VALUE!	###	##	#VALUE!	#VALUE!
46	0.91	D		0.57	0.34
47	0.08	D		0.15	-0.08
48	2.79	D		1.41	1.37
49	7.55	W		0.65	6.90
50	10.61	S	H	2.51	8.10
51	2.02	D		0.51	1.50
52	0.97	D		0.54	0.42
53	0.75	D		0.33	0.42
54	1.35	D		0.08	1.27
55	18.08	S		1.73	16.35
56	15.16	S		0.55	14.60
57	1.81	D		0.10	1.71
58	17.42	S	H	2.48	14.95
59	5.32	M		0.88	4.44
60	10.05	S	H	2.02	8.02
61	3.74	D		1.82	1.92
62	6.73	M	H	3.57	3.15
63	3.60	D	H	3.23	0.37
64	7.94	M	H	5.06	2.88
65	14.68	S	H	3.37	11.31

66	1.57	D		1.25	0.31
67	3.10	D	H	2.89	0.21
68	2.96	D	H	3.21	-0.26
69	2.94	D	H	2.67	0.27
70	3.03	D	H	3.18	-0.15
71	4.23	D	H	2.74	1.50
26H	3.55	M		1.44	2.11
31H	13.81	S	H	3.18	10.63
34H	2.91	D		1.64	1.27
39H	16.59	S	H	6.17	10.42
43H	16.93	S		1.70	15.23
50H	4.89	M		0.00	4.89

Hygroscopic moisture is the ‘air dry’ moisture content of the sample at 75 per cent relative humidity. High levels above, say, 2 per cent are attributable to salt contamination. Hygroscopic salt commonly accumulates in old plaster and masonry that has been subject to dampness penetrating from the ground over many years. High levels above, say, 2 per cent of available moisture (liquid water) in the sample indicate continuing dampness due to liquid water in the sample usually resulting from faulty rainwater and plumbing goods

Appendix D



Raised external ground levels

Air Drain - Typical Section Detail

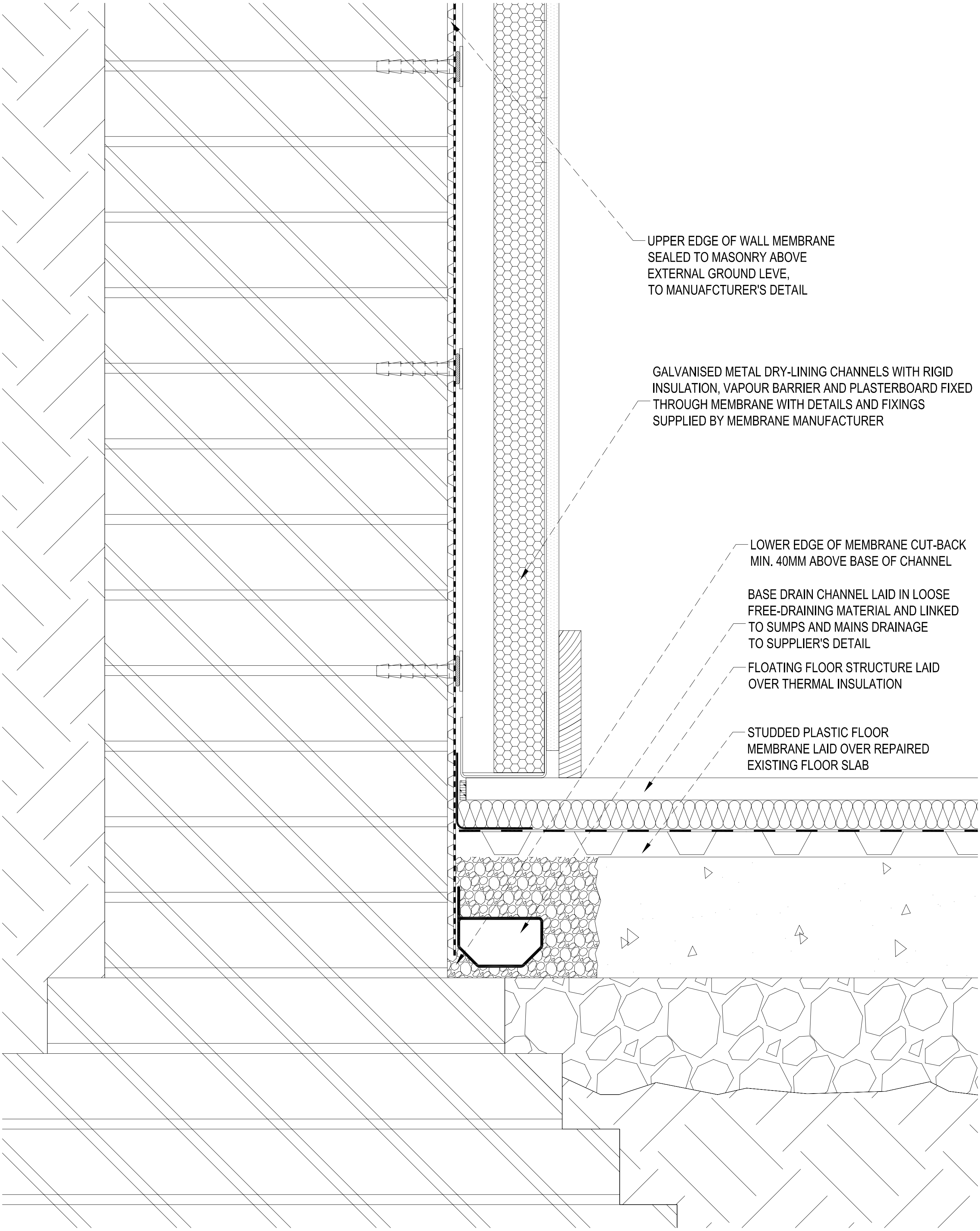
November 2007

Not to scale

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911
Standard detail - air_drain_211102.dwg

