37 NORTH ROAD

DRY ROT AND TIMBER CONDITION INVESTIGATION

JOB NO. 162-58

PKS ARCHITECTS

01 NOVEMBER 2024

Prepared by:	Technical review by:	Administration by:
Andrew Ellis BA(Hons), MSc	-	*Carissa Barnett*

© Copyright Hutton+Rostron, 2024

CONTENTS

Hutton+Rostron Environmental Investigations Ltd (A SOCOTEC COMPANY)

Netley House, Gomshall, Surrey, GU5 9QA,

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

© Copyright Hutton+Rostron, 2024

1 INTRODUCTION

1.1 AUTHORITY AND REFERENCE

Hutton+Rostron Environmental Investigations Limited carried out a preliminary timber decay and damp survey at 37 North Road, N6 4BE on 01 November 2024 in accordance with instructions received from Mr Douglas Paskin by email dated 23 October 2024 (10:51). Reference was made to drawings supplied by the client for the identification of structures. For the purpose of orientation in this report, the building was taken as facing east onto North Road

1.2 AIM

The aim of this investigation was to identify areas of active dry rot/timber decay or make other relevant observations and recommendations to allow the planning of cost-effective remedial measures and prevent damp or decay problems in the future using environmental means as discussed in Appendices A, B, C & D

1.4 H+R STAFF ON SITE

Andrew Ellis

1.5 PERSONNEL CONTACTED

Douglas Paskin - PKS Architects
Site Team

For limitations that apply to this report please see section 5

© Copyright Hutton+Rostron, 2024

2 EXECUTIVE SUMMARY

2.1 DRY ROT

Dry rot (*Serpula lacrymans*) is a geophilic fungus that in buildings lives in damp masonry, and consumes softwood timbers built in contact with the masonry or within adjacent unventilated building voids. Dry rot infection generally originates from chronic defects to roof drainage systems allowing water penetration into masonry with embedded softwood timbers, and then follows moisture in a cone shape down through the building from roof to below ground level; infecting and consuming softwood timbers embedded in the affected masonry in between. The fungus may persist in masonry for decades or even centuries, and may be reactivated and allowed to spread as the result of subsequent water penetration from other sources such as leaking water or drainage pipes, flooding or after fire. Dry rot cannot move through dry materials or through ventilated voids. However, it is not practical or even possible to kill dry rot infections within the masonry with fungicides; especially where vulnerable to further water penetration or continuing damp conditions, as is to be expected at or below ground level or adjacent to roof drainage details. Positive indications of residual active dry rot infection were identified by H+R in a number of areas at 37 North Park as shown on plans, and there was visible evidence of current or recent infection or decay, and previous remedial treatments and repairs in a number of areas also shown on Plans. Softwood timber elements built in contact with masonry in these areas are therefore very vulnerable to structurally significant decay before, during or after refurbishment

1 *Chemical remedial treatment: No chemical remedial timber treatments or wall irrigations are required*

2 *Repair and isolation of timbers: Decayed, partially decayed or at-risk timbers should be repaired or replaced as necessary as directed by the Structural Engineer, and reinstated separated from damp or potentially damp or dry rot infected masonry with a damp-proof material or through ventilated air gap using a detail approved by H+R*

3 *Retention of infected and partially decayed timber elements: Existing timber elements that have been infected and partially decayed by dry rot in the past may be retained on refurbishment without any chemical remedial treatment, provided they are structurally adequate, and are separated from dry rot infected, damp or potentially damp masonry with a damp-proof material as described at 2 above; and that all practical measures are taken so as to prevent water penetration on future occupancy as described at 3.2 below*

2.2 WATER PENETRATION PROVIDING THE CONDITIONS FOR DRY ROT INFECTION AND DECAY

The structures at 37 North Road had been subject to chronic problems of intermittent water penetration since original construction providing conditions for localised infection and decay by dry rot at different times in different areas depending on maintenance and occupancy. In particular there was evidence of recent chronic problems of water penetration from defects to chimneys, flashings, hoppers, rainwater downpipes and to the east, south and west elevation parapets and there was evidence of chronic problems of failure to the rear west flat roof. This had provided conditions for infection and decay by dry rot down through the structures

© Copyright Hutton+Rostron, 2024

beneath as described at 2.1 above. There was also a history of water penetration subsequent with intermittent/poor maintenance, plumbing failures and occupancy providing the conditions for persistent damp and decay. There was evidence of extensive patch repair to roof surfaces and to roof drainage systems in recent years. These remained very vulnerable to leaks and to blockage and overcharging; and only limited provision had been made for safe and convenient access to allow inspection and maintenance (via the east and west dormer windows). However, the recent installation of a scaffolded 'tin-roof' over the entire property had apparently halted all roof envelope and roof drainage water penetration issues to the property, which was promoting the onset of drying to the structures below. The original building had been constructed with lightwell type 'air drains' to the east and west basement windows/doors at the base of walls and foundations so as to minimise moisture penetration at and below ground floor level. However, multiple areas at basement level still featured earth retaining perimeter walls, allowing chronic problems of water penetration to the base of walls at ground and basement levels as well as to the foundations in many areas. This will allow dry rot infection to persist within the affected masonry for the foreseeable future, despite any practical remedial measures as described at 3.1 above. Generally, chimneystacks appeared to be open/in poor condition as well as widespread failure to external façade renders and the widescale improper use of cementitious mortar pointing schemes that are likely to allow water penetration during wind driven rain whilst restrict drying. This will also provide the conditions for decay to timber elements built in contact with chimneystacks/masonry perimeter walls down through the structures beneath

1 *Access: Provision should be made for safe and convenient access to all roofs and roof drainage systems before, during and after refurbishment; so as to facilitate inspection and maintenance and minimise the risk of further water penetration. This may be achieved by introducing permanent roof access hatchways onto the east, west and south pitches to gain expedient and practical access to the perimeter parapet gutters*

2 *Monitoring: Consideration should be given to installing electronic radio telemetric gutter water level monitoring and alarm systems as an aid to project and facilities managers before, during and after refurbishment. H+R can advise further when required*

3 *Roof surfaces and roof drainage: Although not the focus of this investigation, H+R recommend that on future refurbishment, allowance should be made for replacing all existing roof surfaces (a proportion of historic slates may be considered suitable for retention/relaying subject to further investigation), gutter linings and roof drainage systems with new detailed so as to be 'fail safe' and so as to facilitate inspection and maintenance on future occupancy. Consideration should be given to providing the temporary 'tin' roof with a dedicated drainage system during refurbishment; so as to discharge water clear of the structures beneath and promote drying-out of the property during envisaged low occupancy and refurbishment. H+R can advise further when required*

4 *Residual moisture providing conditions for persistent dry rot infection: Consideration should be given to undertaking moisture and salt profiling throughout the building to identify areas of significant residual moisture and salt within the masonry masses likely to provide the conditions for persistent dry rot (Serpula lacrymans) infection and decay and damage to vulnerable materials and finishes following the methodology described in BRE Digest 245. H+R can advise further if required. In particular masonry masses adjacent to rainwater downpipes should be investigated in detail, and existing provision for damp-proofing at and below floor level should be investigated in detail. H+R can advise further when required*

5 *Ground and surface drainage: Existing provision for ground and surface drainage should be inspected in detail using CCTV, mapped and cleared as necessary. Consideration should be given to providing effective temporary ground and surface drainage so as to drain water clear of the structures before and during refurbishment as directed by a Structural Engineer. Consideration should therefore be given to the*

© Copyright Hutton+Rostron, 2024

introduction of a continual perimeter air drain system to the east and west facades so as to separate vulnerable basement facades from earth retaining ground levels. Sub-ground drainage systems should be inspected using CCTV and 'certified' as clear by the Project Managers at completion and should be detailed so as to facilitate access for inspection and maintenance

6 *Inspection and maintenance of roof and surface drainage systems: All existing temporary and refurbished roof and surface drainage systems should be inspected and repaired or cleared as necessary daily during refurbishment works. After refurbishment all roof and surface drainage systems should be inspected and cleared as necessary at least three times a year as part of routine maintenance*

7 *Accelerated drying: Consideration should be given to accelerated drying of damp affected structures identified as described above before and during refurbishment; so as to meet the programme requirements. This should provisionally include for the introduction of targeted 110v radiant heaters towards the worst/damp affected internals walls, as well as the use of fans/forced extraction positioned at the basement stairs so as to force warm moisture laden air up and out of the property via the passive stack effect. H+R can advise further if required*

8 *Long-term drying: Consideration should be given to stripping damp and dry rot infected structurers so as to promote drying. Long term drying may be encouraged by the use of highly permeable and breathable holistic finishes such as NHL plasters and silicate based paints or in extremis via the recladding of structures identified as having high residual moisture content and/or vulnerable to further water penetration with insulated and vented dry-lining details; so as to allow dissipation of moisture and hygroscopic salts on future occupancy while preventing the conditions for dry rot infection and decay, or damage to vulnerable materials. H+R can advise further on detailing when required after detailed investigation as described above*

9 *Chimneystacks: Chimneystacks should be inspected in detail and repaired as necessary when full safe access is available prior to re-roofing works; so as to minimise the risk of further water penetration and so as to allow long-term drying. In particular redundant flues should be capped but unblocked and opened to all internal hearth locations so as to minimise water penetration but allow continued through ventilation by the passive stack effect during the refurbishment phase and after occupancy*

10 *Facades: Facades and balconies should be inspected in detail and repaired so as to effectively drain wind-driven rain away from the property and vulnerable structures within. In particular, unleaded balconies, cornices and cracking masonry/lintels as well as failed/soiled pointing local to historically problematic cornices and downpipes were deemed highly vulnerable to persistent damp penetration and decay issues*

2.3 INTERNAL ENVIRONMENTS PROVIDING CONDITIONS FOR DAMP AND DECAY

General: Internal environments at 37 North Road had generally been controlled since original construction by low level of structural heating to masonry masses and ventilation to interiors by the 'passive stack effect' by the use of the open fires and chimneys. This had been supplemented by 'background ventilation' and 'purge ventilation' via sash windows; and heating had been supplemented in the 19th and 20th century by use of hot water central heating systems in particular on the lower floors. This had allowed dissipation of moisture penetrating the structure from the exterior and introduced with occupancy in the past. However, intermittent occupancy and improper maintenance in the 20th and 21st century had provided conditions for condensation, mould growth, damp and decay in unoccupied and poorly heated and ventilated structures. This would have allowed the persistence and spread of dry rot as described above. Ventilation and heating had also ceased during the properties reduced occupancy between ownership and prior to the commencement of the refurbishment

