

Lower Chesham Hall, Chesham Crescent, Bury

Structural Inspection Report

Mr David Garvey

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1.0 Introduction

1.1 Introduction

Mr David Garvey has commissioned this structural inspection report, into the condition of Lower Chesham Hall, on Chesham Crescent, in Bury. The purpose of the report is to understand the structural condition of the building and to identify the required structural repair work which should be carried out. Clare Dawson, M.Eng (Hons) C.Eng MIStructE, Chartered Structural Engineer, undertook the inspection on 29th January, 2022. The weather was dry, cold and bright on the day of the inspection. The property was occupied by the current owner during the inspection (Mr Graham Harwood). Access was permitted to all areas of the building, with the exception of the main bedroom. Access was limited to only the rear section of attic space, viewed from the loft hatch. Only visible structural elements were inspected, and the majority of the rooms within the building internally had been rendered, with the render potentially concealing further defects behind. The external walls were inspected from ground level only and the foundations have not been exposed for examination. Therefore, conclusions made within this report have been drawn from the surface evidence available at the time of the inspection.

1.2 Background

The building is part of a larger house, originally constructed in 1713. The remaining part of this original building is Grade 2* listed and it is understood that the building is on the National Heritage at Risk Register. The original western section of the building was demolished and re-constructed in 1861 and is now use as a care home (Brookdale Care Home). This is identified in Figure 1, shown in red. The western side of Lower Chesham Hall, and a section to the north share a party wall with the retirement home.



Figure 1 Aerial Image showing Lower Chesham Hall and Adjoining Properties

Lower Chesham Hall is identified shaded in green. A single storey extension was added to the north-eastern side of the property in 1910. The extension (shown highlighted in orange) is where the kitchen and dining room are currently located. As the extension is not contained within Historic England's listed building register, this part of the structure has been excluded from this structural inspection report.



Figure 2 Image showing the original structure to the West; now demolished.

2.0 Structural Inspection and Assessment

2.1 Structural Inspection and Assessment

2.1.1 External Elevations, Overview

The external walls are constructed from inner and outer leaves of sandstone, of random sized stonework, pointed with a combination of lime and sand cement mortar. The outer and inner leaves are likely to be infilled with a rubble infill, given their width, which is approximately 450mm-600mm. The type of infill material and its relative strength are not known. Considerable variations exist in these forms of wall construction. The strongest form of infill was produced where the original masons filled the cavity with loose course rubble stones at the same time as the outer leaves were constructed. A semi-liquid sand:lime mortar was then poured over the loose stones to form a solid core. The weakest form of construction being with a loose earth filled core. Very few of the walls of these types of construction have any form of tie between the inner and outer leaves of masonry, contradictory to current practice in masonry design. In rare cases where ties were installed, these took the form of long through-stones bonded to both the inner and outer leaves, although these also result in defects from water ingress. As the walls are rendered internally it could not be observed during the inspection if through-stones have been utilised on this property.

External Elevations of the property are referenced, North, East and South within this report, as identified below:



Figure 3 Elevation References

2.1.2 South Elevation

The South Elevation is in relatively good condition. No cracking from structural movement was observed and the walls appeared plumb and true.

The walls have undergone widespread repointing with a sand and cement mortar. The mortar joints should be raked out and re-pointed using a lime mortar to allow the walls to be permeable and reduce the levels of damp within the property and also to inhibit the rate of frost damage caused by freeze-thaw cycles.

There is evidence that significant amounts of water have run down the far western corner of this elevation. As the conditions were dry at the time of the survey it was not clear whether the cascading water was due to current ineffective

guttering, or whether this was a historic defect due to the broken original stone gutter. It is understood there was also an opening in the roof above this location, however this has since been locally repaired to reduce further deterioration internally. A full repair of the roof and guttering should be undertaken to prevent further water ingress and damage. The internal condition of this section of the building is discussed in more detail in 2.1.6.



Figure 4 Full view of South Elevation

The stonework over windows is coursed stone, supported on stone mullions. Some cracking was observed within these stone mullions near the joints. It is likely that the metal pints connecting the header stonework and mullions have corroded. The stonework should be removed and either repaired or replaced depending on the extent of damage.

There are three chimney stacks which can be observed from the south elevation. The chimneys were inspected from ground level only, and once scaffolding has been erected it is recommended the chimneys are more closely inspected. The condition of the flues have also not been inspected and all flues should be checked by a suitably qualified GAS SAFE or HETAS engineer. All chimneys are constructed from brick with the oldest two chimneys located along the apex of the building. There are three flues to each of these stacks. It can be seen that the chimneys have been repointed in modern sand cement mortar. There is evidence of sulphate attack to both stacks and this has caused bulging to the rear face of the left hand stack in particular. The bricks should be locally removed and re-set to position. Sulphate attack is caused by the burning of fossil fuels which react with the mortar and cause expansion of the joints.

There is a single chimney stack on the eastern gable end. This is a more recent addition, and it is assumed this was installed during the 1910 alterations. The chimney is constructed from red clay brick. There is evidence of sulphate attack within this chimney which has caused a significant bend and twist to the stack. Given the extent of deformation it is recommended that the chimney is completely dismantled from above roof level and reconstructed. With the installation of a new flue lining, it may not be necessary for the chimney to be re-constructed to the same height, however this reduction would need to be approved by the conservation officer.

It should be noted that the fourth chimney within the 1910 extension is excluded from this inspection report, however it does require an assessment from a qualified structural engineer as significant deformation from sulphate attack was observed.



Figure 5 Image showing the three chimneys

2.1.3 East Elevation

To the eastern elevation, a significant outward bow was observed, with vertical cracking through both the stonework and vertical mortar joints. The most outwardly point of the bow within the wall was located at midpoint between first and second floor levels.

