

Appendix 1

Retrospective application for the demolition of a dwelling and the construction of a replacement detached dwelling

**The Paddock
Access to Dyffryn Farm
Dyffryn
SA10 7BQ**

January 2025

PHONE

MOB PHONE

EMAIL

A Follant

**The Paddock, Dyffryn, Neath,
Neath Port Talbot, SA10 7BQ**

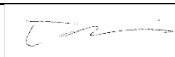
Structural Survey Report

Report Ref: PO-06912

Revision 0

10/09/2024

Document Control

Rev No	Comments	Date	Author and Approve	Signature
0	Final	10/09/2024	Ian Dunning CEng FICE	

This document has been prepared by **Build Excellence** (a trading name of Leading Excellence (UK) Limited for the sole use of our client (the “Client”) and in accordance with generally accepted consultancy principles.

1 Introduction to Commission

1.1 Commission

Property to be Inspected

The Paddock, Dyffryn, Neath, Neath Port Talbot, SA10 7BQ

Client

A Follant

Instruction Detail

Undertake a structural engineers' inspection of the whole property.

Purpose of Report

Required for advice.

Date of Inspection

The property was inspected on 1st September 2024.

Extent and Limitation of Report

The inspection report is limited in its scope to the instructions detailed above. We have not inspected parts of the property or defects that are not relevant to the instructions unless noted within this report. Our inspection was a visual inspection internally and externally as necessary subject to safe and reasonable access being available. We shall only report upon those structural defects that materially affect the stability of the property and provided that these defects are reasonably detectable at the time of inspection. Whilst we will use all reasonable skill and care in preparing this report, it should be noted that we cannot offer any guarantee that the property will be free from future defects or that existing defects will not become worse. Internal inspection is made within the limits of ready accessibility, and it is not normal practice to lift floor coverings or floorboards, remove panels or plaster, or move heavier items of furniture. We have not inspected woodwork or other parts 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 defects. Such unexposed parts may contain problems, and you would need to make special arrangements for these areas to be investigated if you require confirmation about their condition.

We are not qualified to comment upon drainage, electrical systems, water systems, heating systems, gas systems, condition/rot/insect infestation/fungal infestation of timber, damp penetration, mechanical installations, decorative condition, mouldings, coverings and all other non-structural matters. Should we happen to notice any problems in these areas which we recognise we will draw this to your attention, however, you should not assume that the absence of any such comments means that the property is free from defects in these areas.

This report has been prepared for the named client and for a particular purpose. Any liability, which may arise, is therefore restricted to the client and the client's professional advisors in relation to the stated purpose.

1.2 Description of Property

Location

The property is a two-storey detached house at Neath Port Talbot. The property is currently undergoing a wholesale refurbishment. Photograph 1 illustrates the front elevation of the property.



Photograph 1 – Front Elevation

2 General Notes on Structural Movement

Structural defects can take many forms, one of the key indicators are cracks, but we must be clear that cracks, their location and size indicate different issues and in many cases are not cause for alarm.

BRE assessed a number of properties as part of a study that was published as BRE Digest 251 Assessment of damage in low-rise buildings. This identified six categories of cracks together with the typical damage caused and the remedy required:

0 - Hairline cracks: Less than 0.1 mm in width. No repair action required.

1 - Fine cracks: Up to 1 mm in width. Generally restricted to internal wall finishes. Easily treated using normal decoration.

2 - Cracks easily filled: Up to 5 mm in width. Not necessarily visible externally, but doors and windows may require adjusting to prevent sticking. Can be masked by suitable linings.

3 - Cracks that require opening up: Widths of 5-15 mm. Weather-tightness and service pipes may be affected. External brickwork may need repointing or, in some cases, to be replaced.

4 - Extensive damage: Widths of 15-25 mm. Windows and door frames become distorted, walls lean or bulge noticeably. Requires breaking-out and replacement of wall sections.

5 – Structural damage: Widths greater than 25 mm. Beams lose their bearing, walls require shoring, and the structure is generally unstable. May require major repair works.

These crack limits are used to categorise cracks within this report; however, we must also assess whether the cracks are progressive or non-progressive whereby progressive means the cracks may continue to grow and non-progressive is whereby the cracks are inactive and have stopped increasing in size.

So, what causes cracking?