© Copyright Hutton+Rostron, 2024

phase. Additionally, the majority of fireplaces appeared to be blocked, denying ventilation via the passive stack effect. Existing/recent central heating systems also appear to have been ineffective and were decommissioned at the time of investigation. This will limit drying of residual moisture within the fabric as described at 2.2 above. There was some adventitious ventilation to existing roof structures due to exposure works to the dormer windows. However, inadequate provision had been made for long term ventilation

Relative Humidity: Relative humidity, temperature and dew point were outside of acceptable levels within the basement and sub-floor voids at the time of survey when compared to external conditions. This was due to a history of water ingress combined with a lack of adequate ventilation, creating the conditions suitable for wood boring beetle activity and timber decay due to a well-developed dry rot infection. Black mould growth was also locally evident to internal finishes, particularly plasterboard, due to a lack of adequate ventilation and extraction of moisture laden air

1 *Background ventilation: Provision should be made for through and cross ventilation to all rooms and building voids before, during and after refurbishment; so as to allow drying, minimise the risk of condensation, and prevent the conditions for dry rot mycelial growth*

2 *Windows: All existing windows should be repaired, refurbished or replaced as necessary including provision for 'trickle ventilation' and/or window catches to allow them to be securely locked in a partially open position, and allow through and cross ventilation to all areas before, during and after refurbishment. Vulnerable and high-status windows in dry rot infected zones should be considered for temporary removal/storage so as to encourage ventilation and so as to facilitate re-introduction via separation from the damp affected masonry via a suitable damp-proof membrane and ventilated air-gap (likewise to high status vulnerable joinery elements including skirtings, architraves and panelling)*

3 *Ventilation to roof structures: After consultation with the conservation officer, consideration should be given to carefully recording and removing vulnerable ceilings and soffits beneath existing roofs at an early stage during enabling works; so as to allow access to the structures above for decontamination, ventilation, inspection, conservation and repair as necessary; and so as to facilitate the installation of insulation and surfaces on refurbishment. On refurbishment all existing roofs should be refurbished as 'Insulated and Through Ventilated Cold Roof Structures' fully in accordance with the requirements of current Building Regulations. 'Warm roof structures' should be avoided*

4 *Fireplaces and flues: All original fireplaces and flues should be identified, opened, cleared as necessary and provided with through ventilation before, during and after refurbishment. Flues intended for continued use should be fitted with wind and weatherproof cowls. Redundant flues should be capped so as to minimise water penetration but including provision for through ventilation to the interior or into roof voids. Consideration should be given to utilising redundant flues as passive stack vents and/or risers from basement to roof level so as to facilitate refurbishment and sustainable occupancy*

5 *Structural heating: Consideration should be given to installation of cost effective and sustainable heating to the structure of the building during and after future refurbishment. In particular consideration should be given to providing a low level of continuous structural heating to the lower floors, and to providing intermittent 'comfort heating' for occupants as necessary using radiant heating systems. H+R can advise further after computer modelling if required*

6 *Mould: All visibly mould-affected contemporary plasterboard should be safely removed and disposed of upon future refurbishment works. All visible superficial mould growth*

© Copyright Hutton+Rostron, 2024

to retained surfaces should be removed as soon as possible. This may be done by 'wet wiping' using water with a minimal addition of detergent for removal of spores and mycelium, followed by a dilute (10 per cent) solution of sodium hypochlorite or appropriate biocide used fully in accordance with the recommendations of the manufacturers or suppliers. Those undertaking this task should be provided with appropriate respiratory protection to FFP3, eye protection, gloves and protective clothing

2.4 DECAYED TIMBERS AND PREVIOUS REMEDIAL TREATMENTS

For ease of identification, all identified structurally decayed timbers were marked on-site via water soluble red spray paint and on Plans to Appendices G. Inaccessible but presumed vulnerable/decayed timbers are also identified on Plans to Appendices G

There was evidence of extensive structural decay to existing timbers in many areas to the roof and floor structures inContact to the perimeter east, west and south facades on preliminary visual inspection at the time of survey. There was also evidence of repeated remedial treatments and repairs many of which may not be structurally adequate to carry the loads to be expected before, during and after refurbishment. In particular, bearing ends of trusses, floor joists, underlying wall plate and lintels in areas subject to chronic problems of water penetration and dry rot infection and decay in the past as described at 2.1 and 2.2 above and as shown on drawings at Appendices are highly likely to have been decayed or partially decayed or remain vulnerable to decay. This may allow structurally significant movement as timbers settle and/or shrink with heating and drying on occupancy, and with the change in distribution of loads to be expected with refurbishment. Roof spaces and other building voids appear to be heavily contaminated with dust and debris from previous refurbishments. This was likely to contain residues from previous chemical remedial timber treatments, insecticidal treatments, lead oxides, mould spores and fragments, and other potentially irritant or hazard particulate matter. There may also be residual asbestos containing materials within the dust. This will represent a potential health hazard to those working on or occupying the building before, during or after future refurbishment

1 *General: No chemical remedial timber treatments or wall irrigations are required before or during future refurbishment. All decayed, partially decayed and at-risk timbers should be repaired, partnered or replaced as necessary as directed by the Structural Engineer and to a detail approved by H+R ensuring timber elements are re-supported and isolated from damp or potentially damp masonry via hangers and/or a through ventilated air-gaps. In the view of H+R, the existing timber structures (including roofs, lintels and floor elements) designated to be in contact to damp zones/areas vulnerable to dry rot infected masonry are not suitable for retention in their existing condition/detailing. All embedded timbers to recently damp affected walls remain highly vulnerable to further/ongoing decay, even during the latent drying down period. In particular, it is highly probable that existing zones of decay will continue to expand, coning outwards down the building with further loss to historic fabric during the winter months of 2024-5. Further to this, any historic and unverified areas of inactive dry rot are therefore also liable to becoming reactivated from any future water penetration issues both from failed external envelope to the property. Additionally, the extent of concealed decay to embedded timbers remains unverified to localized areas (see Plans) and therefore it remains highly probable that some further structurally significant decay exists. In the opinion of H+R therefore, consideration should be given to comprehensive repair/re-detailing/separation to all roof, floor and lintel timbers in contact to the east, west and south facades as well as the west flat roof, first and ground WC floor structures. All decayed lintels should be replaced with solid variants. Structural Engineer to comment*

© Copyright Hutton+Rostron, 2024

2 *Further access: Allowance should therefore be made for all vulnerable concealed timbers to be exposed and investigated. This will necessitate the careful removal of perimeter floor boards and finishes to investigate floor structures as well as wall plaster/linings to determine the construction and condition to lintels within compromised and dry rot infected masonry. All structurally decayed timbers may then be partner repaired or cut out and replaced in new. All remaining/new timbers should be detailed so as to be separated from vulnerable or potentially vulnerable dry rot infected masonry to a specification agreed to by the H+R and the Structural Engineer*

3 *Contaminated dust and debris: In conjunction to further proposed opening works, allowance should be made for tandem R&D asbestos surveys to newly opened voids in accordance with the Control of Asbestos regulations. Consideration should be given to removing all potentially contaminated dust and debris from roofs and other building voids as soon as practical. Those undertaking this task should be provided with appropriate respiratory protection, gloves and protective clothing; and all practical measures should be taken so as to prevent potentially contaminated dust entering occupied air spaces before, during or after works*

4 *Conservation enabling works: Consideration should be given to removing all wall linings, ceilings and soffits adjacent to or beneath damp and dry rot affected structures so as to promote drying and allow for effective decontamination works; and to facilitate access for inspection, conservation, repair, and for installation of insulation and services, so as to allow sustainable occupancy. Works should only be undertaken after consultation with the Conservation Officer*

5 *Vulnerable secondary timbers: Provision should be made for all vulnerable secondary timbers remaining within designated dry rot 'zones' to be documented and carefully removed, recorded and safely stored in conjunction to dry rot remedial actions as stated at 3.1 and 3.3 above. These should eventually be re-instated so as to be separated from the potentially harmful masonry structures via a damp proof membrane and/or a ventilated air gap. Secondary timbers include panelling, windows, skirting, architraves, doors and floorboards adjacent to dry rot affected walls. Works should only be undertaken after consultation with the Conservation Officer*

© Copyright Hutton+Rostron, 2024

3 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

3.1 ROOF AND SURFACE DRAINAGE

3.1.1 Maintenance

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

3.1.2 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

3.1.3 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

3.1.4 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

3.1.5 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

3.1.6 Access

Safe and convenient access ladders, safety points and walkboards should be installed to all roof areas to allow proper inspection and maintenance

3.1.7 Pigeons

Feral pigeons should be controlled. H+R can give advice on this if necessary

© Copyright Hutton+Rostron, 2024

3.2 VENTILATION

3.2.1 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

3.2.2 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

3.2.3 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

3.2.4 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

3.2.5 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

3.3 STRUCTURAL DETAILING

3.3.1 New timbers

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

© Copyright Hutton+Rostron, 2024

3.3.2 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

3.3.3 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

© Copyright Hutton+Rostron, 2024

4 LIMITATIONS

4.1 GENERAL

This survey was confined to the accessible structures. Concealed timbers and cavities have been investigated where necessary by the use of high-powered fibre optics. The condition of concealed timbers may be deduced from the general condition and moisture content of the adjacent structure. Only demolition or exposure work can enable the condition of timber to be determined with certainty, and this destroys what it is intended to preserve. Specialist investigative techniques are therefore employed as aids to the surveyor. No such technique can be 100 per cent reliable, but their use allows deductions to be made about the most probable condition of materials at the time of examination. 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. No formal investigation of moisture distribution was made

4.2 CDM

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

4.3 BUILDING SAFETY ACT AND BUILDING REGULATIONS

H+R should not be considered as a designer under the Building Safety Act 2022 or the Building Regulations as amended. The client and design team should ensure that appropriate arrangements have been made where the Building Regulations apply and that the appropriate duty holders are in place and applications are made for Building Regulations approval