In common with more modern masonry cavity wall construction; rubble filled walls are susceptible to problems such as ground settlements and loss of lateral restraint. In addition, problems particular to rubble filled walls arise from loss of integrity of the individual elements of masonry (producing bulges either vertically or horizontally). This is commonly caused by consolidation/settlement of the rubble core, due to insufficient compaction during construction or from water penetration, which washes through the fine material. In severe cases, the loss of material can cause large voids, which creates independent structures of the inner and outer leaves.



Figure 6 Image of eastern elevation showing bulge and cracking of stonework

Loss of material can also be a result of modifications to the structure, such as additional windows / doors being installed. It is evident that modifications have been carried out adjacent to the current side elevation entrance doorway. It is understood the doorway was moved southwards to its current location, in 1910.

The bulging and cracking to the wall could be caused by lack of restraint to the floors, or by consolidation or voids within the rubble core, or a combination of the two. Internally the floor joists were observed to run north-south with only a limited number of timber cross beams running east-west. The lack of joists embedded into the limits the restraint that the floor can provide to the end gable wall.

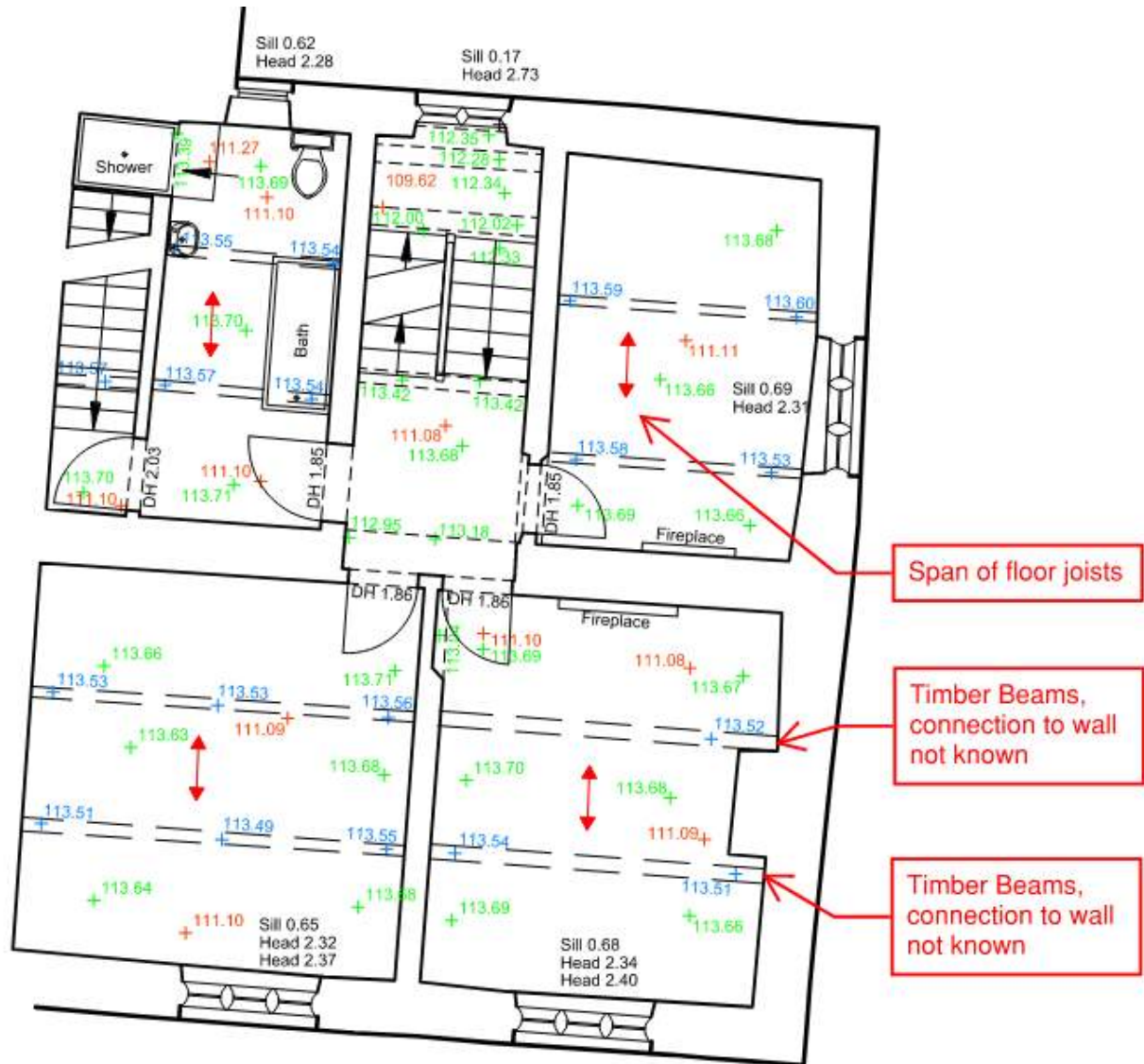


Figure 7 Part plan of first floor showing span of joists

A remedial method of adding restraint between the walls and floors has historically been addressed through the use of cruciform wrought iron wall ties. These however affect the external appearance of the building. In order to achieve a more sympathetic repair, it is recommended that restraint is provided by the following:

- Internal restraint straps installed at regular centres between the timber floor joists and the inner leaf of the walls at each floor level, including the roof.
- Cracked stonework is locally replaced, like for like, with locally sourced stone.
- To the area of cracked and bulging stonework, the inner and outer leaves are tied together using stainless steel, resin fixed rods drilled through, connecting both leaves together. These should be drilled at mortar joint locations to minimise observable repair works as far as practically possible, with the surface over the stainless-steel rod repointed with a lime mortar. The repair should be virtually undetectable externally.

