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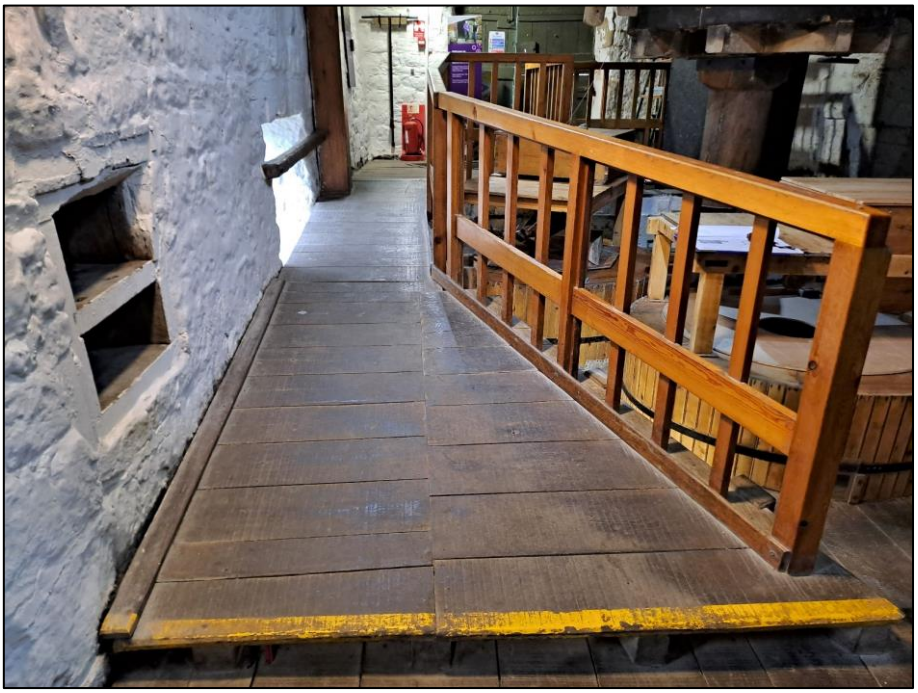

WORSBROUGH WATER MILL
BARNSLEY
STRUCTURAL APPRAISAL REPORT

Commissioned by Donald Insall Associates
on behalf of Barnsley Metropolitan Borough Council

Report 22587-Y-RP-001-R0

23 August 2024

WORSBROUGH WATER MILL
BARNSLEY
STRUCTURAL APPRAISAL REPORT

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ISSUE LOG FOR Report 22587-Y-RP-001-R0

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Issuing office Mason Clark Associates (York). Refer to final page for full office details.

1 INTRODUCTION

Mason Clark Associates (MCA) was commissioned by Donald Insall Associates on behalf of the property owner Barnsley Metropolitan Borough Council, to carry out a structural conservation inspection of an internal floor/ bridging 'ramp' which is planned to be replaced at Worsbrough Water Mill, in Worsbrough Bridge, Barnsley, South Yorkshire S70 5LJ.

Our brief was to carry out a site visit to inspect to the floor structure supporting the existing bridging ramp and provide commentary on the structural implications of the proposal to infill a section of the first floor and support a new demountable timber ramp.

Fig. 1 Aerial view of the site with inspected part of the building outlined (© 2024 Google).

Ms Susana Moreira, Structural Engineer, carried out a non-intrusive visual inspection on 07 August 2024. The weather was warm and dry.

The inspection was limited to the area of the bridging ramp at both ground and first-floor levels.

Ladder access was used to inspect a number of the supporting timber beams (that appeared to be decayed), probing them with a screwdriver to enable a qualitatively assessment of the extent of decay to be made.

Digital photographs were taken, a selection of which is included in this report.

2 DESCRIPTION AND BACKGROUND

The Worsbrough Corn Mill is Grade II* listed (nr. 1151044). Relevant extracts from the National Heritage List for England are as below:

> *Early C17 with addition of c1843. Deeply-coursed dressed sandstone, stone slate and Welsh slate roofs. C17 part on left is two storeys and three bays (internally); C19 part on right three storeys with loft, four bays.*
>
> *Interior: C17 part has early-C19 cast-iron overshot wheel driving three pairs of stones. Original king-post trusses with trenched purlins.*

The UK Flood Map for Planning shows this location to be in Flood Zone 3. This is defined as an area of high probability of flooding from rivers and the sea.