4.4 FIRE SAFETY

H+R have not carried out any risk assessments, surveys, investigations or analysis of fire safety risk, including compartmentation and structural fire performance of materials. It is recommended that the client and design team seek the guidance of appropriately qualified fire engineers or fire risk assessors as applicable

© Copyright Hutton+Rostron, 2024

4.5 PLANNING PERMISSION AND LISTED BUILDING CONSENT

Listed buildings have statutory protection and works or alterations that may include fabric removal, some repairs, extension and demolition will require listed building consent. It is the responsibility of the client to ensure listed building consent is obtained where this is necessary. Where works to any building, listed or otherwise, constitute development requiring planning permission it is the responsibility of the client to ensure planning permission is obtained where this is necessary

© Copyright Hutton+Rostron, 2024

Appendix A

© Copyright Hutton+Rostron, 2024

COMMON DECAY ORGANISMS

1 DRY ROT FUNGUS

1 Dry rot (*Serpula lacrymans*): Dry rot (*Serpula lacrymans*) belongs to the same group of fungi as most of the common mushrooms and toadstools. Reproduction is by means of spores which are produced in enormous numbers by the fleshy pancake-shaped fruiting body. These fruiting bodies generally only appear when the fungus is stressed or dying off. A well-established infestation may produce fruiting bodies more than one metre across and be accompanied by thick layers of rust-coloured spore dust. Each minute spore has an outer coat which affords it some protection against heat and desiccation, and germination has been achieved after a twenty-year latent period. Dry rot spores are ubiquitous and there is no domestic or natural environment entirely free of them. They can be found throughout the environment from high up in the jet stream to the middle of the countryside

2 Spores: These will germinate and grow in timber with a moisture content of between 20 and 30 per cent. The fine fungal thread (hypha) digests the cellulose and hemi cellulose fractions of the wood, but is unable to attack the structural linings. These remain as a brittle matrix which cracks into cubes under differential stresses. Cuboidal cracking is also a characteristic of many wet rots and does not automatically indicate the presence of dry rot

3 Fungal hyphae: These may clump together into a variety of structures known as mycelia which take various forms depending on the surrounding conditions. They may fill a humid cavity as a cotton wool-like mass, or grow across the surface of the timber, as a grey-white skin. Active dry rot has a fresh white or greyish appearance and smells strongly of mushrooms. Distinctive patches of lilac or canary yellow pigmentation are usually present

4 Some hyphae group together to form conducting strands: These have a fairly impervious outer layer rich in chitin, the major constituent of insect cuticle. The strands, which may reach a centimetre in thickness, are flexible when moist, becoming progressively more brittle as they dry out. Their main function is the conduction of nutrients, through or across inert non-nutrient materials (brickwork etc) to other timbers. Their relatively impervious outer layer, together with an unusual alkaline tolerance, allows them to survive in the mortar layers within masonry and walls. An infested area may be full of dry rot strands. The dry rot fungus may tolerate relatively lower moisture contents and, through this, and other quirks in its biology, is potentially capable of considerable destruction. Realisation of this potential, however, requires a narrow range of environmental conditions and, in practice, several factors restrict growth

5 Dry rot hyphae may attack timber: This would require a moisture content of about 18 per cent, although spores would not germinate under these conditions. This moisture content is still 5 to 10 per cent wetter than timber should be in a healthy domestic building, and indicates water penetration or, perhaps, faulty plumbing. There is no evidence that dry rot can 'wet up' timber to any appreciable extent under conditions expected in a healthy building, although this is often claimed. The fine attacking hyphae, unlike the coarse conducting strands, are susceptible to desiccation and dry wood may disperse moisture faster than it can be transported. This means they cannot move through dry masonry and wood or across ventilated cavities

© Copyright Hutton+Rostron, 2024

6 Total breakdown of wood by fungus: This produces considerable quantities of water. It has been suggested that dry rot can sustain itself on this 'metabolic' water alone. However, in practice, external drying factors disperse the moisture so that favourable conditions can be maintained only in exceptional circumstances such as behind impermeable finishes or in sealed cavities

7 Optimal conditions for fungal decay: In order to thrive, dry rot requires a moisture content in timber in excess of 20 per cent, and a relative humidity above 95 per cent. Below these levels the fungus will cease to cause current decay problems. Temperature is also a strong regulating factor, and growth ceases at about 25^{o}C, a temperature frequently exceeded in roof spaces, for example. Large radiators can be particularly lethal to dry rot and measurements of 30^{o}C with 20 per cent relative humidity are not unusual in their immediate vicinity

8 Latency: Dry rot is attacked by many other decay organisms which cause particular damage when the fungus is under stress will eventually destroy it. However, under dry conditions, dead dry rot does not disappear. Strands may eventually darken and the fungal mats may lose their fresh appearance, becoming tinged with brown, and leathery or papery in texture. The decayed wood becomes powdery as it dries, shrinks and distorts, which can be the first sign of decay having occurred behind paint finishes

2 WET ROT FUNGUS

1 Species: Wet rot is caused by a number of basidiomycete fungi of which the most important are *Coniphora puteana* (cellar fungus), *Poria fungi*; *Fibroporia vaillantii*, *Poria placenta*, *Amyloporia xantha*, *Geophyllum trabeum*, *Phellinus contiguus*, *Donkiporia expansa*, *Pleurotus ostreatus*, *Asterostroma* and *Paxillus panuoides*

2 Damage: They attack both softwoods and hardwoods causing a darkening of the timber (brown rot) or bleaching (white rot)

3 Optimal conditions: Wet rot fungi usually occur in persistently damp conditions, needing an optimum moisture content of 50 to 60 per cent. Unlike dry rot, the conducting strands of wet rot fungi do not extend far from their nutrient wood, hence they cannot travel through masonry and brickwork. The fruiting bodies occur rarely in buildings

4 Unseen damage: Wet rot has been known to hollow-out giant beams

5 Common species: Wet rot *Coniphora puteana* is responsible for up to 90 per cent of wood decay within buildings but raises less concern than dry rot, possibly because it is more easily controlled by standard building techniques

6 Some wet rots are also called soft rots: This is because they destroy both cellulose and lignin, leaving the colour of the wood largely unaltered, but producing a soft felty or spongy texture. Soft rot is caused by *Chaetomium globosum* and a number of other fungi also found growing on wet wood in buildings

3 WOOD-BORING INSECTS

1 Lifecycle: The common furniture beetle (*Anobium punctatum*) has a life cycle consisting of four stages - egg, larva (which causes all the damage), pupa and adult. The eggs are laid in end grain or in existing flight holes and hatch in 4 to 5 weeks and the new larvae bore directly into the wood. The larvae feed and grow within the wood creating a network of tunnels closely packed with frass (small ellipsoidal pellets). The larvae are whitish,

© Copyright Hutton+Rostron, 2024

curved, approximately 6mm in length and have well defined dark-brown jaws. When fully grown the larva excavates a small chamber and pupates producing a beetle after 6-8 weeks which bores through a thin layer of wood producing the characteristic emergence holes 1-2mm in diameter. Emergence usually occurs between May and August. The life cycle depends on the condition of the wood, the temperature and humidity. The life cycle usually takes a minimum of 3 years within buildings.

2 Attack of timbers: This is usually confined to the sapwood of softwoods and hardwoods but may occur in the heartwood in timbers such as beech, birch, spruce or in timbers modified by fungal decay. As sapwood only makes up a small cross section of the majority of structural timbers in older buildings, attack is often of little or no structural importance

3 History: In most instances of suspected attack, the infestation has died out long ago due to unfavourable environmental conditions. Careful checking is therefore required to establish that living woodworm are present

4 Optimal conditions: In cases of active infestation the environmental conditions are often marginal allowing the life cycle to continue but at a very slow rate. Small changes in the environmental conditions can tip the balance against insects. Woodworm attack is often very localised to small areas of high humidity or especially 'palatable' timber and further spread is highly unlikely

5 Deathwatch beetle: In the British Isles, death watch beetle (*Xestobium rufovillosum*) infestations occur most commonly in oak, probably because this wood used to be extensively employed in construction, but infestation can also occur in elm, walnut, chestnut, elder and beech. The life cycle is similar to that of the common furniture beetle but can take many years to complete from one year under experimental conditions, to ten years or more in a building. The hatched larvae wander over the surface of the timber before burrowing into it. When it is fully grown it pupates and changes into the adult beetle which does not emerge until the spring of the following year producing a 3mm diameter hole

6 Damage: In old buildings severe damage can be caused under favourable environmental conditions. Softwoods are occasionally infested where they are in close proximity to damp infected hardwood. Infestation is confined to fungal decayed or damp affected timbers. Many existing cases probably arose from the reuse of infected timbers from demolished buildings and from the use of unseasoned timbers used in their construction. Attack is not confined to the sapwood and often the heartwood is entirely consumed causing severe structural damage. Damage is most severe where ventilation is poor and where timbers are in contact with damp masonry

7 Death watch beetles are not active fliers: A localised attack of death watch will not automatically spread to the whole house and infest every timber in the building. Lowering of moisture contents of the timber in conjunction with careful observation to determine the level and extent of activity should provide control of the insects. Some severe cases may merit the use of local insecticide treatments as a first aid measure. However, the chemical must be targeted properly or large quantities of toxic pesticides will be used to little effect

8 Effect of timber moisture content: Woodworm and death watch beetle infestation will not flourish if the moisture content of timber is below about 14 to 15 per cent. The risk of infestation of insect attack is slight, in timbers with a moisture content at or below 14 per cent and the insect larvae will desiccate below about 12 per cent moisture content. The infestation will eventually die out if the timber moisture content is maintained below this. Healthy roof timbers should have a core moisture content of between 14 to 15 percent,

© Copyright Hutton+Rostron, 2024

while suspended floor timbers should be between about 11 and 14 per cent. Installation of a central heating system may reduce these moisture contents to about 9 per cent particularly in exposed timbers

9 Investigation: It is absolutely necessary to recognise whether an insect infestation is 'active' or 'dead'. The presence of fresh frass (bore dust) in conjunction with damp timbers may be acceptable evidence of active infestation

© Copyright Hutton+Rostron, 2024

Appendix B

© Copyright Hutton+Rostron, 2024

SPECIALIST SURVEY TECHNIQUES AND THEIR LIMITATIONS

1 PRELIMINARY INSPECTION AND INVESTIGATION

1 The basis of any investigation is an understanding of building structures and defects and how these may interact to produce the ecological niches in which various decay organisms can thrive. With experience, an initial visual inspection can give a good idea of the areas that will need further study. A check-list for this preliminary investigation includes building defects, significant timber structures and concealed cavities