- The stainless-steel rods should also be installed at floor levels, at regular centres, to ensure the internal restraint strap ties also provide restraint to the outer leaf.

Full details and specification are provided in Appendix A.

As observed on the south elevation, widespread re-pointing using a cement mortar has also been undertaken. This should be raked out and replaced with a lime mortar.

Outward movement of the kneeler on the corner of the south elevation was observed, together with cracking of the mortar joints to the top 1m of the wall, indicating potential movement of the masonry where the front and side elevations are tied together. It is recommended that crack stick bars are installed every other course in this top section of the wall, and that the kneeler is anchored to the masonry wall using a stainless-steel bar resin fixed into the kneeler and top of the wall.



Figure 8 Cracking in stonework and movement of the kneeler

Twisting and movement of the kneeler and copings was also observed to the corner on the north elevation. The likely cause of this movement is not known, and it is recommended further investigation is undertaken. Internally there is also an inward bulge to this area (refer to section 2.1.6) and therefore a potential cause of the movement in both outer and inner leaf could be the separation of the two leaves from voids within the rubble core. Given the extent of deformation internally, it is recommended that this small corner is locally dismantled and re-constructed.

The ball finials were missing and so these should be re-fix using resin fixed stainless steel rod to adequately connect the finials back into the supporting stonework.

There is a diagonal crack which extends down from the second-floor window to the first-floor window and then down to the centre of the door. The movement could have occurred when the new central door opening was created in this elevation, however a small central crack can also be seen in the stone lintel above the door. The internal finishes should be removed, and investigation undertaken to identify whether the internal timber lintels have rotted and failed.



Figure 9 Cracked stone lintel and diagonal cracking in stonework above

As with the south elevation, there was also some cracking observed within the stone mullions in the windows which suggested the internal metal connecting pins may have corroded. This should be investigated and the stonework either repaired or replaced as necessary with like for like, locally sourced stone.

2.1.4 North Elevation

As on the other elevations, there is again widespread evidence of repointing using a sand cement mortar, which should be rakes out and replaced with lime mortar.

A stepped crack was observed starting at the junction between the extension and extending diagonally upwards. This will be discussed in more detail within section 2.1.6.

There was also some cracking observed within the stone mullions in the windows which suggested the internal metal connecting pins may have corroded. This should be investigated and the stonework either repaired or replaced as necessary with like for like, locally sourced stone.

2.1.5 Roof

The roof was inspected from ground level only, within the attic spaces, and from locally within the area above the loft access hatch within the front left-hand bedroom. It is understood that the purchaser intends to fully strip the existing slates and all copings, finials etc, and re-construct using the original salvaged materials where possible. This would be our recommendation also. The roof is supported from timber rafters which are laid east to west supported from the stone /

masonry cross walls which extend from foundation up to roof level. The spine wall also extends up through the building to the apex of the roof. Purlins then run north-south supported off the timber rafters.

In advance of the strip out works it is recommended that the walls are tied to the timber joists at all floor levels, as discussed in section 2.1.3. The walls should also have been surveyed to identify any weaknesses within the rubble infill, and repairs undertaken. This will ensure stability within the walls prior to the roof being stripped. The timber rafters at roof level should also be tied to the external walls, and scaffolding installed around the full perimeter with the end elevation propped above second floor level to ensure stability in the temporary state.

Following strip out of the slates and finishes, the condition of the rafters can be thoroughly inspected by a timber specialist, and then treated or replaced where necessary. Particular attention to the bearing ends of the timbers onto the external stone walls should be made.

2.1.6 Internal Inspections

Internally, the majority of the walls, particularly on ground floor had been rendered with a cementitious render / plaster. This is likely to conceal further defects which will only be known once the finishes have been removed. Any cementitious plaster should be removed and replaced with a lime plaster. It is recommended that a structural inspection is undertaken upon removal of the render so that any structural defects can be inspected.

At ground floor level within the sitting room adjacent to the party wall of the care home, significant water ingress was observed which was entered the building through an opening through the roof and from water cascading down the building due to ineffective guttering. The plaster has disintegrated and although the timbers were not inspected at the time of the inspection it is expected that significant decay and potentially rot will have occurred. Following strip out of the finishes / ceilings the timbers should be inspected by a specialist and treated / replaced where required.



Figure 10 South western corner showing damage from water ingress

In addition, at roof level there is cracking and bulging where the timber rafters connect into the party wall. All timbers should be thoroughly inspected by a specialist. It is recommended the rafter is propped and the wall re-built locally at the bulge to ensure the wall is plumb to provide adequate support for the roof rafter.

Cracking was observed internally within the cross walls either side of the basement access staircase.



Figure 12 Cracking to basement cross walls running north south

The internally finishes should be removed to both these walls to understand the level of defects present. It may be necessary to locally re-build the wall where the timber beam to the dining room is located, to ensure there is adequate bearing support in this location. Decay was noted to the timber bearer for the half landing stair, within the access stair to the basement.

Decay was also noted to some timbers within the basement area. Decaying timber members should be replaced as necessary. Timber props were found supporting the decaying timber members. The timber lintels supporting masonry walls above openings between the two areas of the cellar are also showing signs of decay and should be replaced.

A bulge was noted internally on the rear eastern bedroom within the attic space. This is cognisant with the location where movement was observed externally on the gable end and where, directly below, at ground floor level, alterations to the doorway had been undertaken. It may be that to this location there are voids within the rubble infill and movement has occurred between the two leaves of stonework. The movement is significant, so in this location it is recommended that the roof beams directly over are propped and the wall is locally dismantled and re-built, plumb.