We have seen that cracking from 0.1 to 5 mm will only require a decorative repair and we will now look at some of the main causes of cracking in houses.

Subsidence

This can be defined as the downward movement of the soil beneath a house. By far the most common cause of subsidence is the action of tree roots on shrinkable soils such as clay. If a tree is allowed to mature in relatively close proximity to a house which sits on clay, the tree will draw up large amounts of water which will cause the clay to shrink and the house to subside.

Another common cause of subsidence are broken drains which cause water to leak out into the clay which over time weakens it significantly. There are more rare instances of subsidence due to coal mining or other mining activity beneath a property however this is less common and usually highlighted as part of a legal review prior to your purchase. Subsidence cracks are most commonly wider at the top of a property, and the cracks will generally travel diagonally in opposition to the downward movement, this can be seen in Figure 1.

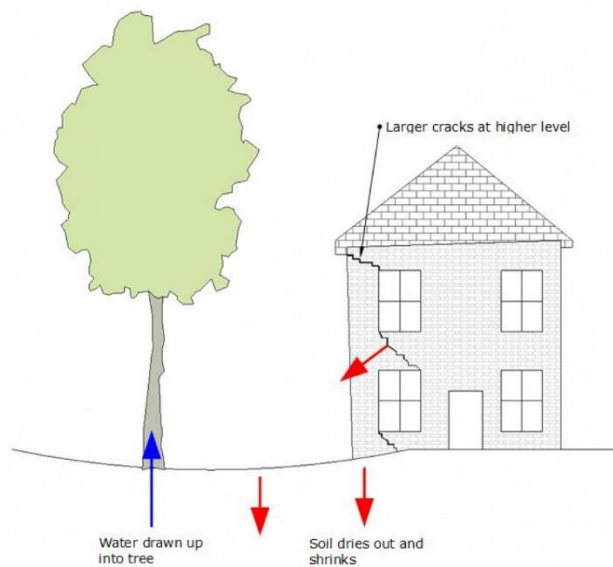


Figure 1

A common repair for subsidence is to remove the offending tree in stages so that heave does not occur (explained below) and underpin the property, repairing significant cracks and repointing.

Settlement

This is defined as the downward movement of a property which has been newly formed. This can also occur if you extend your property and cause additional load to be applied to the soils. This is a process of soil consolidation and tends to occur once over a period of time and then cease. This must be carefully controlled in the design of a new property, but generally should not be considered worrying unless there has been an error in construction or design. If cracking has been accommodated, then decorative repairs only will normally be necessary. In some cases, it may be necessary to stitch brickwork back together.

Heave

This is the upward movement of soil and can broadly be considered the opposite of subsidence. This is caused as a result of dry soils expanding due to water being reintroduced. The most common example of heave is where a large tree is removed and the water which it would have drawn up is now introduced back into the soil. This is why it is best to remove a large tree over time so that there is no sudden heave. Where heave occurs, cracking is normally wider at the bottom of the property and tapers as it rises, and cracks generally occur at right angles to the diagonal and upward movement. This can be seen in Figure 2.

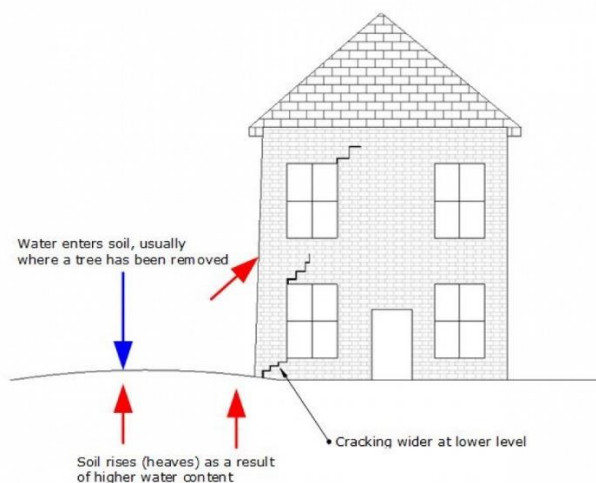


Figure 2

Thermal movement

All materials to some extent expand and contract as they warm up and cool down. In modern construction this is dealt with by movement joints so that cracking occurs exactly where you want it to rather than anywhere where it would cause a problem however with older buildings thermal movement can cause problems where large expanses of brickwork or flat roofs are subject to direct sunlight. Thermal movement may be difficult to analyse due to the materials, angle of the material relative to the sun and its age and there are various forms of repair or mitigation which can be undertaken to minimise the impact of thermal changes or reduce temperature change altogether.