2 The condition of concealed timbers may be deduced from the general condition and moisture content of the adjacent structure. Only demolition or exposure work can enable the condition of timber to be determined with certainty and this destroys what it is intended to preserve. A non-destructive approach is therefore required and to help reduce uncertainty, specialist instrumentation and test equipment can be useful. However, it is important to remember that all tests and instruments are only aids to the surveyor, and must be interpreted with experience and care. A slavish reliance on any technique and failure to take into account its limitations is a recipe for disaster. No technique can be 100 per cent accurate or reliable

3 The techniques that may be used for preliminary investigation include resistance-based timber moisture meters, capacitance masonry moisture detectors, borescopes and Rothounds

2 DETAILED INVESTIGATION

1 The findings from the initial investigations are followed up by more detailed study. The aim is to determine as far as possible the distribution and extent of all significant decay and organisms in the building, the distribution of micro environments predisposed to timber decay and the building defects that cause them. The extent of significant timber decay should also be determined as far as possible. Active decay organisms may not yet have caused significant timber decay. Conversely, there may be significant decay even when the decay organisms that caused it have been dead for many years. This may seem obvious but many expensive 'treatments' are carried out on insect or fungus damaged timber that has not been infected for tens or even hundreds of years. Key factors that may be noted are species and viability of decay organisms, moisture content of materials, ambient relative humidity, and ventilation. Timber species and previous chemical treatments may also be significant

2 It is important that the results of the investigation are co-ordinated with the building structure bearing in mind the characteristics of particular periods and methods of building. They should also be carefully recorded and quantified where possible. This allows analysis of the results by other experts, reduces the 'grey' area in which disputes of opinion can arise and forms a basis on which future investigations can build. Photography can be especially valuable and may be used when necessary

© Copyright Hutton+Rostron, 2024

3 ROTHOUNDS

1 Rothounds are specialist search dogs trained to help find dry rot (*Serpula lacrymans*) in buildings. Rothounds may indicate areas of active dry rot even before they are visible to the naked eye. This will occur if the dry rot is just developing, is inside the substance of the timber, between the timber and another surface or within porous masonry. Such indications may be confirmed by comparing them with measurements of the moisture content of the structure or by the use of a drilled sample. Rothounds will not indicate the remains of dead dry rot infestations

2 In areas indicated by Rothounds the significant timber structures should be checked for structural decay or high moisture levels. Even if these are not found steps should be taken to reduce moisture levels and increase ventilation. This may be all that is required to stop a developing problem and all that is then required is to check the area in 6 months. For this purpose Hutton + Rostron again favour the Rothounds

3 Capabilities of Rothounds are:

- May detect living dry rot (*Serpula lacrymans*) by the scent of the metabolites produced by the fungus
- May detect the scent of dry rot even when hidden behind panelling, under floors, behind plaster or in other concealed cavities
- May detect the scent of dry rot at a distance of several metres depending on scenting conditions
- May detect early dry rot growth before it is detectable by the unaided human eye
- May discriminate between living or dead dry rot and between dry rot and other fungi instantly
- Actively search for dry rot in buildings at high speed, covering 20 to 50 rooms in an hour and may indicate extent and spread of dry rot infestation
- Will search small inaccessible areas and roof spaces and will work in furnished and inhabited buildings
- Totally non-destructive
- Will work 2-4 hours per day

4 Limitations of Rothounds are:

- Trained only to indicate living dry rot, not wet rot or dead dry rot. Will not indicate fruiting bodies on old dead outbreaks of dry rot
- Indicates the scent of dry rot and the point of maximum scent. This may need interpretation as scent can occasionally be moved by air currents from the point of origin
- Scent will not travel through impermeable surfaces such as neoprene. However, it may be detected at the edge of an impermeable barrier, e.g. around the edge of a room with a rubber-backed carpet covering an infected floor
- Indicates dry rot infection, not decay. Therefore heavily decayed but inactive outbreaks may give a weaker indication than a recent highly active outbreak that has not yet caused significant decay
- Maynot work if there is a corrosive or choking dust or vapour. However, Rothounds should not be put off by smells and may detect even small amounts of dry rot in the presence of other strong scents

5 Uses of Rothounds are:

- Survey of properties prior to purchase, renovation, change of occupancy etc, to quickly check for hidden problems
- Preliminary survey of properties with suspected decay problems to determine existence and extent of dry rot infestation

© Copyright Hutton+Rostron, 2024

- Survey of properties with known dry rot problems to determine activity and extent of infestation
- Survey of properties undergoing remedial works to check for additional hidden areas of infestation
- Survey of properties after remedial works to check for efficiency of treatment
- Routine survey of properties with past problems thought to be at risk in order to detect recurrence of infestation at an early stage before significant decay can occur
- Periodic survey of properties with known problems awaiting renovation, to detect 'hot spots' of dry rot activity

6 These can then be dealt with by 'reactive maintenance' allowing outbreaks to be controlled by minor exposure works and environmental controls. This avoids expensive building or remedial works. Further decay is prevented and infection controlled with significant savings on eventual renovation

4 FIBRE-OPTIC BORESCOPE EXAMINATION

1 Flexible and fixed type videoscopes or ‘borescopes’ allow inspections of cavities (such as suspended floor voids) through a small pilot hole. This can allow damp/decay issues to be reviewed with a minimum of disturbance or exposure

2 Borescope examination alone is limited in the sense that it gives only a surface view. Because most wood-destroying fungi will not live on the face of timber, there is a possibility that a decay may go un-detected (which is why exposure and decay-detection drilling is often required as a second stage inspection). Fibre optics can therefore be useful in targeting such areas in need of exposure

3 The siting of inspection holes depends on the points at risk within the room and will usually be located adjacent to balconies, flat roofs, and other external envelope faults. H+R do not generally form holes in high value finishes unless permissions are in place. H+R do not form holes into voids in the vicinity of building services (wires/pipes)

5 THE MEASUREMENT AND SIGNIFICANCE OF MOISTURE CONTENT

1 The moisture contents in timber, mortar and plaster are measured by a variety of methods. Timber moisture content might be ascertained by the use of a standard resistance-type moisture probe which measures the moisture content at the surface of the wood.

2 However, this moisture content will be subject to considerable fluctuation, depending on current relative humidity and temperature. A rafter in a roof in summer may, for example, have a moisture content at the surface of 16 per cent which might rise to over 20 per cent in winter. This difference would not necessarily reflect increased water content resulting from a fault in the roof, but might simply be a redeposition of water resulting from a considerable drop in temperature

3 The condition in the core or subsurface of a timber will remain relatively stable which is why the centre of thick timbers may be preferentially decayed. It is this 'deep' moisture content which must be measured if results are to be meaningful. For this reason, a hammer probe with insulated electrodes or deep moisture probe is used to measure the moisture content within the timber. Healthy roof timbers should maintain a stable core moisture content of between about 12 per cent and 16 per cent, whilst suspended floor timbers (excluding ground floors) should be between about 11 per cent and 14 per cent. Central heating will usually reduce this figure to around 9 per cent

© Copyright Hutton+Rostron, 2024

4 Similarly, surface moisture content readings in plaster and mortar are of limited value except for purposes of comparison. A surface capacitance meter may be used on plastered walls. For further investigation absolute measurements of moisture content may be made on site by means of a carbide-type gas pressure meter

5 Alternatively, samples are taken back to the laboratory in sealed vials, and the moisture contents are measured by the oven and balance method. For this, mortar samples are obtained by drilling holes in the wall and dust from the first inch of each hole is discarded. Dry mortar and plaster should have moisture contents below about 2 per cent. At levels much above this the moisture content of incorporated timbers will exceed 20 per cent and may easily reach levels at which fungal decay is likely

6 OTHER TECHNIQUES

Other techniques that may be used include microscopy, laboratory culture, hot wire anemometry electronic RH measurement, microwave moisture metres, pole cameras, drone aerial photography, pheromone insect traps, infra-red thermography, building monitoring by data loggers and more

© Copyright Hutton+Rostron, 2024

Appendix C

© Copyright Hutton+Rostron, 2024

REMEDIAL BUILDING WORKS AND ENVIRONMENTAL CONTROL

1 The most critical factors for the environmental control of decay organisms are available moisture and temperature. The former is dependent on such factors as moisture content, relative humidity, micro-ventilation, and salt content. In simplistic terms it is necessary to correct building defects leading to high moisture contents in timber and to increase ventilation around timber at risk

2 In practice there are two problems; first it is necessary to identify the significant building defects and then the best techniques must be chosen to control the environment at each point. This may be achieved by analysing the building in terms of moisture sources, moisture reservoirs and moisture sinks

3 It is not possible to prevent moisture entering a building entirely and often attempts to block the movement of moisture through a building structure using impermeable materials are ineffective. They may also be counter-productive as they can prevent moisture being dissipated, resulting in high moisture levels and decay in adjacent materials. The more effective and robust approach is that used in traditional buildings. Here, porous materials are preferred, and every moisture source is balanced by a moisture sink. Thus ground water may penetrate masonry but is evaporated off before it reaches timber structures. Similarly, water vapour is introduced by occupation, but is ventilated out via windows, chimneys and other passive and active forms of ventilation. Failure to balance a moisture source with an appropriate sink may result in moisture moving into vulnerable materials and eventually causing decay and other problems

4 Moisture reservoirs occur when a moisture 'source' has not been balanced by a 'sink' and water has accumulated in a porous material. Typical examples of this are to be found when thick masonry walls have been soaked by persistent leaks or when chimney breasts have been filled with rain water from uncapped chimneys. Such reservoirs may take years to dry out, even when the source has been dealt with. As a result, they can act as a source of moisture for recurrent timber decay over a long period. A special case of this phenomenon occurs when large quantities of water have been used in fighting a fire

5 In practice then, each area of decay is associated with a building defect, resulting in an increased moisture source, a blocked or inappropriate moisture sink or a moisture reservoir. The appropriate building measures should then be specified to correct that defect