Figure 13 Significant internal bulge to north eastern bedroom

It should be noted that the majority of the timber members during the inspection were unfortunately concealed and so the full extent of decay, infestation and dry rot will not be known. As the building is stripped back internally it is recommended that a full timber survey is undertaken by a specialist, particularly at the bearing ends where timbers are supported from the external porous walls, and also to the southwest corner of the building, where significant water ingress was observed. The condition of all timber lintels on external walls should be inspected, and members should be replaced where necessary.

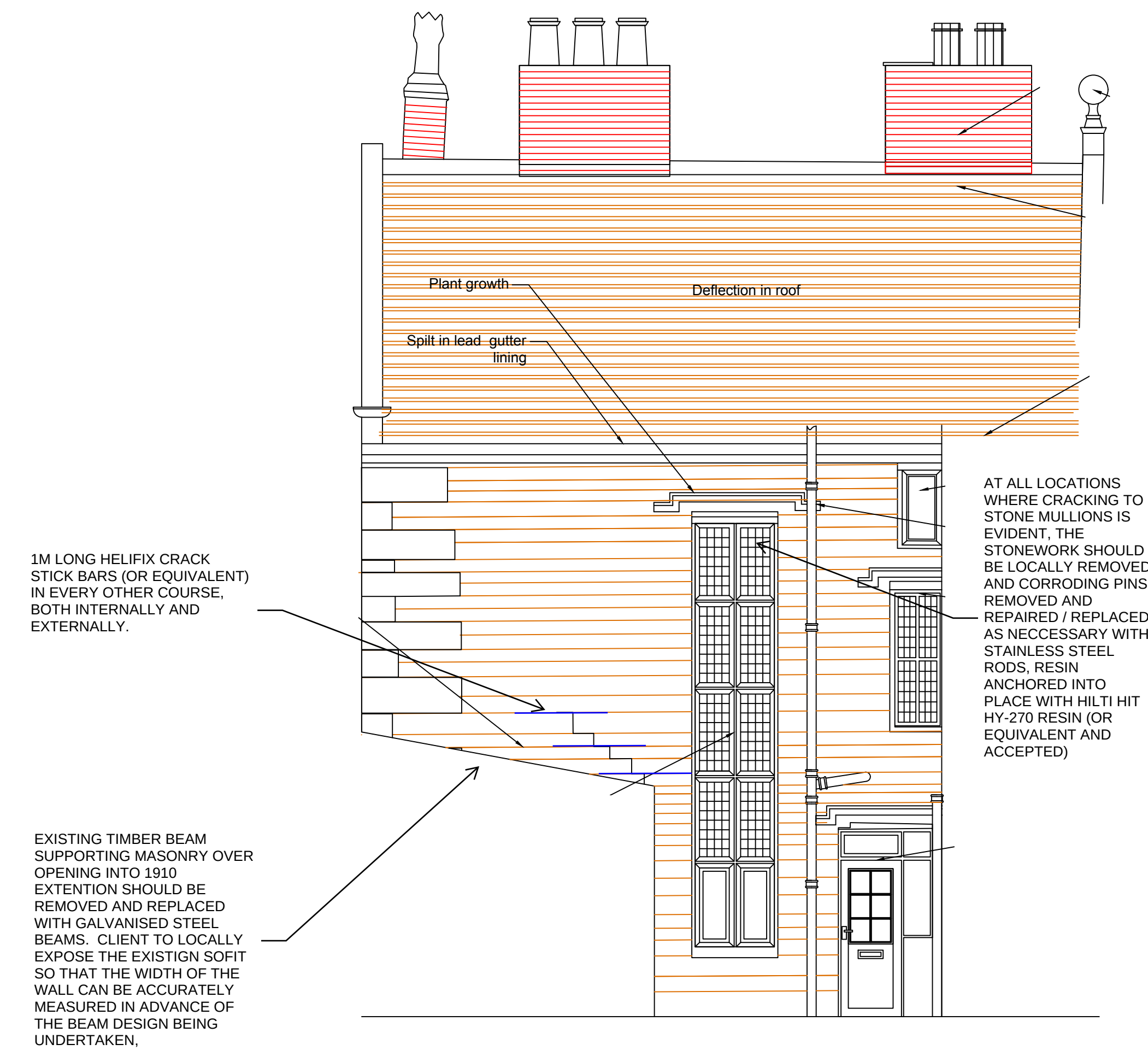
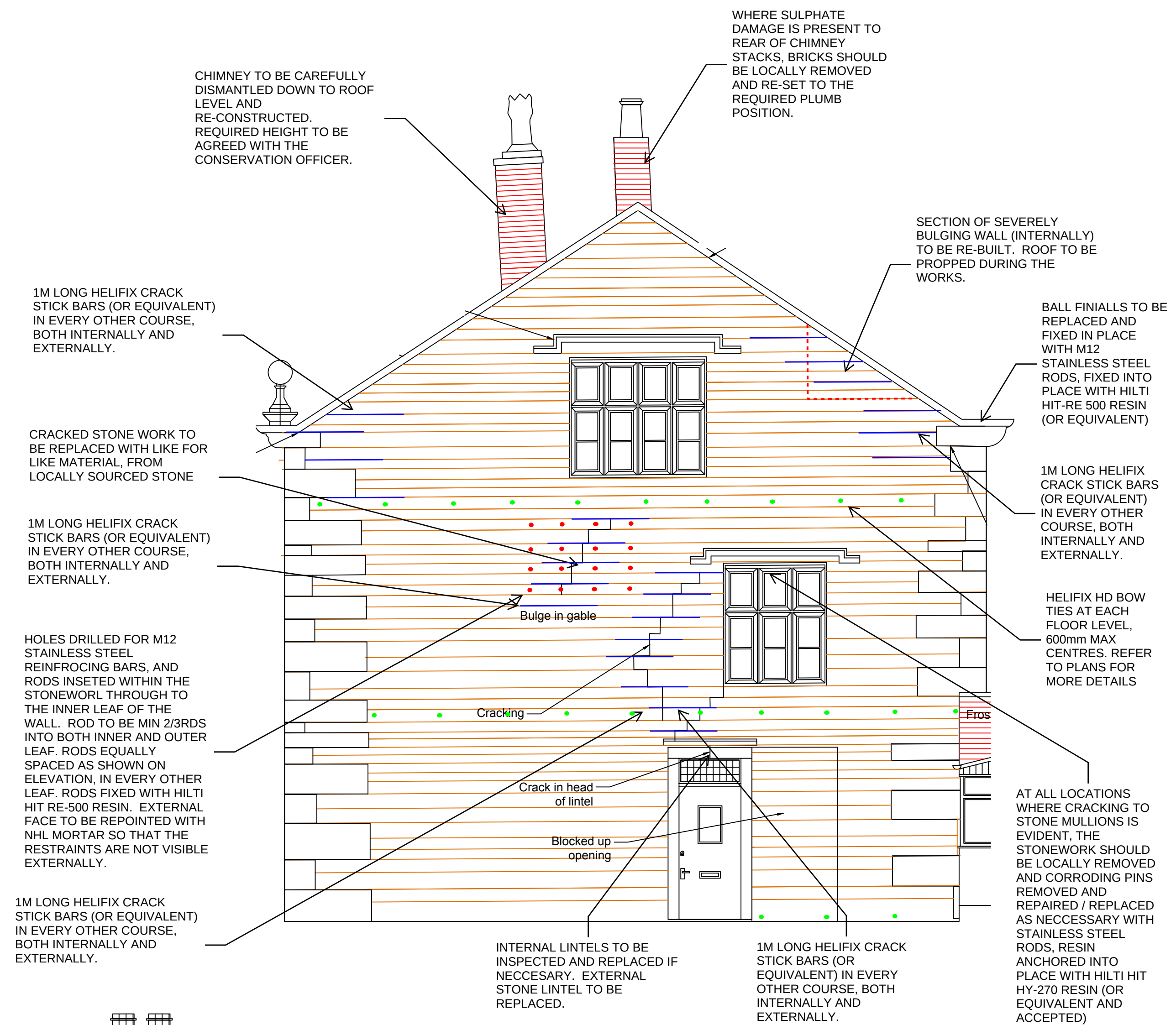
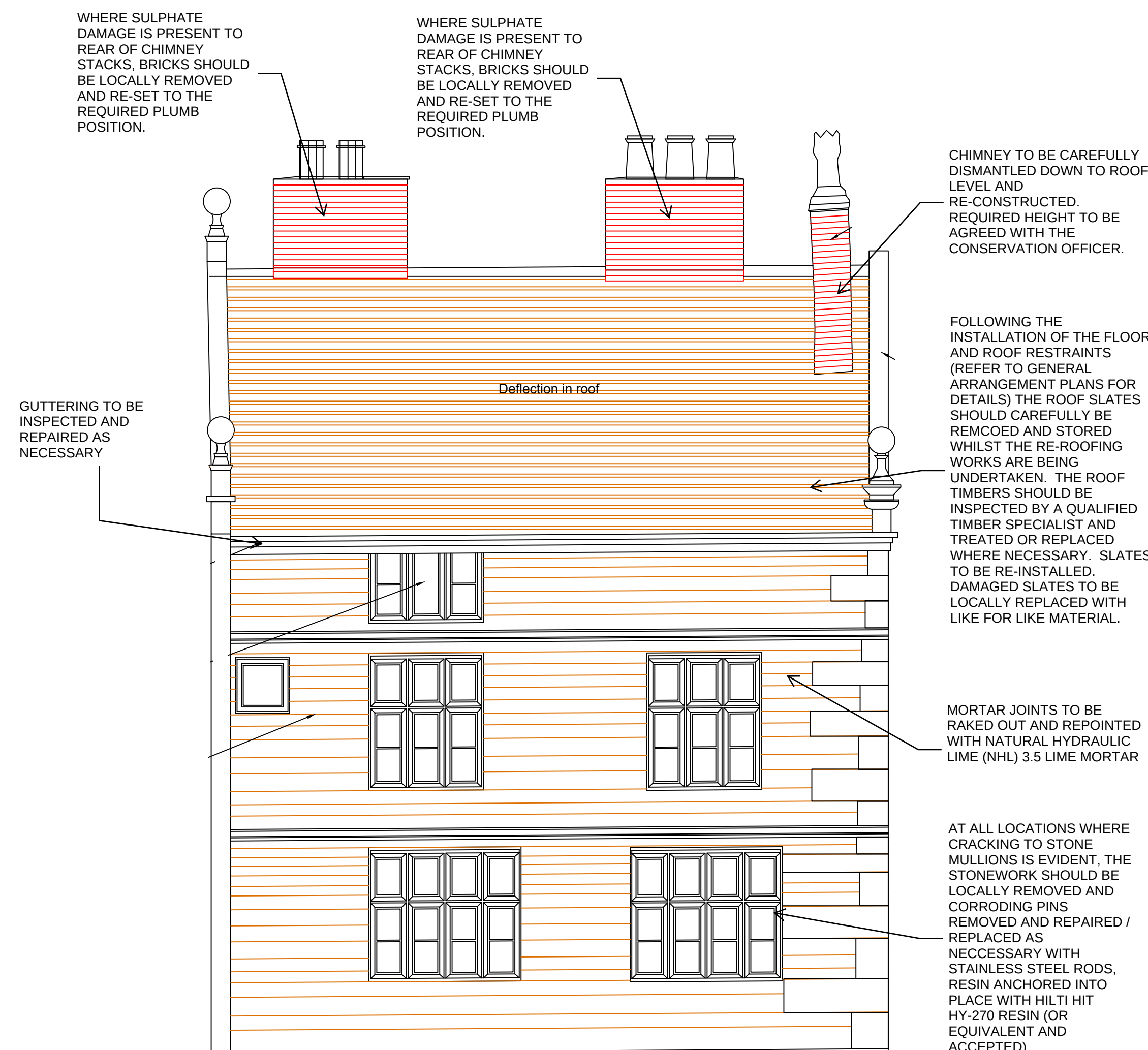
2.2 Summary

The recommendations within this report cover the repairs required in order to address the structural issues identified during the visual inspection. Further repairs required to address issues with internal finishes, services, windows, and non-structural decorative items are excluded from these recommendations.