Seasonal movement

In the United Kingdom we are clearly subject to the four seasons each of which has different characteristics which will affect shrinkable soils (clay and silts) in different ways. As in the case of subsidence, in the summer clay will shrink as it dries out, particularly in times of drought. Conversely some soils will expand during the winter months with heavy rainfall. Older properties such as those built in the Victorian period will have relatively shallow foundations and therefore will be more subject to seasonal movement and you may find that these properties have cracks which open and close across the course of one year. These cracks are rarely worrying and generally can be dealt with through normal decoration.

Out of Verticality (Tilting)

BRE Digest 475 states the requirements for verticality. The following table recommends remedial action for any tilts greater than 1/100, it is difficult to recommend actions other than monitoring to confirm that the walls are stable, and the movement is non-progressive. However, once a wall has tilted or bulged outside of the parameters, the wall is already destabilised and can move regardless of whether monitoring demonstrates the movement is non-progressive.

Table 2 Indicative values for tilting of low-rise housing

Classification	Tilt	Comment
Design limit value	1/400	The maximum acceptable differential settlement across the building is related to the design limit value for tilt. If the building is likely to tilt more than this limit value, ground treatment or deep foundations may be required.
Noticeability	1/250	The point at which the tilt of a building becomes noticeable will depend on the type and purpose of the building, and the powers of observation and perception of the occupiers. Typically, tilt of low-rise housing is noticed when it is in the region of 1/250 to 1/200.
Monitoring	1/250	When tilting is noticed it is advisable to make some measurements to confirm that the building has tilted. If the measured tilt is greater than 1/250, monitoring should be carried out to determine whether the tilt is increasing.
Remedial action	1/100	Where tilts of this magnitude are measured, or the measured rate of increase of tilt indicates that this degree of tilt will be exceeded, some remedial action should be taken. This is likely to include re-leveling the building, perhaps by grouting or underpinning and jacking.
Ultimate limit	1/50	If tilt reaches this level, the building may be regarded as in a dangerous condition, and remedial action either to re-level or to demolish the building will be required urgently.

BRE 475 Table of Out-of-Verticality

Buildings Insurance

We recommend it to be prudent to make formal enquiries via your legal adviser of your proposed buildings insurers prior to exchange of contracts and to obtain confirmation that the property will be insured on an “all-risk basis” during the period of your ownership and therefore if future problems with ground movement, subsidence, settlement or foundation failure were ever encountered that this would be a fully insured peril subject to the payment of any policy excess. Confirmation from your proposed building insurers regarding the current and future insurance status of the property is particularly important as we can only advise upon the current condition of the property. We cannot comment upon future climatic changes and in particular, the effects which periods of adverse weather could have upon the subsoil and the structural stability of the property.

Good Housekeeping

As a general note on good housekeeping of properties that have cracks or have received cracks repairs. It is good practice to monitor the existing cracks or repaired cracks to enable a full and detailed record of condition to be created over a period of time. The benefit of this is to be able to furnish any future buyers with those records to be able to demonstrate that the crack and repaired cracks are non-progressive.

General Maintenance

Properties require ongoing maintenance to prevent increased costs in the future. We have detailed in Table 2 some of the maintenance items required on the property to provide longevity. This list is not exhaustive and only list the activities that they consider required to as a guide to the likely additional costs the owner may incur to return the property to good order.

3 Record of Findings

3.1 Site Arrangement, Levels and Drainage

The property is on a level footing with the adjacent properties and highways also level.

In accordance with data held on Gov.uk, the property is identified as being in a 'Very Low Risk' area for Surface Water Flooding and also 'Very Low Risk' for Rivers and Sea Flooding.