British Geological Survey mapping indicates that the local geology comprises the Pennine Middle Coal Measures Formation (Mudstone, siltstone and sandstone) with no superficial deposits recorded.

Publicly available borehole scans within 250m of the building recorded brown to grey sandstone and shale up to 4.20m depth over grey, brown shale and sandstone. The borehole closest to the reservoir recorded probably alluvium of sandy clay with gravel and sandstone fragments up to 4.20m depth over sandstone.

The existing and proposed drawings were provided by Donald Insall Associates prior to the visit. Existing ground floor plans and section are presented in Fig. 2 to 4 below with the proposed arrangements for the new demountable bridging ramp shown in Fig 5 & 6 below.

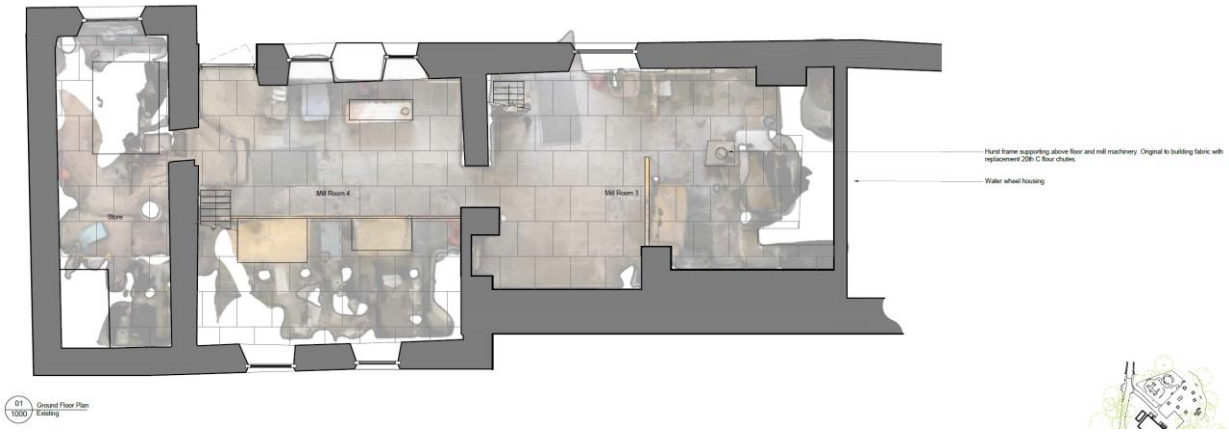


Fig. 2 Existing ground floor plan.

Fig.3 Existing first-floor plan

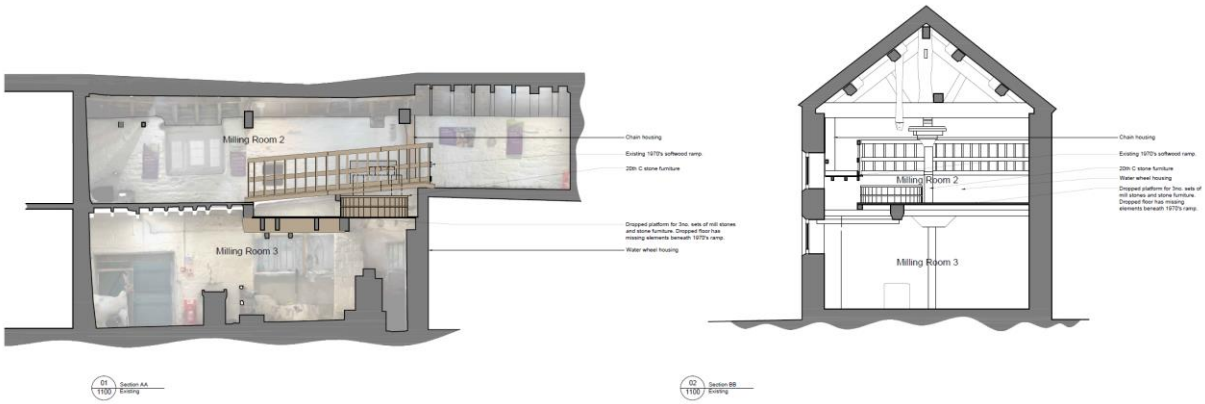


Fig. 4 Existing longitudinal and transversal section of the building.