6 A common example might be the bridging of a damp proof course by raised ground levels. This will act as a moisture source and may result in decay of timbers in an adjacent floor space. Reducing the ground level will cut off this source and will also provide a sink of moisture by allowing evaporation from the exposed wall. The sub-floor moisture level might also be controlled by increasing the other available moisture sinks. Cleaning pre-existing airbricks or inserting additional sub-floor ventilation would be a common measure. In general, it is important to increase evaporative surfaces and avoid obstructing them during refurbishment

7 Another common example would be a blocked and overflowing parapet gutter acting as a moisture source. This could wet up gutter soles, joist ends and wall plates as well as any other structure in an expanding cone extending from the leak down through the building. Preventing this moisture source may require a number of measures such as increasing the capacity of down pipes, re-lining the gutters and fitting thermostatically controlled trace heating tape to increase free flow of snow melt water

© Copyright Hutton+Rostron, 2024

8 Any failure in a roof finish, gutter or coping will generally result in significant water penetration into the masonry wall beneath, which will then act as a moisture reservoir. Any timber in contact with this reservoir will be at risk of decay as it will tend to 'wick' moisture from the masonry. Steps must therefore be taken to isolate in-contact timber from the masonry using such measures as DPC membranes or joist hangers producing an air gap. It will also be necessary to ensure the timbers are adequately ventilated so that any moisture that is absorbed can be breathed off. Closed cavities or water-impermeable layers over timbers at risk must therefore be carefully searched out and rectified using knowledge of historic methods of construction. Bricked-in lintels and sealed up emulsion-painted sash windows are typical examples of structures at risk in this way

9 Having cut off the moisture source to a moisture reservoir and protected the 'at-risk' timbers it is next necessary to provide safe 'sinks' for the moisture. This will ensure that the reservoir is dried out in the long term. In some cases, the reservoir can be removed entirely, for example damp pugging can be dug out and replaced. In most cases it is a matter of promoting ventilation around a wicking surface on the reservoir and ensuring that the moisture-laden air can be vented to the outside. Dry lining systems can be useful for this purpose as can the good old-fashioned chimney. Raising the temperature will promote the process of wicking and evaporation. General house heating can help but care must be taken to ensure that water vapour is not being 'pulsed' into other parts of the building by a sequence of evaporation and condensation down a temperature gradient. Heating can be especially useful if it is possible to heat the reservoir material itself. We have devised special systems for heating large section timbers and masonry for this purpose but again the old-fashioned fire-place and chimney is very useful

10 In some cases, dehumidifiers can be used in the short to medium term, but care must be taken. They often require special 'tenting' and monitoring so that moisture is removed from the appropriate material and not from the world at large. They also require high air temperatures and high RH's to extract moisture efficiently

11 In all cases most of the remedial building works that may be required are quite within the capacity of the general contractor. Most are traditional repairs though some may take advantage of new materials or techniques such as dry lining, joist hangers and tanking. New and potentially useful products are coming into the building market all the time, for example, time controlled automatic fans, hollow ventilating plastic skirting boards, plastic masonry drains, roof space ventilating systems and moisture permeable paints. All such products and techniques can be used to help in making the environmental control of timber decay even more efficient and economical. All that is required is careful analysis of each situation and a little scientific understanding

© Copyright Hutton+Rostron, 2024

Appendix D

© Copyright Hutton+Rostron, 2024

MAINTENANCE AND MONITORING AFTER REFURBISHMENT

1 The investigation and building works should put a building back into a state of structural and environmental health. The environmental control approach will also mean that a building is less likely to develop problems in the future. This is because the effect of minor building failures should be 'buffered' by the robustness of the systems established. Fortunately, most traditional systems are robust in this way. This is why older buildings may tolerate a considerable amount of neglect and abuse before developing severe problems. However, the long-term health of the building will always depend on adequate maintenance. This is no less true of buildings treated with timber preservatives

2 Detailed investigation carried out as part of an environmental control policy provides an excellent basis on which to plan the most cost-effective maintenance program. Indeed, the building works required for environmental control are often best integrated into such a program. Short-term 'emergency' measures can be taken to simply halt further decay and measures to replace damaged structures or prevent future problems can be delayed to fit into a longer term plan of works. This flexibility in scheduling work as a result of the environmental approach allows further saving of costs and inconvenience

3 A maintenance program must also include provision for the routine inspection of all significant parts of the building at appropriate intervals. This should aim to detect and correct problems developing before they cause significant damage. Again the information gained in the investigation can be used to decide on the most cost effective inspection interval

4 Remote monitoring systems can be useful in increasing the efficiency and reducing the cost of maintenance programs. They can be especially useful for checking the moisture content of inaccessible timbers in roof spaces, behind decorative finishes and in walls. H+R have developed the Curator building monitoring systems for this proposal

5 Sensors can be placed at all critical points after the investigation or after the remedial building works. Areas can then be closed up and finishes re-applied, for example sensors may be placed in lintels, joist ends, valley gutter soles or in damp walls to monitor drying. It is important to use enough sensors and to place them with an understanding of the moisture distribution processes because conditions can vary even in a small area. It is these local variations in conditions that produce the environmental niches which decay organisms exploit

6 If more than 30 sensors are deployed, taking the readings can become onerous and this may result in human error or negligence. In these situations automatic monitoring systems become desirable. H+R have developed a number of specialised 'Curator' data logging systems to do this. With larger systems, the wiring of sensors can also become a problem. For systems requiring 100 or more sensors we can use a 'Curator A' unit working via a single 4-core main cable connecting up any number of nodes, each supporting 4 sensors. This system can be programmed with logging intervals and alarm limits for each sensor and can be read via the telephone system via its own modem. Data from the system can then be analysed using CAD and programs for statistical interpretation on a remote computer

© Copyright Hutton+Rostron, 2024

Appendix E

© Copyright Hutton+Rostron, 2024

HEALTH AND SAFETY RISK ASSESSMENT

HAZARD: Irritant dusts

Risk:	disturbance of building material or debris by exposure works, cutting, drilling etc could produce airborne dusts which may be irritant to the skin, eyes, nose and respiratory system, and may be a health hazard if breathed in by workers or others in the area; particular hazards include the disturbance of mineral/glass fibre insulation and/or chemically contaminated dust (resulting from remedial timber treatments) in roof spaces or other voids, the disturbance of materials containing asbestos, especially in boiler rooms, flues and pipework installations and the disturbance or removal of faeces deposited by birds or animals
Reduce risk by:	carrying out a COSHH assessment (the duty of the employer under the COSHH regulations) to determine the health risks and necessary measures to protect employees and others. This may include: correct identification of building materials, if possible before works commence (this may require research into record drawings/specifications for previous building refurbishments/repairs/refits; contacting HSE if the presence of asbestos is suspected; avoiding disturbance of hazardous materials; containment of dust within localised areas of the building by creating dust-proof envelopes; ventilation of working areas (may need to be mechanical and may need filtration for the retention of hazardous particulates); provision by employer and use by the operatives of personal protective clothing, goggles and breathing apparatus/masks suitable for the particular type of dust

HAZARD: Working in confined spaces

Risk:	there may be a build-up of toxic gases (e.g. from chemical remedial treatments or from site contamination) or a depletion of oxygen in the atmosphere of a confined space; restricted working space may be awkward and lead to injuries; escape may be difficult, causing overexposure to adverse conditions or delay to medical treatment; communication with persons outside the confined space may be difficult

© Copyright Hutton+Rostron, 2024

Reduce risk by:	testing the atmosphere for toxic gases and if present, carrying out a COSHH assessment; providing a supply of fresh air into a confined space, if necessary; ensuring that work only proceeds with at least two persons - at no time should a person work alone in a confined space; ensuring that there are emergency procedures in place before work commences, for rescue from confined spaces

HAZARD: Collapse: renewal of lintels and beams

Risk:	improperly sequenced works during the renewal of decayed roof trusses, rafters, joists or lintels could lead to collapse of structure causing injury to workers or others
Reduce risk by:	specifying a correct sequence of propping, removal and replacement of structural members to maintain stability during refurbishment

HAZARD: Collapse: dangerous structures

Risk:	unstable structures which are the result of decay, fire damage, impact damage or partial demolition, could collapse causing injury to workers or others
Reduce risk by:	shoring up the structure to ensure its overall stability and prevent loose parts falling off; demolition of parts of an unstable structure which are not to be retained, but only if they are not of historical value and only with instruction from the Supervising Officer. Unstable structures should be made inaccessible to workers and others by means of barricades and warning notices until they have been stabilised/demolished. Barriers to comply with BS 6180:1995 Code of Practice for barriers in and about buildings

HAZARD: Electricity

Risk:	of electrocution by cutting through electric cables
Reduce risk by:	locating cables before excavation work or cutting into or drilling the existing building fabric, using a cable locator and cable plans, marking their position and taking precautions to avoid contact with them; supplying all portable tools and equipment with 110v transformers, not 240v; ensuring proper connections to equipment. All temporary electricity installations for construction sites should comply with BS 7375:1996

© Copyright Hutton+Rostron, 2024

HAZARD: Falls from height (over 2 metres): scaffolding

Risk:	undertaking inspections or carrying out work from inadequately designed or erected scaffolding could cause persons to fall or injure themselves or others below
Reduce risk by:	use of properly designed and erected scaffold with adequate access; baseplates to uprights; adequate ledgers, braces, struts, ties; fully boarded platforms; guard rails and toe boards to prevent falls of more than 2 metres; frequent inspections of scaffold. Also personal protection such as safety harness and safety line. Scaffolding to comply with BS 5973:1993 Code of Practice for access and working scaffolds etc

HAZARD: Falls from height (over 2 metres): ladders

Risk:	undertaking inspections or carrying out work from improperly positioned or inadequately secured ladders could cause persons to fall or injure themselves or others below
Reduce risk by:	use of properly positioned ladders secured at the top, and which project at least 1.07 metres above any landing

HAZARD: Falls from height (over 2 metres): flat roof

Risk:	inadequate edge protection can allow persons to fall off the edge of a flat roof or through openings or fragile roof coverings
Reduce risk by:	installation of edge protection such as guard rails around the perimeter of flat roofs, and around openings or areas of fragile roof coverings within flat roofs; providing safe walkways, platforms, travelling gantries across fragile roofs. Barriers to comply with BS 6180:1995 Code of Practice for barriers in and about buildings