NOT TO SCALE

SD-13



H+R

Drained Cavity System

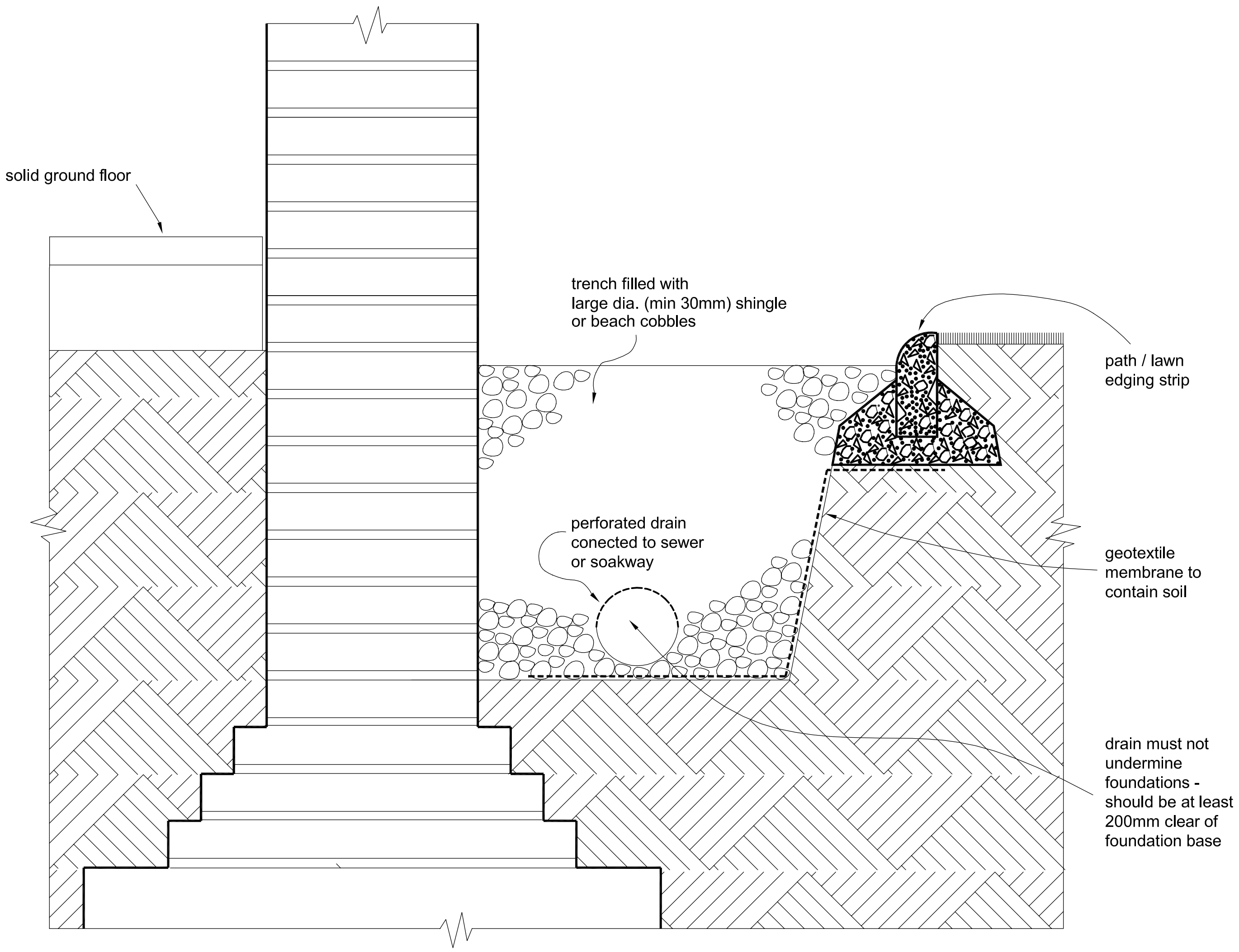
Basement - Solid Floor (existing) with Dry Lining

Section - May 2008

NOT TO SCALE

SD-23

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911 Standard Details \ DCS1-B-SoFE-DL