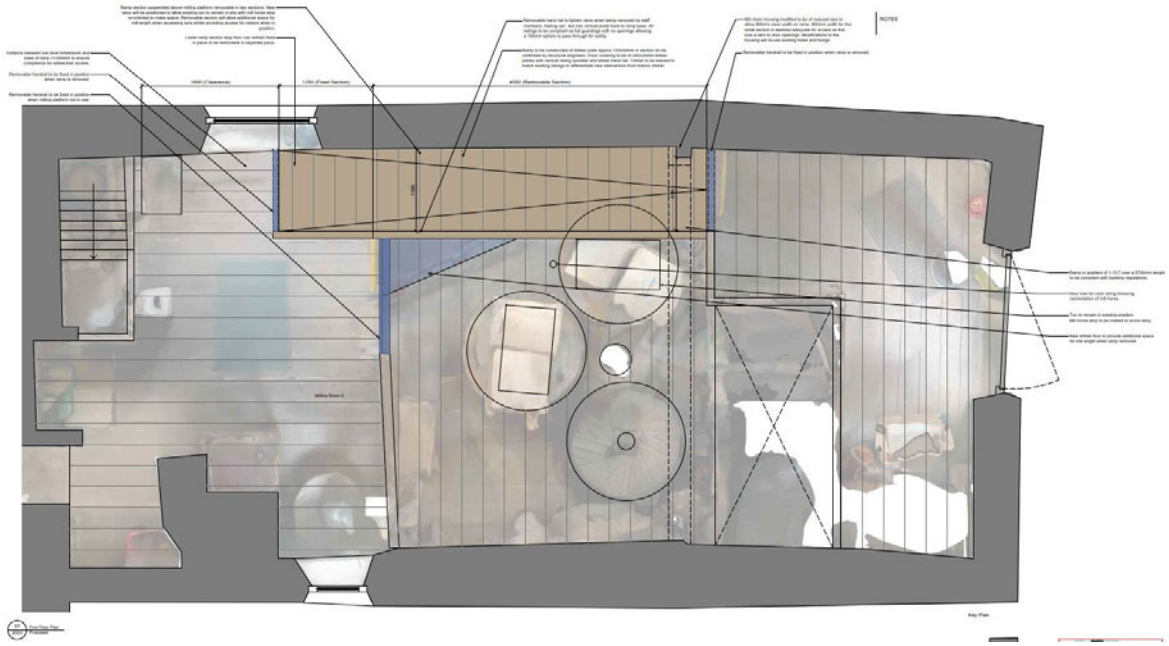


Fig. 5 Proposed first-floor plan.

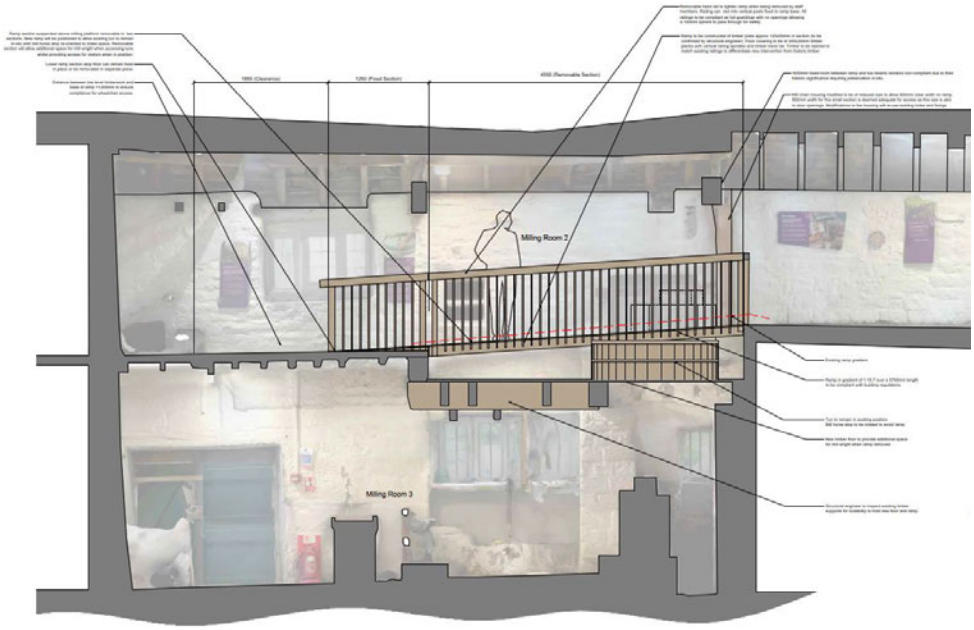


Fig. 6 Proposed longitudinal section.