HAZARD: General

Risk:	general accidents in the course of work such as cuts, impacts, muscular strains etc
Reduce risk by:	providing first aid facilities; providing welfare facilities; providing personal protective equipment and ensuring that the workers use it; ensuring adequate lighting of all access areas and work areas; ensuring that emergency procedures are in place prior to site work commencing

© Copyright Hutton+Rostron, 2024

Appendix F

© Copyright Hutton+Rostron, 2024

Fig 1:

East elevation; showing a general view to the principal front façade. Note general spread or dry rot ‘zone’ identified as a cone emanating from roof level and widening substantially down towards ground level

Fig 2:

Roof structures; showing a general internal view looking towards the east pitch. Note the majority of historic plaster linings remaining

37 North Road, N6
Photographs
01 November 2024
Not to scale

 © Copyright Hutton+Rostron 2024

Fig 3:

Roof structures, east pitch; showing structural decay to the rafter plate for almost its entire length at ~4m as well as 1no. common rafter for ~250mm to its bearing end. All structurally decayed items identified on-site via water soluble red spray paint

Fig 4:

Roof structures, east pitch; showing structural decay to the south-east corner including to the corner tie, the hip rafter for ~400mm and to the south rafter plate return for ~2m

 © Copyright Hutton+Rostron 2024

Fig 5:

Roof structures; showing a general internal view looking towards the west pitch. Note limited access to roof structures at the time of survey

Fig 6:

Roof structures, west pitch; showing structural decay to the rafter plate for ~2m as well as 1no. common rafter for ~100mm to its bearing end only. All structurally decayed items identified on -site via water soluble red spray paint

 © Copyright Hutton+Rostron 2024

Fig 7:

Roof structures, south catslide; showing severe structural decay to the majority of timber components to the south-east corner, including the east rafter plate, 5no. Jack rafters and the south rafter plate (for its full length extending beyond this image. See fig.8)

Fig 8:

Roof structures, south catslide; showing continuance of structural decay to the south rafter plate for its full length (although access limited to the west end due to remaining plaster finishes). Also, decay detected to ~5no. Common rafters

 © Copyright Hutton+Rostron 2024

Fig 9:

Second (attic) floor; showing structural decay, as well as excessive service notching to 2no. West perimeter floor joists. Also note no visible access to the embedded wall plate beneath but this was deep resistance drilled and subject to structural decay at ~2m (indicated via red line)

Fig 10:

Second (attic) floor; showing a further view along the west perimeter wall where structural decay was detected to 5no. Embedded floor joists as well as 2m of wall plate

 © Copyright Hutton+Rostron 2024

Fig 11:

Second (attic) floor; showing what appeared to be an asbestos containing material (ACM) debris within the ashlar roof void

Fig 12:

Second (attic) floor; showing a general view towards the east perimeter wall. Note all historic floor joists had been previously remedially cut short and partnered with new softwood members which were improperly embedded into the masonry. Partners were deep drilled and moisture probed. No decay detected although historic underlying plate subject to total structural decay. See fig.13

 © Copyright Hutton+Rostron 2024

Fig 13:

Second (attic) floor; showing a general view towards the east perimeter wall from first floor level. Note total structural decay detected to the historic embedded wall plate

Fig 14:

Second (attic) floor; showing a view towards the west perimeter wall. Structural decay detected to 5no. floor joists and up to ~2m of wall plate (see also fig10). Also note structural decay detected to the window timber lintels south bearing end

 © Copyright Hutton+Rostron 2024

Fig 15:

First floor; showing structural decay to the internal lintel between the principal east room and the south passageway (embedded timber grounds also decayed). Also total decay to the 1no. perimeter ceiling joist above

Fig 16:

First floor; showing representative decay to timber grounds forming fixing locations for windows and doors within the designated dry rot zones

 © Copyright Hutton+Rostron 2024

Fig 17:

First floor, east room; showing non-structural decay issues to the historic window joinery in contact to the south dry rot affected masonry. Lintel over of solid construction

Fig 18:

First floor, east room; showing approximate area of structurally unsound floor structures marked on-site with water soluble spray paint. Allow for cordoning off and propping from beneath

 © Copyright Hutton+Rostron 2024

Fig 19:

First floor, east room; showing active dry rot mycelium decay to embedded east perimeter floor joists

Fig 20:

First floor, east room; showing structural decay to most timber elements in contact to the dry rot infected east elevation masonry. Including the double timber lintel build-up beneath (over the ground floor window) which also served as a wall/ joist plate to first floor structures

 © Copyright Hutton+Rostron 2024

Fig 21:

First floor, east room; showing active dry rot fungus to embedded east perimeter floor joists sat directly over the ground floor lintel

Fig 22:

First floor, south passage; showing a view looking east. Note total decay to all timbers in contact to the historically dry rot infected masonry, including the total wall plate and 4no. joists

 © Copyright Hutton+Rostron 2024

Fig 23:

First floor, south passage; showing decay detected to the south perimeter floor joist, presumably due to a lack of a ventilated air gap between it and the party masonry wall

Fig 24:

First floor, stairs; showing structural decay to most stair elements in contact to the west and south perimeter walls. Including stair treads, outside string, landing floorboards and landing beams/joists

 © Copyright Hutton+Rostron 2024

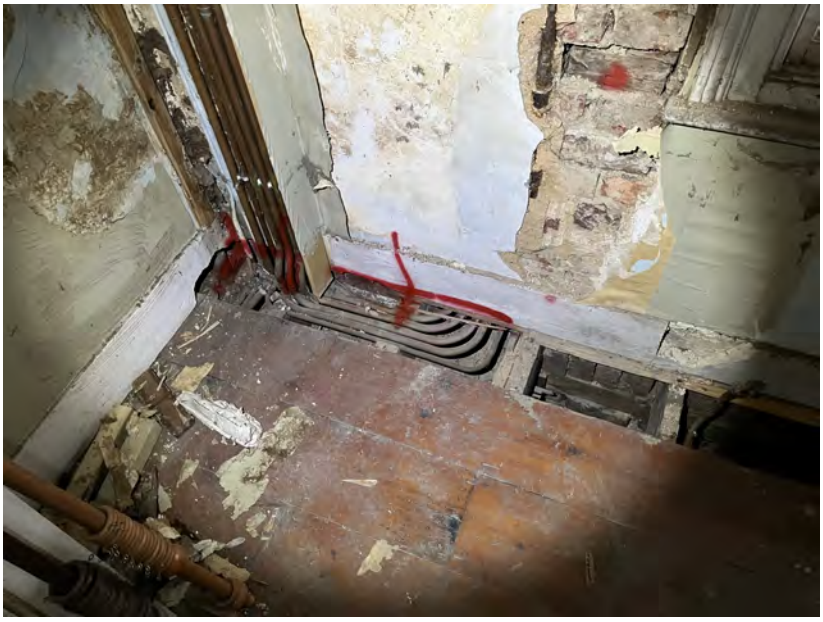


Fig 25:

First floor, west room; showing historic structural dry rot decay to structures in contact to the south-west corner. Including the wall plate at ~1m and 3no. floor joists

Fig 26:

First floor, W/C mezzanine; showing complete structural decay/loss to the timber lintel between the W/C and the stair landing. Allow for expedient remedial shoring

 © Copyright Hutton+Rostron 2024

Fig 27:

First floor, W/C mezzanine; showing comprehensive structural decay to floor joists in contact to the south perimeter wall

Fig 28:

First floor, W/C mezzanine; showing south perimeter wall plate partially visible and subject to decay (presumably for its entire length– TBC)

 © Copyright Hutton+Rostron 2024

Fig 29:

W/C mezzanine flat roof; showing structural decay to 2no. Flat roof joists in contact to the south perimeter wall. Limited access to remaining flat roof joists due to collapsing floor below and remaining ceilings. Further decay presumed. No plate suspected

Fig 30:

First floor, lower flight of stairs; showing structural decay to the 2no. innermost carriage beams and local treads

 © Copyright Hutton+Rostron 2024

Fig 31:

Ground floor; showing view to the underside of the first floor stair landing. Note structural decay identified to the landing trimmer beam where it embeds into the south perimeter wall

Fig 32:

Ground floor, east room; showing structural decay to the east window lintel. Also note localised openings to wall plasters showed no evidence for embedded bonding timbers to this area

 © Copyright Hutton+Rostron 2024

Fig 33:

Ground floor, east room; showing structural decay to all accessible structural and non-structural timbers in contact to the active dry rot infected east perimeter façade masonry

Fig 34:

Ground floor, east room; showing active dry rot mycelium decay to embedded east perimeter floor joists

 © Copyright Hutton+Rostron 2024

Fig 35:

Ground floor, east room; showing further evidence for active dry rot fungus to embedded east perimeter floor joists

Fig 36:

Ground floor, stair landing; showing representative structural decay to embedded bonding timbers within the east perimeter wall. This elevation showed the only bonding timbers identified at the time of investigation

 © Copyright Hutton+Rostron 2024

Fig 37:

Ground floor, west passageway; showing severe dry rot issues to the south wall panneling. Note that the partially embedded decayed panel slats were not considered bonding timbers and therefore are not considered a structural decay issue

Fig 38:

Ground floor; showing general view to the south extension floor structures of suspended timber construction with joists spanning north-south. Limited access at time of investigation, although widespread decay issues suspected

 © Copyright Hutton+Rostron 2024

Fig 39:

Ground floor, west extension; showing a representative view of the subfloor void. Note timbers in visibly very poor state likely due to close proximity to the damp earth and without provision for a damp proof membrane/course and/or due to long term escape of water for the plumbing goods above. Widespread decay issues suspected

Fig 40:

Ground floor, west extension; showing a representative view of the subfloor void. Note timbers in visibly very poor state. Also note structurally inappropriate brickwork supporting floor joists. Widespread decay issues suspected

 © Copyright Hutton+Rostron 2024

Fig 41:

Ground floor, stairs; showing structural decay to the stair landing trimmers and 2no. joists where they embed into the west internal masonry wall

Fig 42:

Ground floor, stairs; showing no access to determine position and condition to the main east passage stair landing beams and trimmers. Allow for further exposure as per red marked areas

 © Copyright Hutton+Rostron 2024

Fig 43:

Basement, east room, showing structural decay to the window lintel

Fig 44:

Basement, west room, showing a view to the west window lintel where no decay was detected