Surface water flooding, sometimes known as flash flooding:

- happens when heavy rain cannot drain away
- is difficult to predict as it depends on rainfall volume and location
- can happen up hills and away from rivers and other bodies of water
- is more widespread in areas with harder surfaces like concrete

[Learn more about this area's flood risk - GOV.UK \(check-long-term-flood-risk.service.gov.uk\)](https://gov.uk/check-long-term-flood-risk.service.gov.uk)

3.2 Bearing Strata and Foundations

The age of the property suggests that the foundations to the property are constructed in accordance with standard practice at the time of build. We have identified through the British Geological Society website that the underlying ground formation includes;

- Bedrock - Grovesend Formation - Mudstone, siltstone and sandstone.
- Superficial Deposits - Till, Devensian - Diamicton.

There were no local boreholes available to enable a more accurate understanding of the ground bearing strata at the property.

3.3 External Elevations

The external elevations of the property show good line and level, with signs of cracking across all elevations to the render. The cracking comprises a variety of horizontal, vertical and diagonal cracking, typically upto Category 2. Diagonal cracking to the right-hand side can be indicative of subsidence due to foundation movement, horizontal cracks can be indicative of internal wall tie corrosion whereby the mortar joints are pushed apart due to corrosion of the wall ties. Render also ages with time, becomes brittle and can be impacted by seasonal thermal and ground movements.

The Render does seem to be life expired for several contributory reasons and should be replaced. However, it is our recommendation that further investigations are undertaken to assess the condition of the property to enable it to be considered a structurally stable in the long-term considering it is undergoing a costly refurbishment.

We recommend that the wall ties are investigated to the rear elevation to confirm condition. It is also recommended that trial holes are excavated to the elevations along with soil sampling for lab analysis. This investigation will confirm the risk to the property of subsidence due to the condition of the ground along with the presence of the established trees.

3.4 External Roof Condition

The roof to the majority of the property is constructed from a reinforced concrete slab which has been measured at 85-90mm thick with mild steel reinforcing bars at regular spacing throughout. The depth of slab would not be designed at this thickness nowadays, with a minimum slab thickness typically 150-200mm which gives sufficient availability of cover to the reinforcing bars to be robust and have longevity.

The ability of an 85-90mm thick slab to support roof loading can also be questioned. Particularly considering the condition of the reinforcing bars showing signs of significant corrosion which significantly reduces the strength of the roof. It is not possible to easily repair corroded steelwork and there is the added complication of carbonation on concrete. Reinforced concrete can be impacted by Carbonation. Carbonation is the phenomenon whereby carbon dioxide within the atmosphere impacts the alkalinity of the concrete which can make the concrete vulnerable to steel corrosion. The rate of carbonation on concrete is typically the square root of the age of the property. If a property was 64 years old, the potential depth of carbonation is 8mm. In this instance, the cover to the reinforcement can be as little as 10mm which is likely due to workmanship and construction tolerances. Considering the presence of carbonation, the steel reinforcement is at risk of accelerated corrosion.

Considering the property is undergoing a wholesale refurbishment, the roof should be considered as life expired and should be considered for demolition and replacement. The cost provided in Section 4 is a broad estimate due to the decision as to which type of roof should be installed.

3.5 Internal Roof Condition

Not applicable.

3.6 Internal Ceilings

The ceilings were typically plastered and showing little sign of structural distress through sagging (deflection), cracking or localised failure of joists.

3.7 Ground and First Floor

The floors were typically level showing little sign of structural distress through sagging (deflection) or localised failure of joists. The concrete ground slab had a lateral Category 2 crack which can be associated with age and general movement of the property. The cover

to reinforcement within the slab was measured at 33mm which is sufficient to resist the effects of carbonation for a significant period. See Photograph 16, 17 and 20.

3.8 Internal Walls

The majority of the walls were exposed. To the front of the property, there was evidence of diagonal cracking within the wall which had evidence of previous filling but with the crack reopening. This can be considered as evidence of ongoing progressive movement. Due to the significant quantity of established trees surrounding the property, there is the possibility that water demand from the trees is impacting the property. Following the refurbishment, there is the possibility that cracking may reappear. See Photograph 18.

To the rear room, the two steel beams that are supporting the rear external wall was showing significant corrosion with signs of delamination of the bottom flange which has the effect of reducing the capacity of the beam. These beams require removal and replacement as there is a risk of beam and wall failure at some point. This point is not easily predicted. See Photograph 14.