French drain

Typical ground drainage detail that may be adapted for use

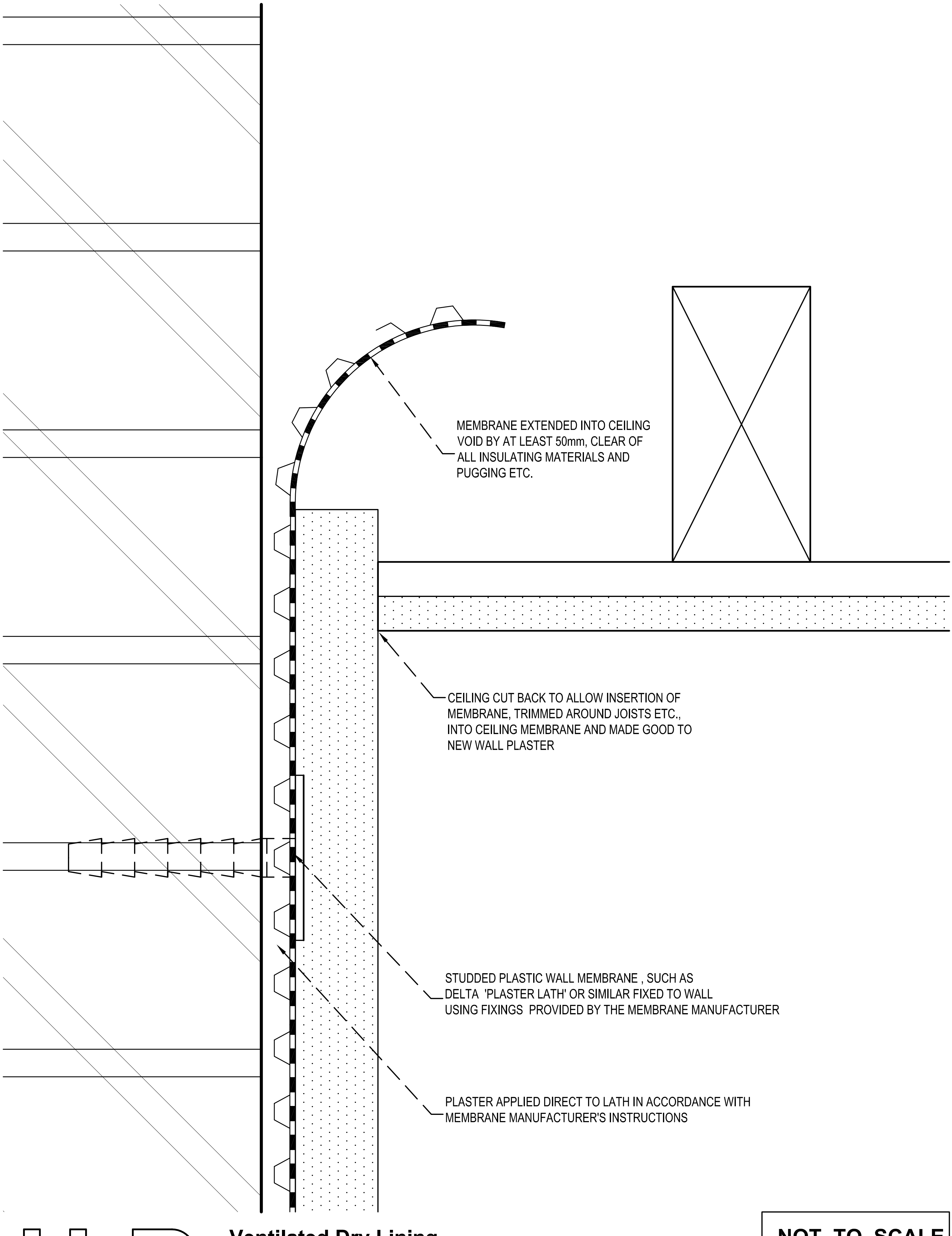
July 2009

Not to scale

NOT TO SCALE

SD-37

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911 Standard detail - frenchDrain_060904.dwg