 © Copyright Hutton+Rostron 2024

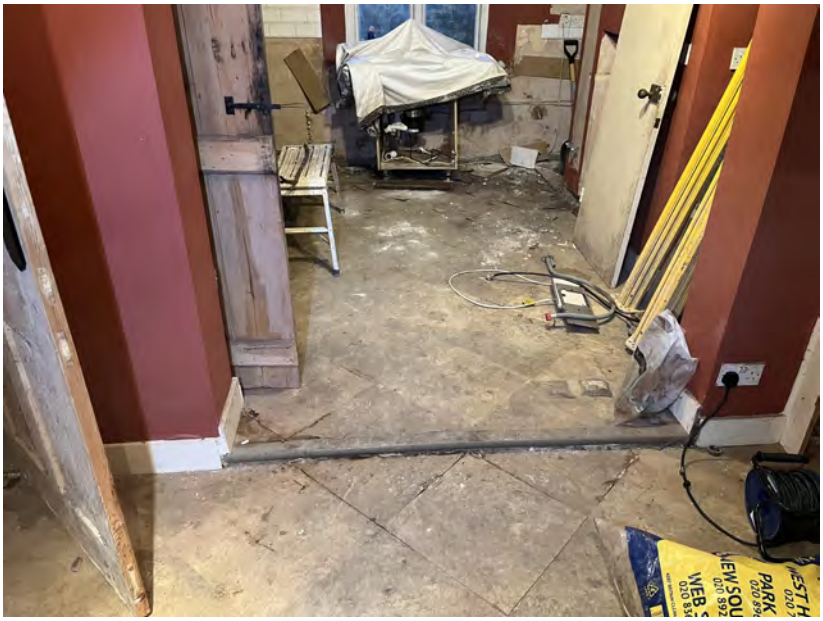


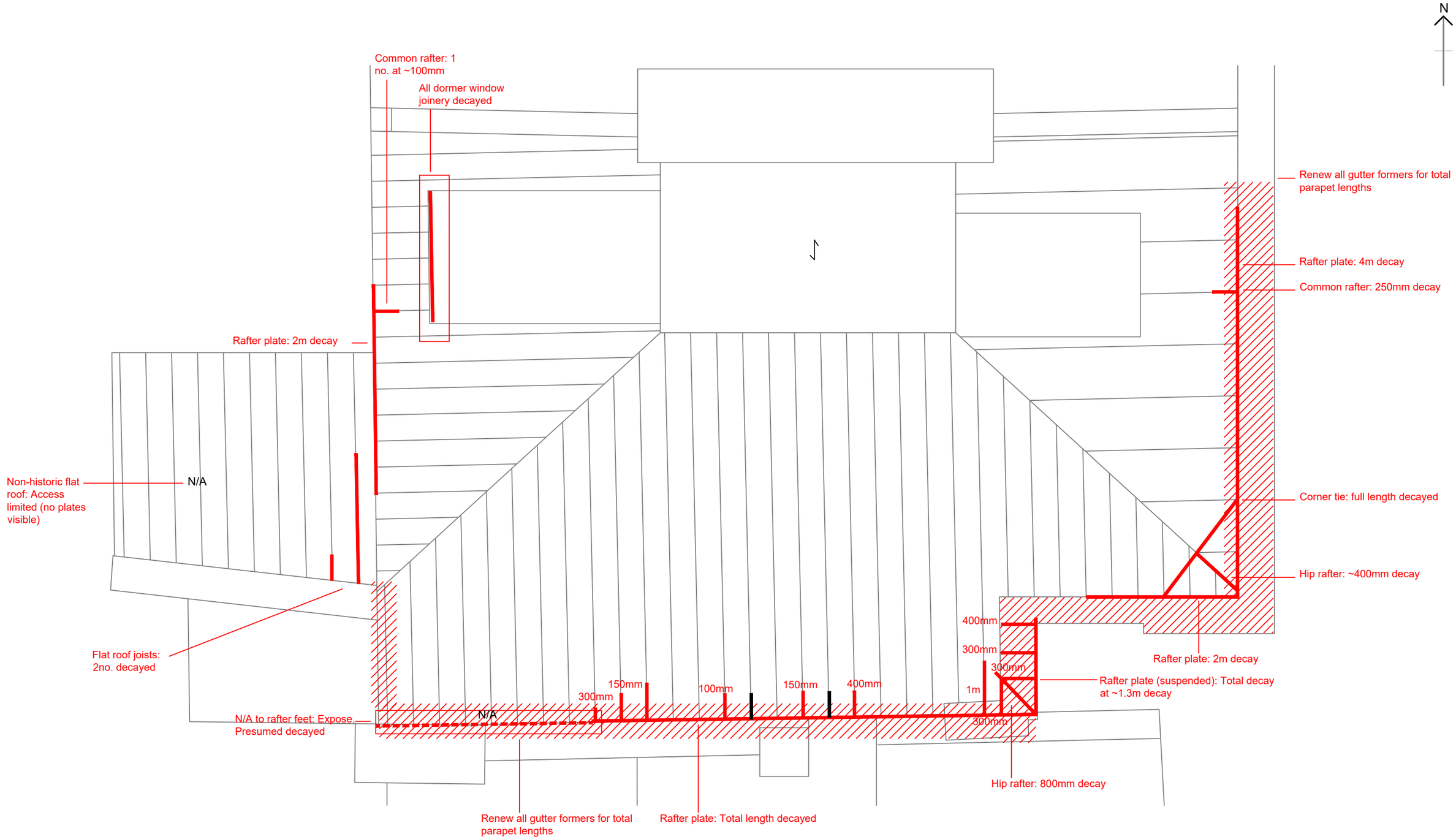
Fig 45:

Basement, central area, showing a general view to the floor structures which were of solid construction, apparently of York stone laid directly onto the earth substrate. Note a slight elevation to the west room apparently due to a poured asphalt type surface over, presumably for improved thermal performance in the past. Note historic linoleum tiles as well as any poured asphalts may contains ACMs

 © Copyright Hutton+Rostron 2024

Appendix G

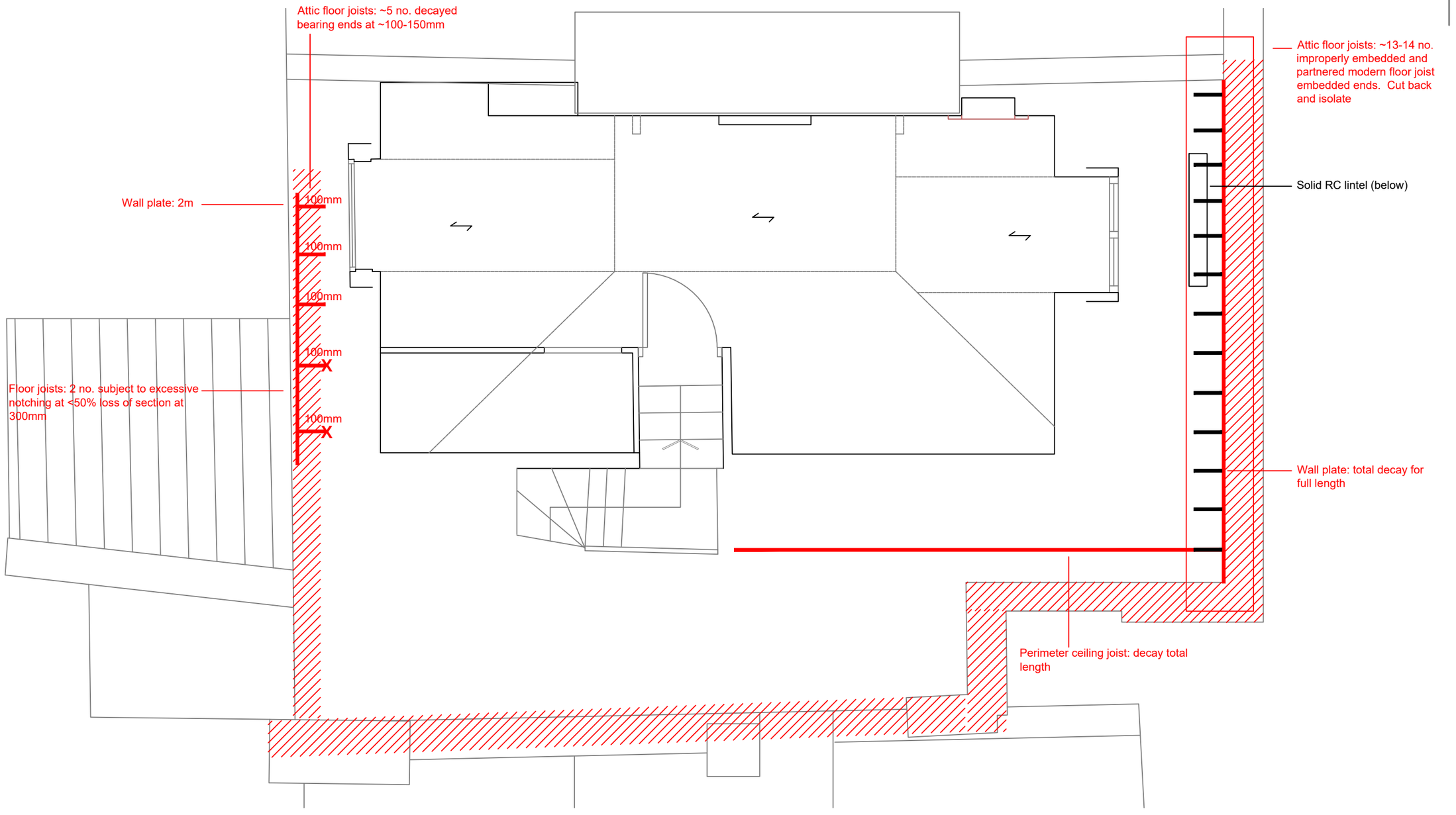
© Copyright Hutton+Rostron, 2024



37 North Road, N6 - Roof
Timber Condition Investigation
November 2024

Hutton + Rostron Environmental Investigations Ltd A SOCOTEC COMPANY
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221 Email: ei@handr.co.uk Web: www.handr.co.uk
162-58 Report -Not to scale- © Copyright Hutton+Rostron 2024