Further defects are likely to be encountered during strip out of the internal finishes and the roof and a further structural inspection may be required to assess any structural defects and determine an appropriate solution.

The repair works required are identified on the appended drawing contained within Appendix A.

3.0 Appendix A



1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH STRUCTURAL REPORT LCH-ZZ-XX-RP-S-0001 REV P02, ISSUED 07.03.2022. FULL METHODOLOGY AND DETAILS ARE PROVIDED WITH THE REPORT.

-	07.03.2022	FIRST ISSUE	CD	CD	CD
Issue	Date	Description	By	Chkd	Verfd

Project	CHESHAM HALL, STRUCTURAL REPAIRS
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Client
MR DAVID GARVEY

Architect
NA

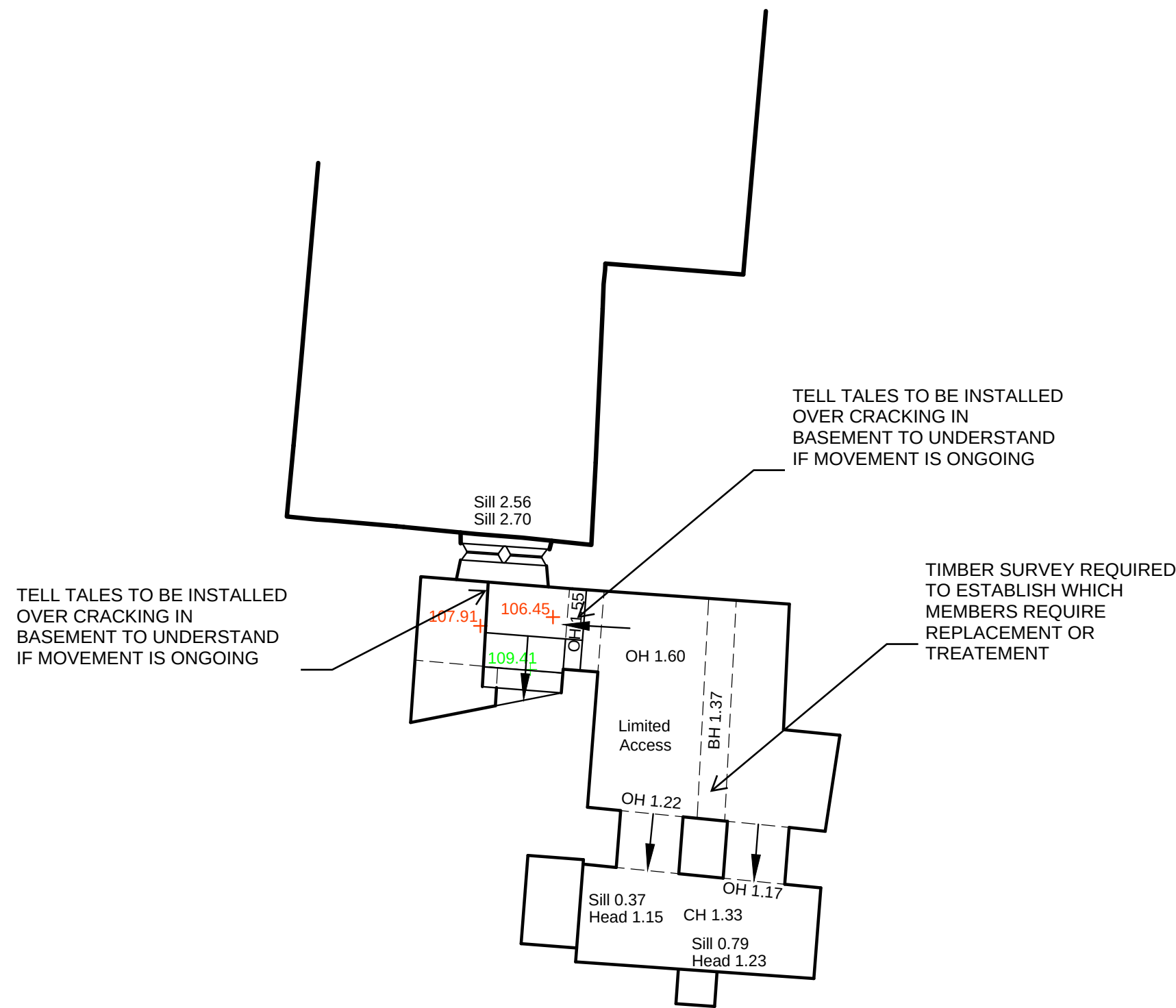
Title	WORKS TO EXTERNAL ELEVATIONS
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Originator CD	Checker CD	Verified CD	Issue -