H+R

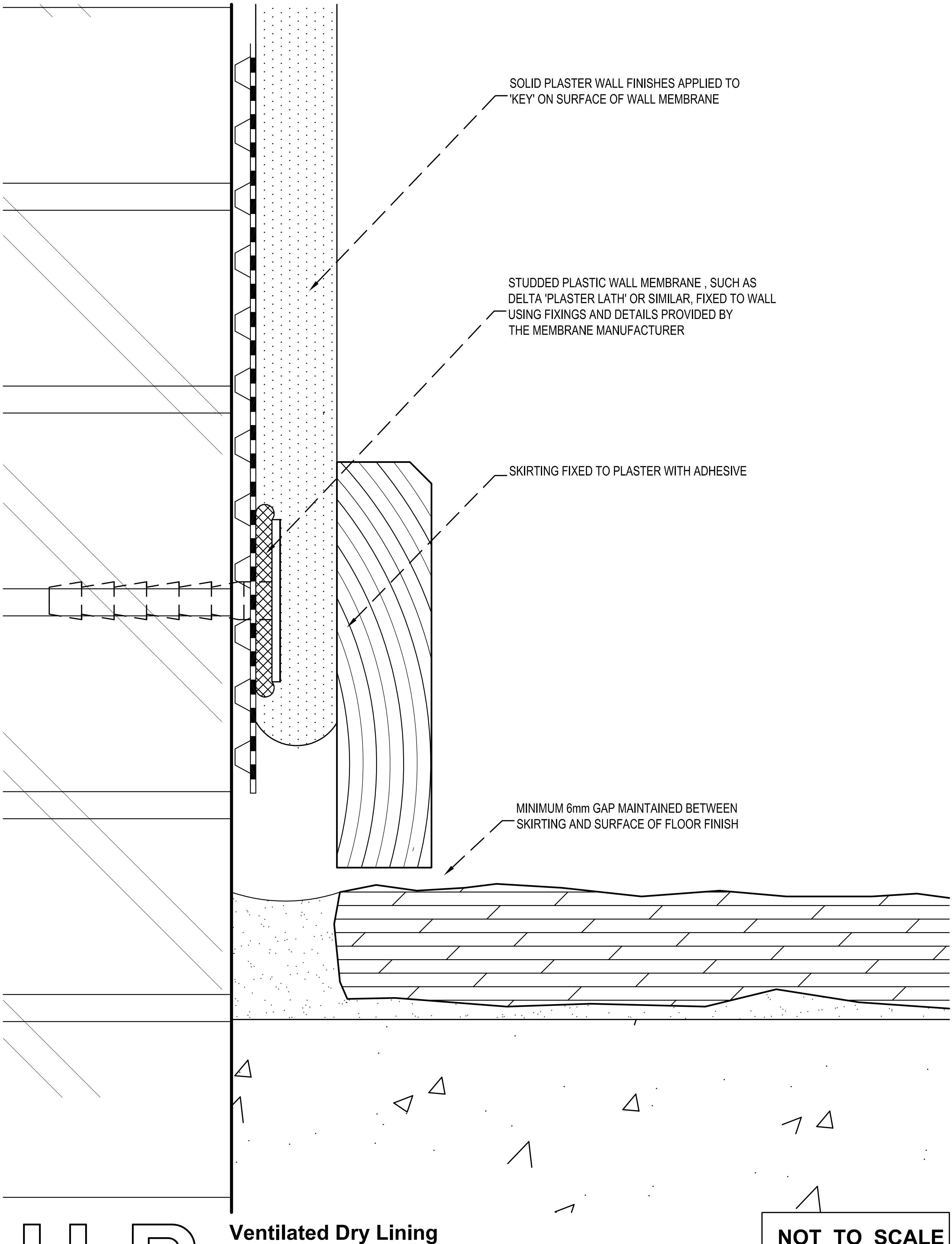
Ventilated Dry Lining

Full height studded plastic membrane extended into ceiling void, solid plaster finish

NOT TO SCALE

SD-38B

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911 Standard Details/ventilated dry lining



NOT TO SCALE

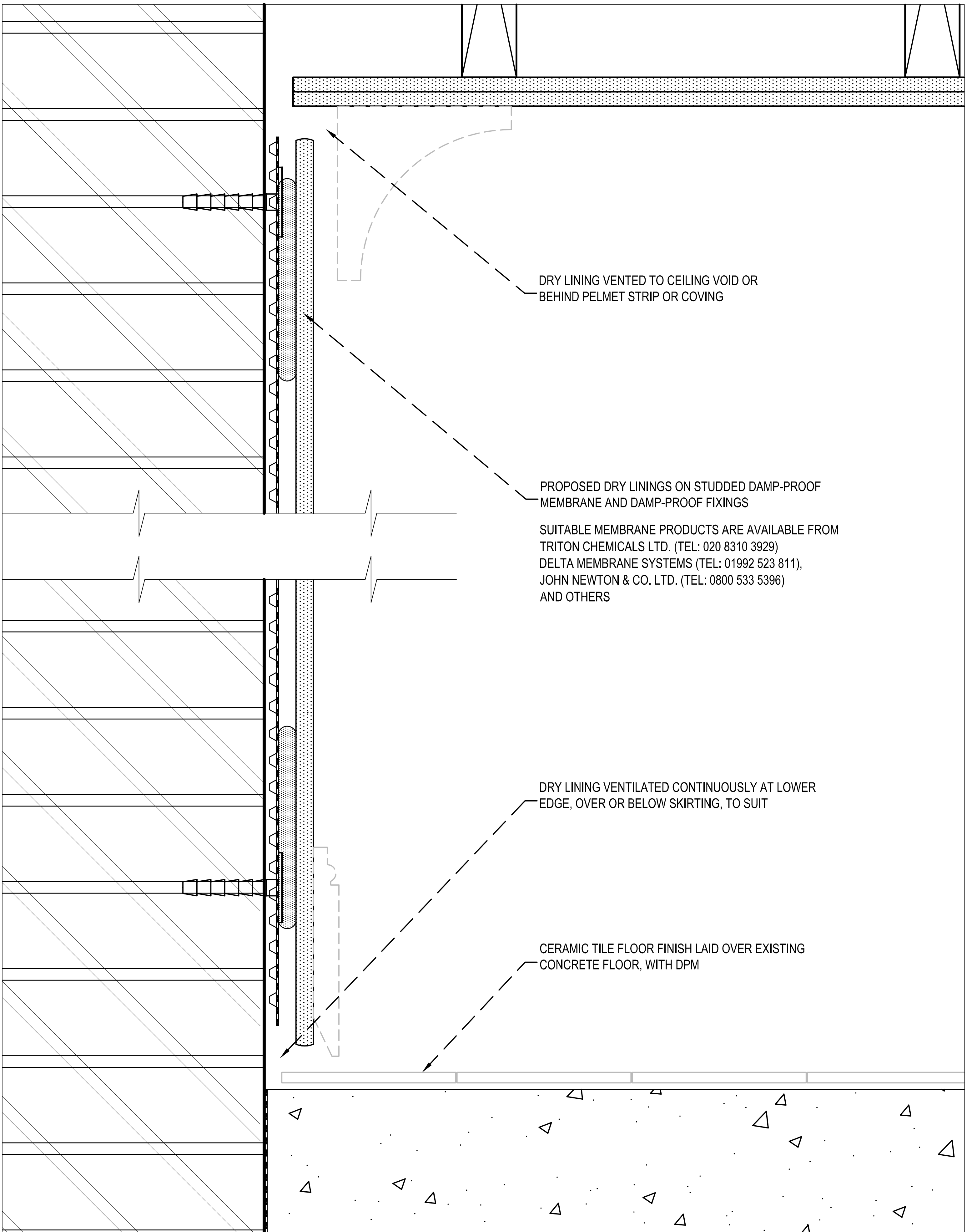
SD-93B

Ventilated Dry Lining

Ventilated skirting detail, adhesive fixing

Stone or tiled floor

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911 Standard Details/ventilated dry lining