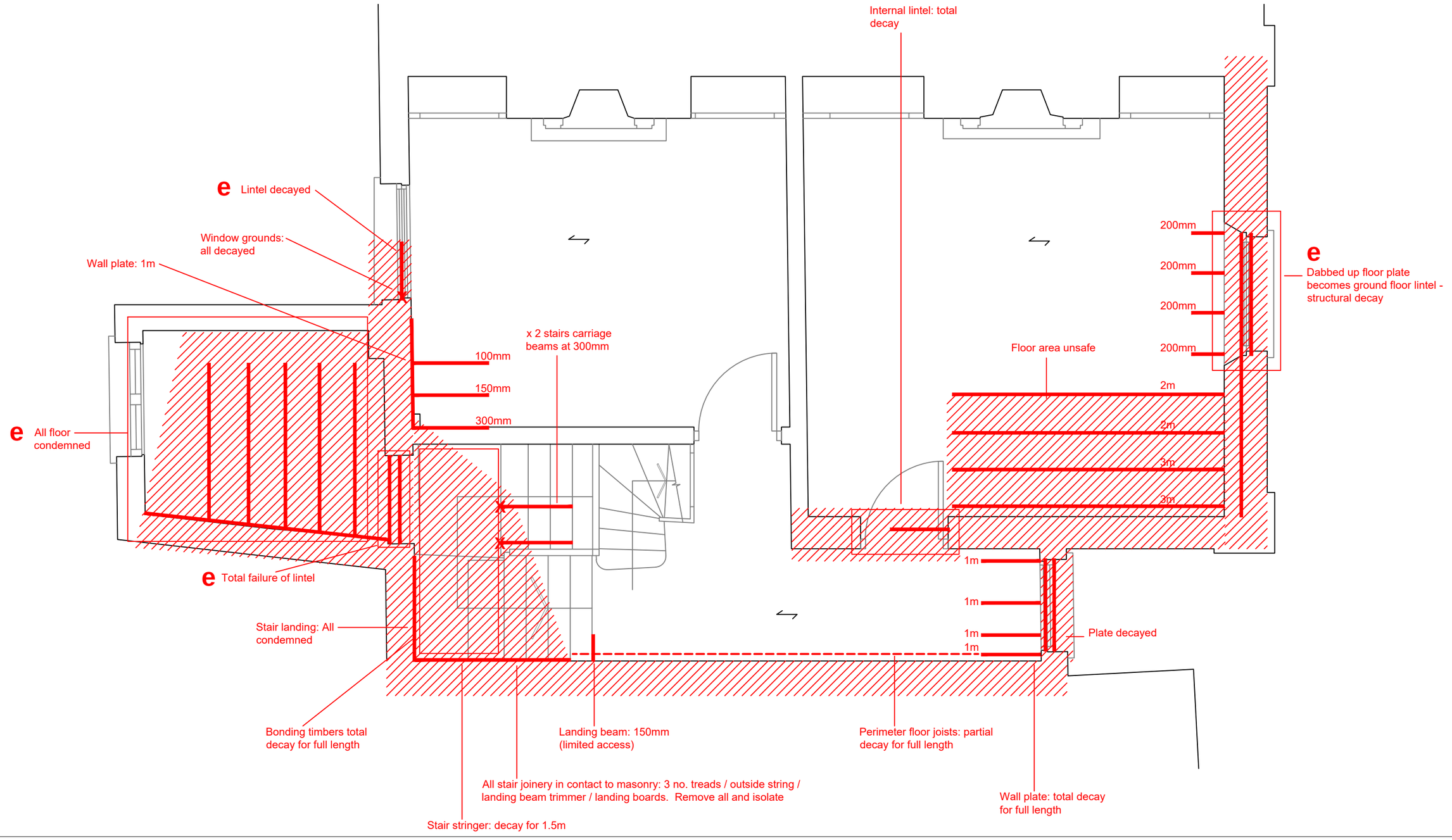
Key:
- e — Structural engineer to comment
- Area subject to dry rot infection *(Serpula lacrymans)* / timber decay
- Structurally decayed timber element
- X — Decayed bearing end of lintel / joist or beam
- N/A — Area of no access at time of survey
- Joist direction



37 North Road, N6 - Second Floor
Timber Condition Investigation
November 2024

Hutton + Rostron Environmental Investigations Ltd A SOCOTEC COMPANY
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221 Email: ei@handr.co.uk Web: www.handr.co.uk
162-58 Report -Not to scale- © Copyright Hutton+Rostron 2024

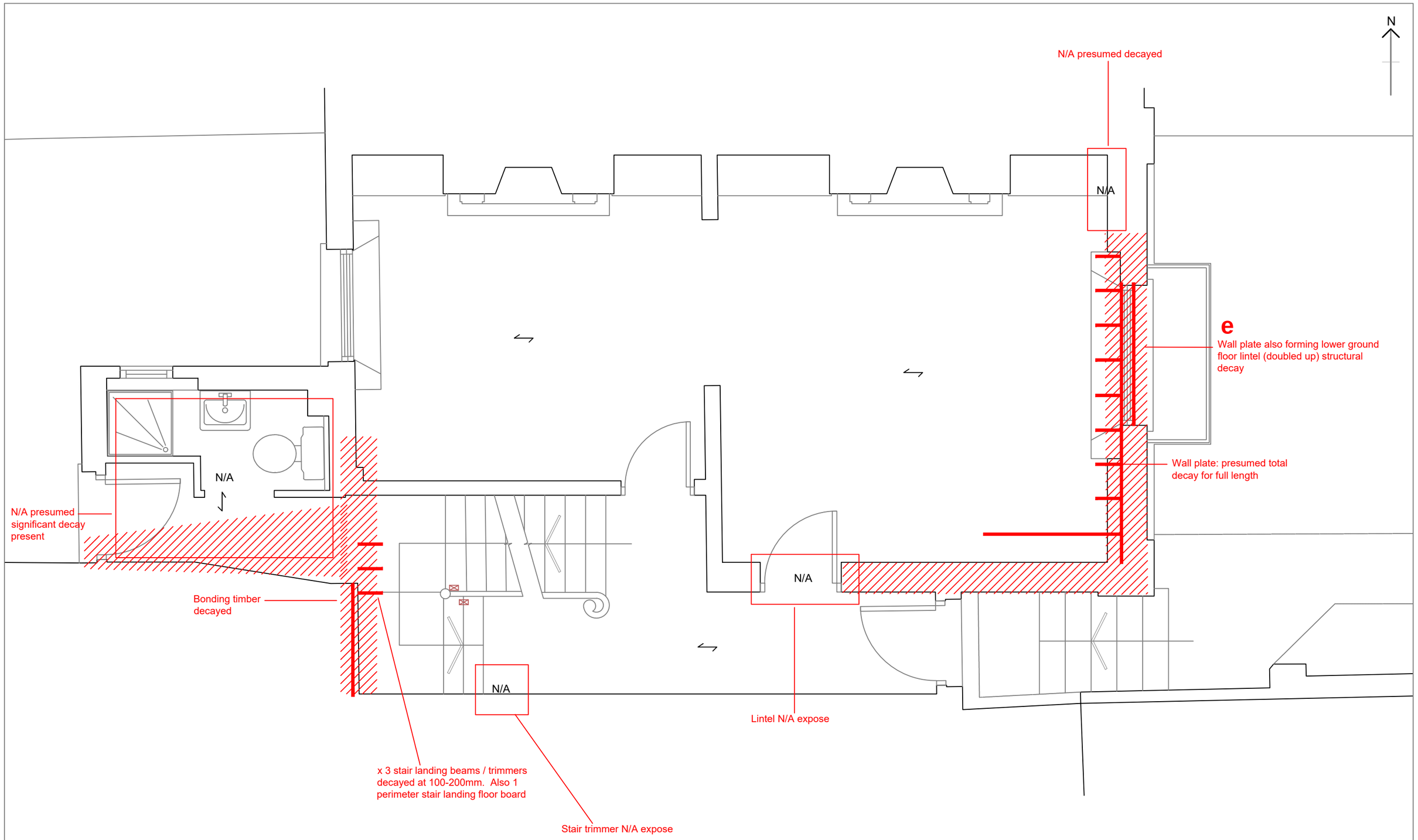
Key:
- e — Structural engineer to comment
- Area subject to dry rot infection *(Serpula lacrymans)* / timber decay
- Structurally decayed timber element
- X — Decayed bearing end of lintel / joist or beam
- N/A — Area of no access at time of survey
- Joist direction



37 North Road, N6 - First Floor
Timber Condition Investigation
November 2024

Hutton + Rostron Environmental Investigations Ltd A SOCOTEC COMPANY
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221 Email: ei@handr.co.uk Web: www.handr.co.uk
162-58 Report -Not to scale- © Copyright Hutton+Rostron 2024

Key:
- e — Structural engineer to comment
- Area subject to dry rot infection *(Serpula lacrymans)* / timber decay
- Structurally decayed timber element
- X — Decayed bearing end of lintel / joist or beam
- N/A — Area of no access at time of survey
- Joist direction



37 North Road, N6 - Ground Floor
Timber Condition Investigation
November 2024

Hutton + Rostron Environmental Investigations Ltd A SOCOTEC COMPANY
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221 Email: ei@handr.co.uk Web: www.handr.co.uk
162-58 Report -Not to scale- © Copyright Hutton+Rostron 2024

Key:
- **e** Structural engineer to comment
- Area subject to dry rot infection *(Serpula lacrymans)* / timber decay
- Structurally decayed timber element
- **X** Decayed bearing end of lintel / joist or beam
- N/A Area of no access at time of survey
- Joist direction

N

e
Lintel also forming ground floor joist plate (doubled up) structurally decay

x 3 stair landing beams / trimmers decayed at 100-200mm. Also 1 perimeter stair landing floor board

37 North Road, N6 - Lower Ground Floor
Timber Condition Investigation
November 2024

Hutton + Rostron Environmental Investigations Ltd A SOCOTEC COMPANY
Netley House, Gomshall, Surrey, GU5 9QA Tel: 01483 203221 Email: ei@handr.co.uk Web: www.handr.co.uk
162-58 Report -Not to scale- © Copyright Hutton+Rostron 2024

Key:
- e — Structural engineer to comment
- Area subject to dry rot infection *(Serpula lacrymans)* / timber decay
- Structurally decayed timber element
- X — Decayed bearing end of lintel / joist or beam
- N/A — Area of no access at time of survey
- Joist direction