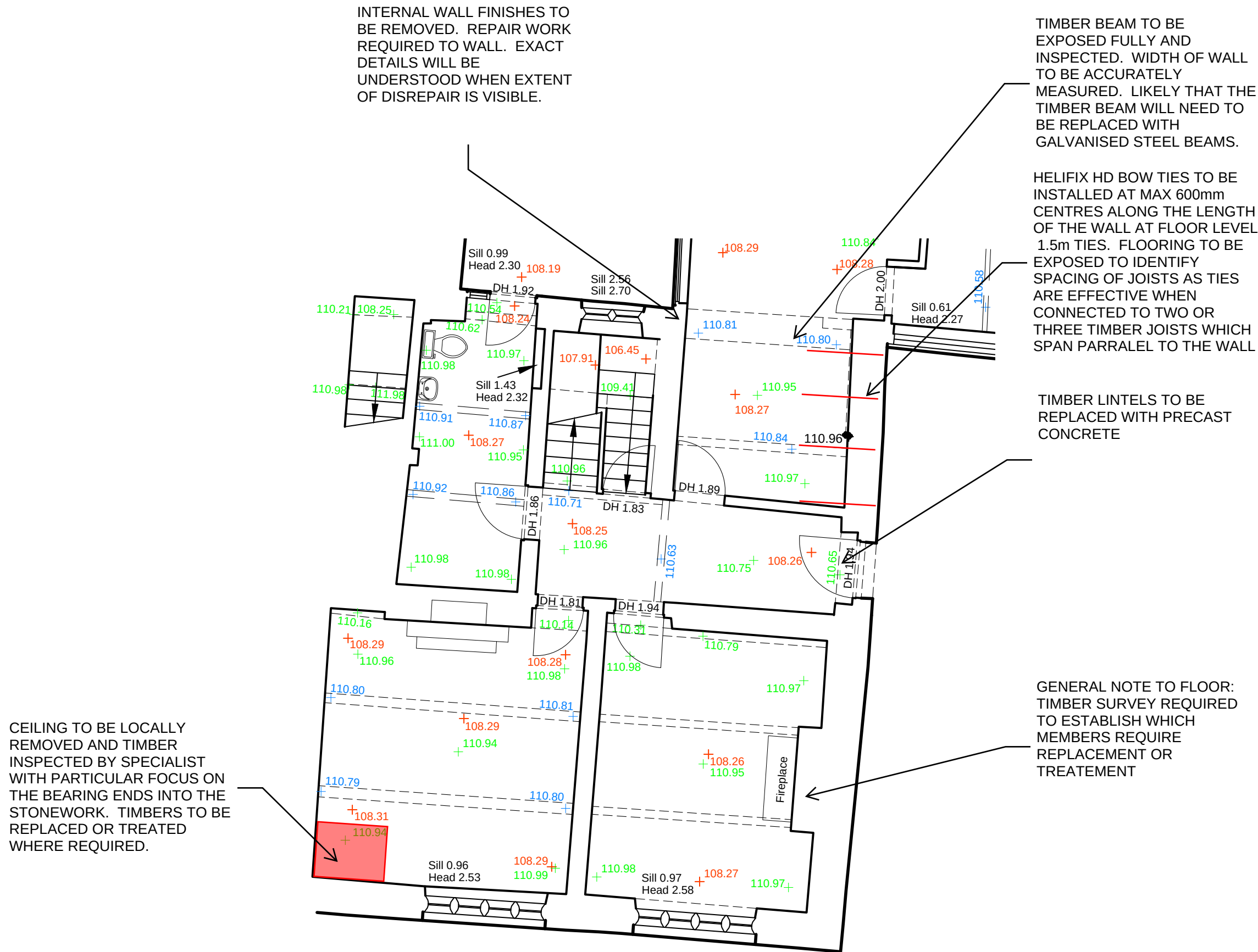
CLARE DAWSON
M.Eng (Hons) C.Eng MIStructE

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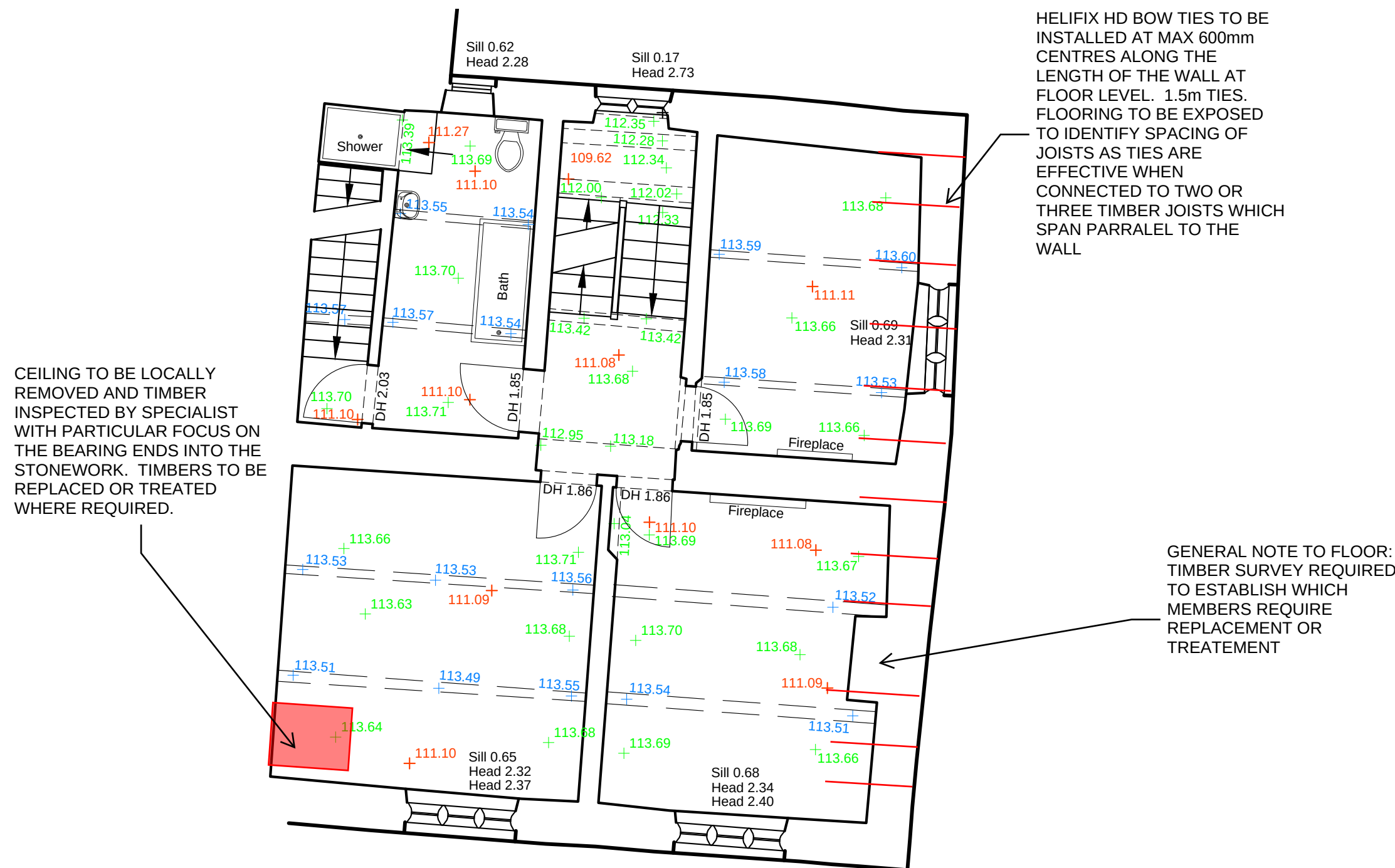
1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH STRUCTURAL REPORT LCH-ZZ-XX-RP-S-0001 REV P02, ISSUED 07.03.2022. FULL METHODOLOGY AND DETAILS ARE PROVIDED WITH THE REPORT.