3 OBSERVATIONS

Key observations and defects are noted in the photographs below. Our comments generally relate to items considered to be of significant concern relating to structural integrity only. We have not recorded every defect.

Left/right and front/rear are used relative to the specific image. For convenience and the purposes of this report, the front façade is orientated SOUTHEAST.

Where a reference to cracking in masonry construction, plasterwork or rendered finishes is made, the following descriptive classification is based on the English Heritage EHS Condition Survey Standard 2023.

Negligible / hairline	*crack up to 0.1mm.*
Very slight / fine	*cracks up to 1mm.*
Slight	*cracks up to 5mm.*
Moderate	*cracks from 5 to 15mm (or several of e.g. 3mm).*
Severe	*cracks from 15 to 25mm.*
Very severe	*cracks over 25mm.*

Note that the severity and consequences of any cracking must be assessed on a case-by-case basis considering the form of construction, together with the history of movement and past repairs or alterations to the building.

Where tilt readings taken with a spirit level are indicated these are recorded for example as +1.9°, ie leaning outwards (positive) by 1.9 degrees of the angle at the location where the level was placed. The accuracy of these readings will be affected by rough surfaces, and they only provide an approximate indication of verticality or level at a specific point.

Where the term “plumb” has been used, this is generally used in this report to mean close to vertical, as estimated by visual observation only.

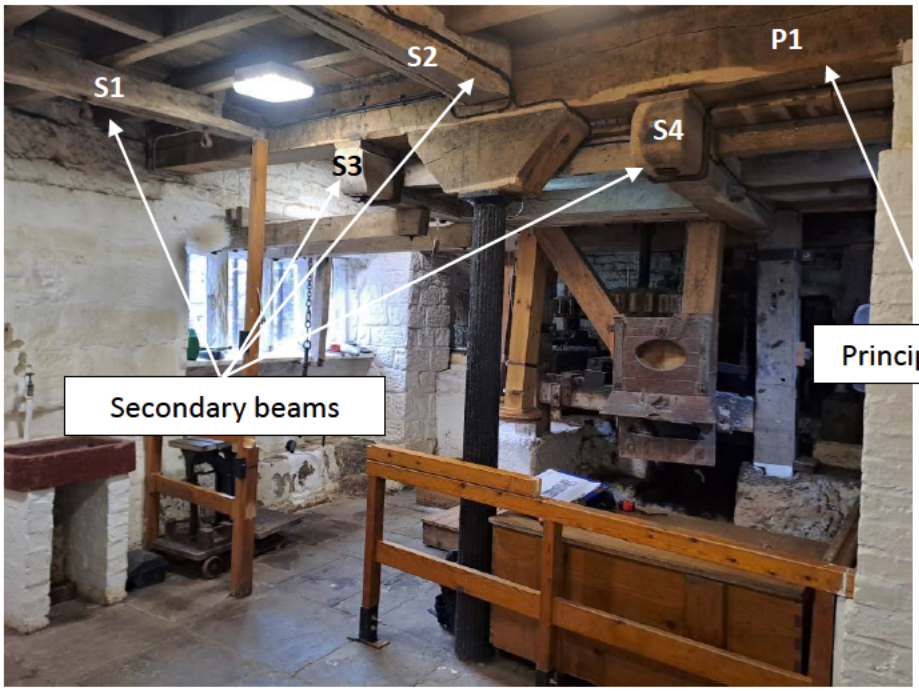
In some locations a “heel-drop” test has been carried out with the engineer dropping their full weight onto their heels to judge the response of a floor structure to dynamic loading. A “lively” response indicates more movement or vibration experienced than would be anticipated for a floor of normal robust construction assuming similar materials (eg timber joists). This may indicate a defective or under-sized floor structure. Note this is a subjective test, and we would recommend further assessment and possibly targeted intrusive inspections prior to specifying any detailed interventions to strengthen or repair the floor.