Ventilated Dry Lining

Internally ventilated dry lining, with studded plastic wall membrane

NOT TO SCALE

SD-94

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911 Standard Details\MA SD Review 2009\094

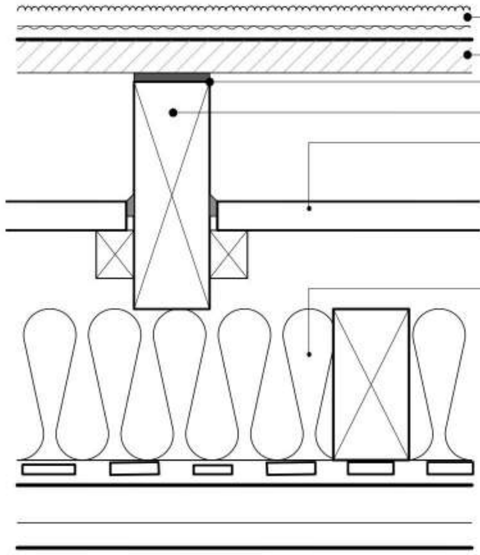
FLOOR TYPE F13:
EXISTING INDEPENDENT STRUCTURE

Regupol 3912 Isolation Strip 50mm Self Adhesive

For Timber/Metal Studwork

Regupol Isolation Strip 50mm Self Adhesive prevents sound transfer by isolating partitioning in walls, or by seperating ceilings and floorboards from connecting joists and other point to point contact.

Impact Rating — Rated at 23 dB | Thickness — 6 mm | Area — Covers 15m²



CARPET ON UNDERLAY

EXISTING FLOORBOARDS REFIXED ONTO

REGUPOL 3912 ISOLATION STRIPS ON

EXISTING FLOOR JOISTS

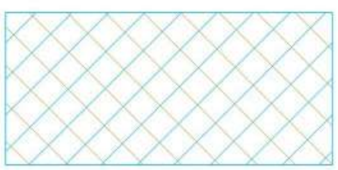
19MM GYPROC PLANK SUPPORTED ON 25X32 BATTENS WITH ACOUSTIC MASTIC TO JOINTS WITH JOISTS

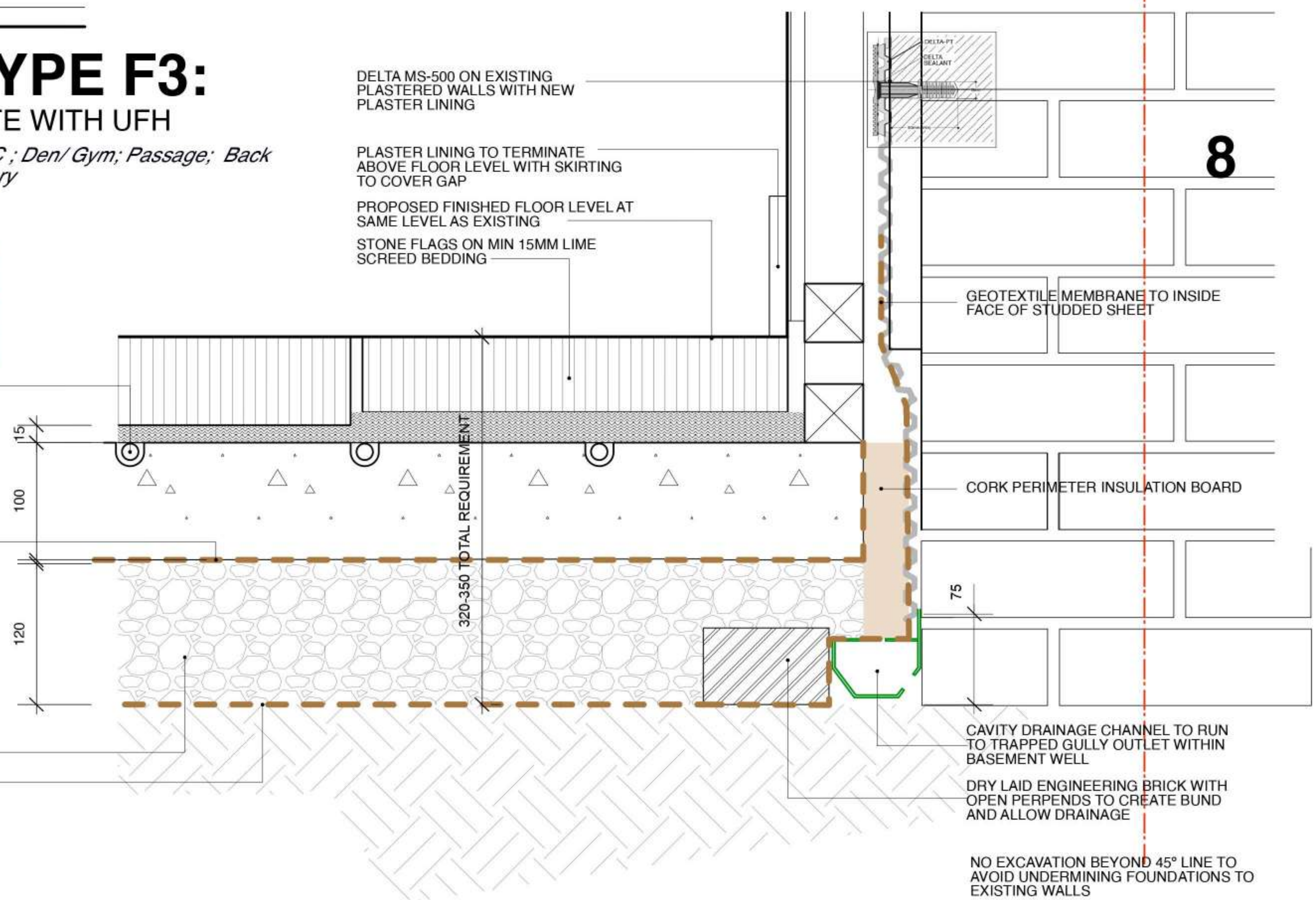
100MM ROCKWOOL RWA 45 ACOUSTIC INSULATION TO VOID