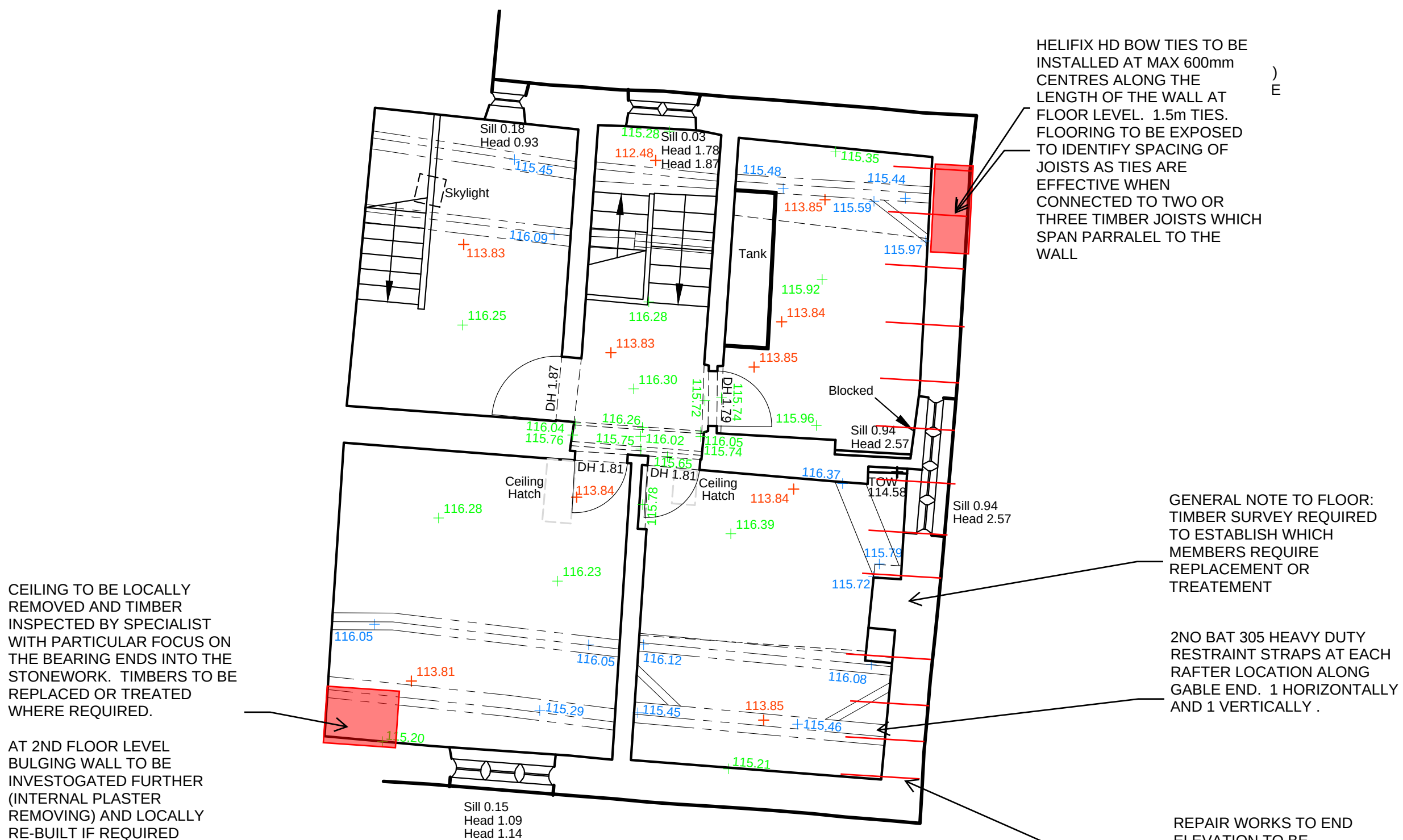
BASEMENT



GROUND FLOOR



FIRST FLOOR



SECOND FLOOR