Interior

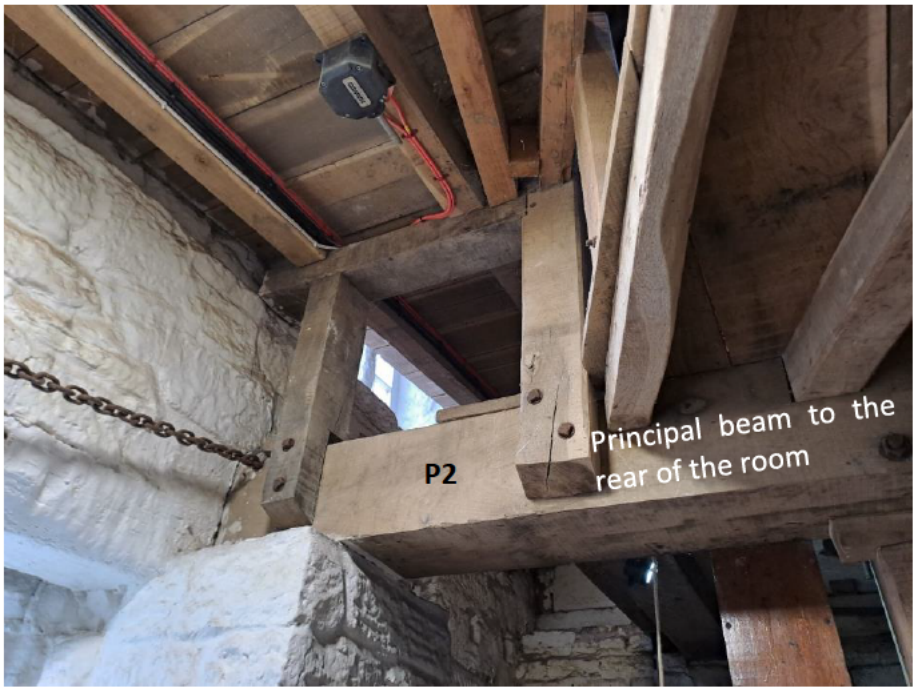
1 First-floor level - Milling Room 2. View of the existing ramp from the northwest side. Difference in level between the ramp and the floor. Handrail loose especially in the first 1.5m from the east access.

2 First-floor level - Milling Room 2. Proposed area of new timber floor. Existing timber elements, generally in good condition.

3 First-floor level - Milling Room 2. Underside of existing ramp. Timbers generally in good condition.



4 Ground-floor level - Milling Room 3. Area under the existing ramp and first floor where the mill stones and stone furniture is located. Timbers generally in good condition. Cast iron column supporting the one of the principal timber beams. Principal timber beam supporting all secondary timber beams.



5 Ground-floor level - Milling Room 3. Timber posts supporting the ramp and connected to principal beam at the rear. Timbers generally in good condition. Minor corrosion to fixings. In average 17% relative humidity.

6 Ground-floor level - Milling Room 3. View of upper floor timber support beam S5.

7 Ground-floor level, Milling Room 3. Minor deflection to existing secondary timber beam. Minor corrosion to metallic fixings on both ends of the beam. Splits to the underside of the beam. In average 17% relative humidity.

8 Ground-floor level, Milling Room 3. Splits to the underside of the beam. Surface decay to bearings of timber joists on the wall. In average 17% relative humidity.

9 Ground-floor level, Milling Room 3. Surface corrosion to metallic connection between principal and secondary beam that can receive the new floor joists. Timber elements generally in good condition.

4 DISCUSSION & CONCLUSIONS

Existing timbers are generally in good condition and most of this timber can be repurpose for the new ramp.

There is a significant number of timber elements to the underside of the first-floor ramp and floor. Photos 4 to 9 show the existing arrangement formed of principal (P) and secondary (S) beams. These beams are connected between themselves with a series of cross beams. In most cases, connections between timber members were achieved with metallic fixings, which evidence surface corrosion.

The principal beams have an approximate section of 240x300mm, and they appear to bear directly on the external masonry walls. Principal beam P1 has an intermediate support formed by a cast iron column, which does not have evident cracks.

Secondary beams S3 and S4 have an approximate section of 250x250mm, and they transfer the loads to the principal beams through metallic straps and bolts. Secondary beam S5 wasn't measured due to limited access, but it is orientated on its minor axis.

Secondary beams S3 and S5 could support the new timber joists that will fill the area below the new demountable ramp. Currently, they already support the floor and ramp at first floor level. The additional loads resulting from the proposed improvements would be mostly due to the new area of floor. Therefore, we consider the increase in loads wouldn't be significant considering that the new structure is also in timber.