EXISTING CEILING JOISTS, PLASTER AND LATH AND ACOUSTIC CEILING TO FLAT 7A UNAFFECTED

FLOOR TYPE F3:
PUMICE LIMECRETE WITH UFH

BASEMENT: *Lower Hall; WC ; Den/ Gym; Passage; Back stair; Laundry/ Utility; Scullery*





DELTA MS-500 ON EXISTING PLASTERED WALLS WITH NEW PLASTER LINING

PLASTER LINING TO TERMINATE ABOVE FLOOR LEVEL WITH SKIRTING TO COVER GAP

PROPOSED FINISHED FLOOR LEVEL AT SAME LEVEL AS EXISTING

STONE FLAGS ON MIN 15MM LIME SCREED BEDDING

PUMICE SLAB WITH ROUTED GROOVES TO TAKE UNDERFLOOR HEATING PIPEWORK

GEOTEXTILE MEMBRANE TO INSIDE FACE OF STUDDED SHEET

CORK PERIMETER INSULATION BOARD

GEOTEXTILE MEMBRANE

GEOCELL FOAM GLASS AGGREGATE INSULATION

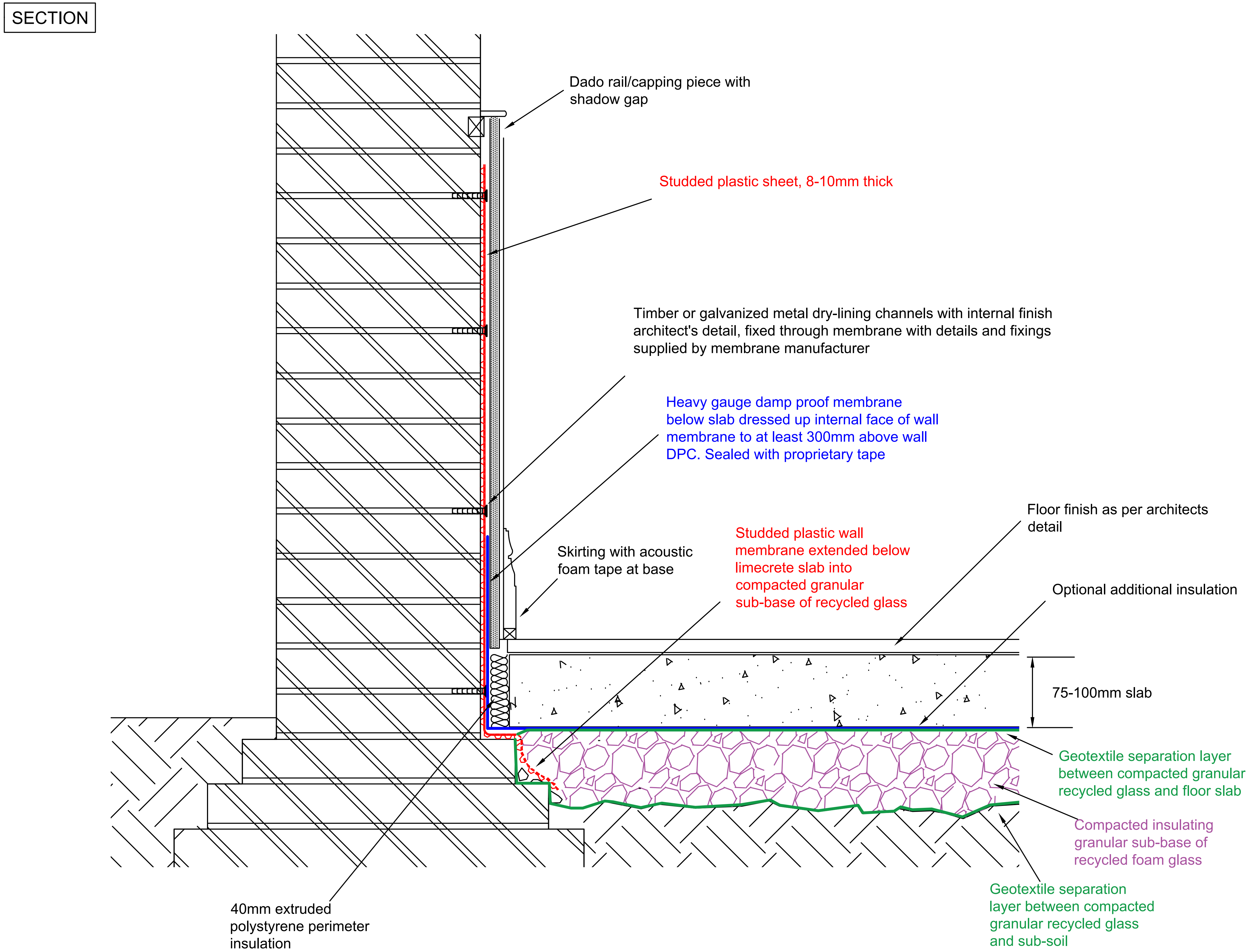
GEOTEXTILE MEMBRANE

CAVITY DRAINAGE CHANNEL TO RUN TO TRAPPED GULLY OUTLET WITHIN BASEMENT WELL

DRY LAID ENGINEERING BRICK WITH OPEN PERPENDS TO CREATE BUND AND ALLOW DRAINAGE

NO EXCAVATION BEYOND 45° LINE TO AVOID UNDERMINING FOUNDATIONS TO EXISTING WALLS

MM 50 100 200 500 1000



NOTE: A professional architect or designer should be consulted for specific construction advice and finishes. This detail is for advisory purposes only. H+R reserves the right to update this drawing

Standard Detail - Ground Floor

'Non-earth retaining' masonry wall, where floor structures are to be replaced

Notes:

If solid plaster finishes are required on refurbishment these should be laid on an appropriate bonded plastic 'lath' or over boarding fixed on dabs applied to suitable wall membrane

Suitable membrane products are available John Newton & Co Ltd (tel: 0207 237 1217, www.newton-and-co.co.uk) or similar products from Delta Membrane Systems Ltd (tel: 01992 523811, www.deltamembranes.co.uk), Triton Chemicals Ltd (tel: 0208 310 3929, www.triton-chemicals.com) and others.

Comments:

Date	Designed by	Drawn by	Checked by
06/12/19	MS	MLA	MS

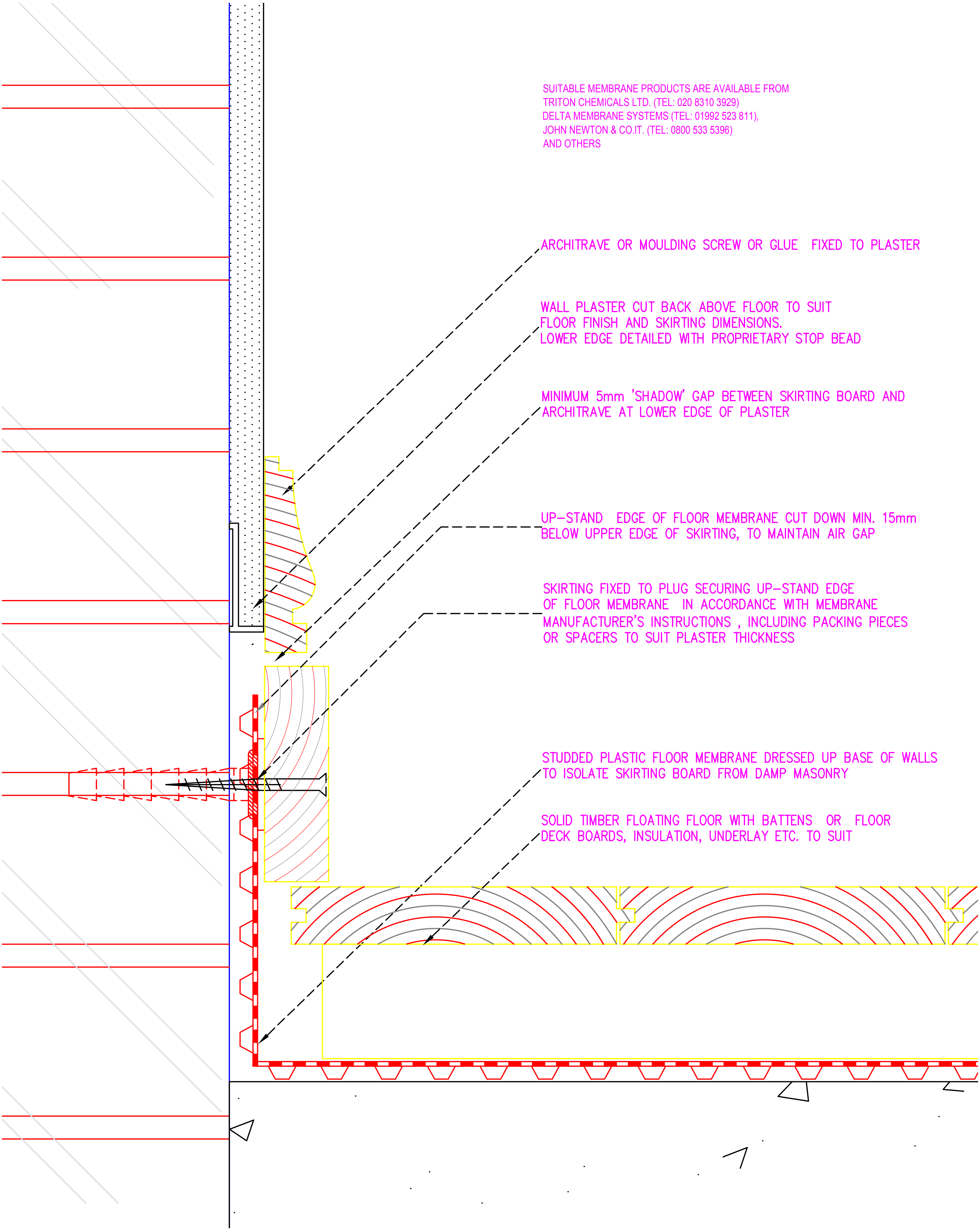
H+R Ref	Scale
SD-42-C	NOT TO SCALE

Status: READY FOR ISSUE

Drawing number	Sheet no.	Revision
SD-42-S	1	-

Hutton + Rostron
Environmental Investigations Ltd

Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Fax: 01483 202911
www.handr.co.uk



Ventilated dry lining

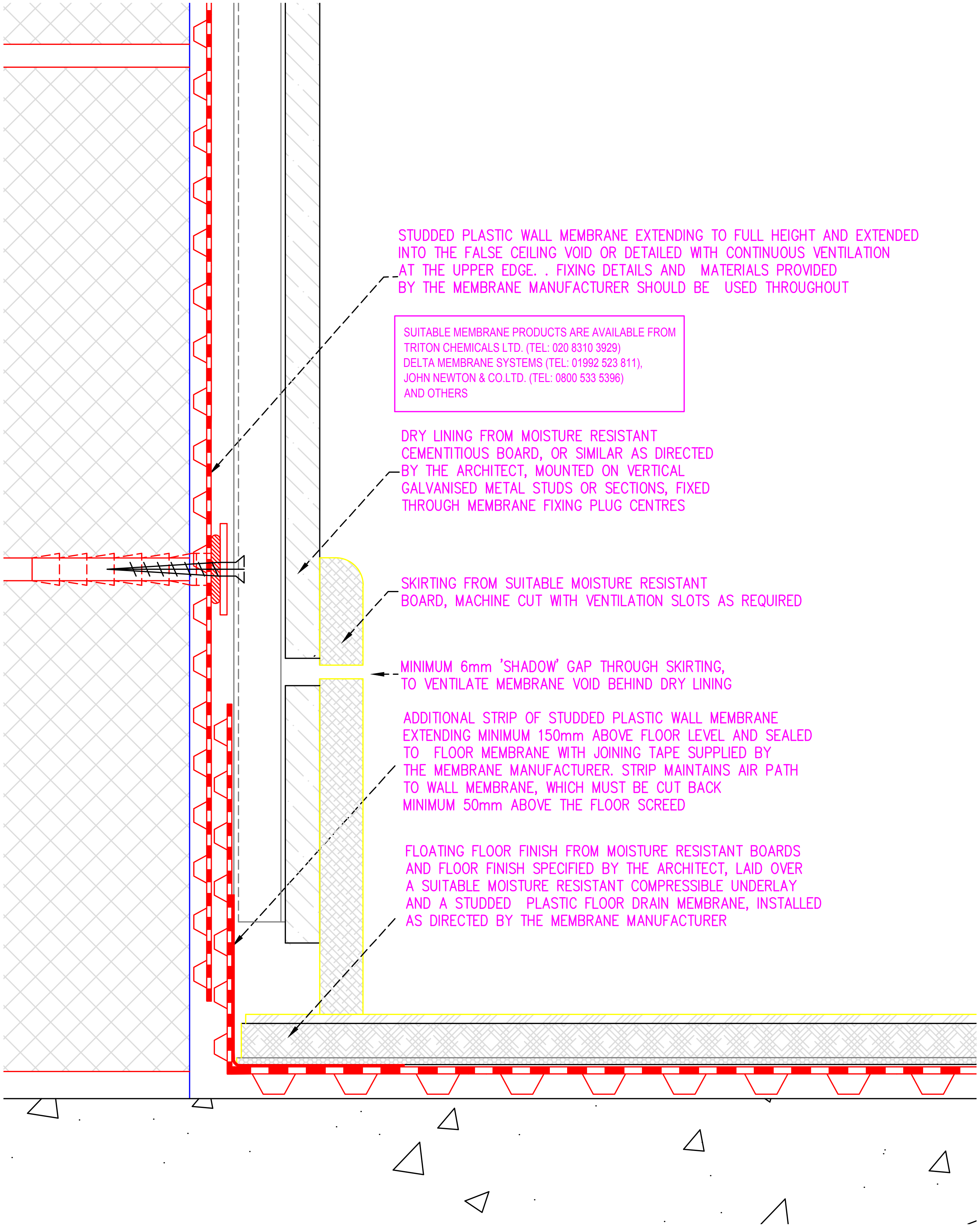
Ventilated skirting detail, with 'floating' timber floor laid over studded plastic floor membrane - section

Indicative Only - Not for Construction

NOT TO SCALE

SD-301i

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk Standard Details \ Wall



Ventilated dry lining

Ventilated skirting detail, with drained cavity membrane below floating floor finish (external wall)

Indicative Only - Not for Construction

NOT TO SCALE

SD-301L

H+R

Hutton + Rostron Environmental Investigations Ltd, Netley House, Gomshall, Surrey, GU5 9QA
Tel: 01483 203221 Email: ei@handr.co.uk Standard Details \ Wall