Secondary beam S1 has a minor deflection and is orientated along its minor axis. Its approximate section is 175x150mm. The floor joists in this area to the south of beam S1 are approximately 90x100mm at 460mm centres and to the north are 75x115mm at 420mm centres. A small part of the ramp will extend over these existing joists and beam, which will bring a small increase in permanent load. A number of joists on the north side of the floor has surface decay close to the bearings possibly from damp in the external wall.

The existing timber guardrail is loose, particularly in the first 1.5m from the east access. The timber elements of the existing guardrail can most likely be reused for the new guardrail, if suitable for the architectural design, but connections should strengthened. The proposed guardrail must be designed to comply with horizontal loads proposed in current codes.

A preliminary assessment based on an estimation of the proposed permanent loads and an imposed load of 300kg/m2 shows that most timber beams would comply with current code limits for bending resistance and deflection, except for beam S1 and S5.

5 RECOMMENDATIONS

All proposed alterations and modification to the floor structure within the Mill should be discussed with the Local Conservation Officer fully and necessary Listed Building Consent obtained.

5.1 Further investigations and monitoring

We recommend that the following list of further investigations and monitoring are carried out.

5.1.1 Careful additional investigations (including intrusive works) are likely to include:

i. Carry out a dimensional survey of the first and ground floor areas (Milling Rooms 2 and 3).

ii. Measure the sizes of all secondary beams and cross beams that comprise the first-floor structure (noting that some of these beams have already measured).

5.1.2 On-going monitoring should include:

No monitoring required at this stage.

5.2 Urgent remedial works

No emergency stabilization is required.

5.3 Proposed Interventions are likely to comprise:

The following is a summary of the likely structural interventions that we consider will be required to alter and adapt the current bridging ramp arrangement. The specification and extent of these works is subject to further investigations and design assessment:

i. Strengthening of beams S1 & S5 with side-by-side timbers or stainless-steel/steel plates

ii. Replacement/strengthening of decayed joists.

iii. Installation of timber joists to new area of floor. The floor to span between existing secondary timber beams and the northeast wall.

iv. Surface cleaning and application of protective coating to existing metallic straps and fixings.

Signed on behalf of Mason Clark Associates Ltd:

Report authored by

Susana Moreira *PhD*
Structural Engineer

Reviewed by

Richard Pauw *BSc (Hons) CEng MICE*
Associate Director

6 LIMITATIONS

6.1 Our inspection and report are concerned with the structural aspects of the building such as foundations, walls, and floors. We have not concerned ourselves with the condition of items such as doors, windows, and other fittings; or items such as timber infestation / decay, dampness, and testing of services to the property, unless specified in the report.

6.2 Sampling and testing of materials is beyond the scope of this report.

6.3 We have not inspected woodwork or other 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.

6.4 This report is applicable to the condition and state of the building at the time of inspection. The building may be subject to deterioration in the future and the opinions expressed in this report may need to be revised accordingly.

6.5 This report is limited to the property under consideration. It does not consider the effects that adjoining properties may have, unless with prior agreement, a detailed inspection of all adjoining properties can be made.

6.6 The above recommendations do not constitute a full list of works to be carried out and refer to the main areas of work associated with structural aspects of the building, based on a visual inspection only and under the limitations of our inspection.

6.7 All building and construction works are covered by the requirements of the CDM regulations. Owners/Clients have legal responsibilities to engage persons and companies with appropriate level of skills knowledge and experience to ensure that the requirements of the CDM regulations are met. The works required will be covered by the CDM regulations 2015 and you should understand your obligations and act accordingly.

6.8 Unless specifically mentioned no comment is made in the report as to the presence of new or old mine workings or tunnelling, heavy metals, chemical, biological, electromagnetic or radioactive contamination or pollution, or radon methane or other gases, underground services or structures, springs and water courses, sink holes or the like, noise or vibratory pollution, mould, asbestos and asbestos products.

6.9 The report has been prepared for the client alone and no third party should rely on it. For the avoidance of doubt, the Contracts (Rights of Third Parties) Act 1999 shall not apply to this contract.

6.10 The inspection and report will not include any liability in respect of Advice/Design in fire safety to the structure and/or any liability whatsoever in respect of any losses (whether direct or

indirect) arising from combustibility of cladding in delivery of our Services. We shall not be liable for that part of any claim which relates to loss of profits, loss of use, loss of production, loss of contract, liquidated damages or for any cost of decamping or rehousing.

6.11 *This report is limited to structural matters. The client should obtain their own advice on any specialist surveys that need to be undertaken.*

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