4 Conclusion and Recommendations

4.1 Conclusion

Overall, the property was in a good condition structurally with some of the key observations being;

- The concrete roof is considered life expired due to its thickness, presence of significant corrosion and carbonation of the concrete. Considering the property is undergoing a wholesale refurbishment, the roof should be considered as life expired and should be considered for demolition and replacement.
- There are steel supporting beams that require immediate replacement due to the corrosion levels and the fact they are supporting the rear of the property.
- Due to internal and external cracking, with some cracking seeming to be progressive, We recommend that the wall ties are investigated to the rear elevation to confirm condition. It is also recommended that trial holes are excavated to the elevations along with soil sampling for lab analysis. This investigation will confirm the risk to the property of subsidence due to the condition of the ground along with the presence of the established trees.

4.2 Structural Recommendations

It is our recommendation that the identified issues as described in Section 3 that require maintenance or repair to return them to a serviceable condition are undertaken as listed within Table 1 and Table 2. Table 1 details the structural repairs that are necessary to resolve current structural issues. Table 2 details the maintenance activities that are required to ensure the longer-term well-being of the property i.e., maintenance. Based on the findings of this report, to inform the condition of the property, further surveys and investigations may be appropriate as defects exist that are not diagnosable without further information, these are detailed in Table 3.

The schedule has been developed based on the findings of this report.

Item	Location	Description	Cost (£)
1.	Roof	Demolition and Replacement	£20,000-£40,000
		Total	£20,000-£40,000

Table 1 – Structural Repairs

Item	Location	Description	Cost (£)
1.	Elevations	Render removal and replacement	£8000-£10,000
		Total	£8000-£10,000

Table 2 – Maintenance Actions

Item	Location	Description	Cost (£)
1.	Property	Ground Investigation	£1,800
2.	Property	Wall Tie investigation	£1,000
		Total	£2,800

Table 3 – Surveys and investigations required

NOTE: The cost of repairs has been developed based on individual item costs assuming the homeowner commissioned a separate contractor for each element of work. The costs include labour, plant and materials, no allowance has been made for risk or contingencies and does not include VAT. It should be noted that the costs estimated are based on estimated levels of work based on the information available. These estimates have the potential to be significantly different based on the findings or any further investigations/surveys, designs and recommendations from builders. Additionally, market forces can significantly change the costs dependent on the region in the UK and quotations received from companies undertaking the works.

5 What Next?

This section provides advice on the next steps should we have recommended any of the following items within Section 4.

5.1 Monitoring

If we have recommended monitoring for the movement of the property, this means we are proposing the installation of crack gauges around the property to determine whether the movement is progressive or non-progressive. If the movement is non-progressive, then the defect which is more than likely permanent can be repaired and the property is considered stable. If the movement is determined to be progressive, there is likely to be further investigation required to identify the root cause of the problem and appropriate repairs. BuildExcellence can install the monitoring devices and periodically return to take the measurements.

We apply stainless steel studs using resin across the cracking at key locations. This data is recorded periodically to see if the cracking is opening continuously (progressive), not increasing (non-progressive) and opening and closing (seasonal movement)

We determine the most appropriate length of monitoring based on the type and location of cracking and is likely to be a minimum of two seasons i.e., to get a range of weather variations and ground conditions. We carry out crack monitoring using Demec Monitoring studs and Mitutoyo digital callipers using methods in accordance with BRE Digest 343 and BRE Digest 386.

5.2 Helifix Crack Stitching

This type of repair is to strengthen the cracking to prevent reopening upon repointing. This type of repair is a standard and very common method and can be seen at this location. <https://www.helifix.co.uk/applications/crack-stitching-repair/>. BuildExcellence can arrange for these works to be formally quoted for and undertaken in a timely fashion.

5.3 Foundation and Ground Bearing Strata Trial Holes

Where a property has moved due to the foundation we recommended investigations. Typically we would recommend Roberts Environmental but others are available. Roberts Environmental Limited are a geo-environmental consultancy who undertake ground condition assessments. We provide an interpretation on the causes of instability associated with current developments, the contamination status of a site and the foundation solutions for a proposed development. Such works include the progression of trial pits and / or boreholes to visually assess the material and obtain samples for laboratory testing. The results of the insitu and laboratory work are then interpreted by a professionally qualified consultant. The resulting report can be utilised to inform mitigation measures (if required) and supplied to appropriate professional bodies such as insurance companies, solicitors and the planning authority.

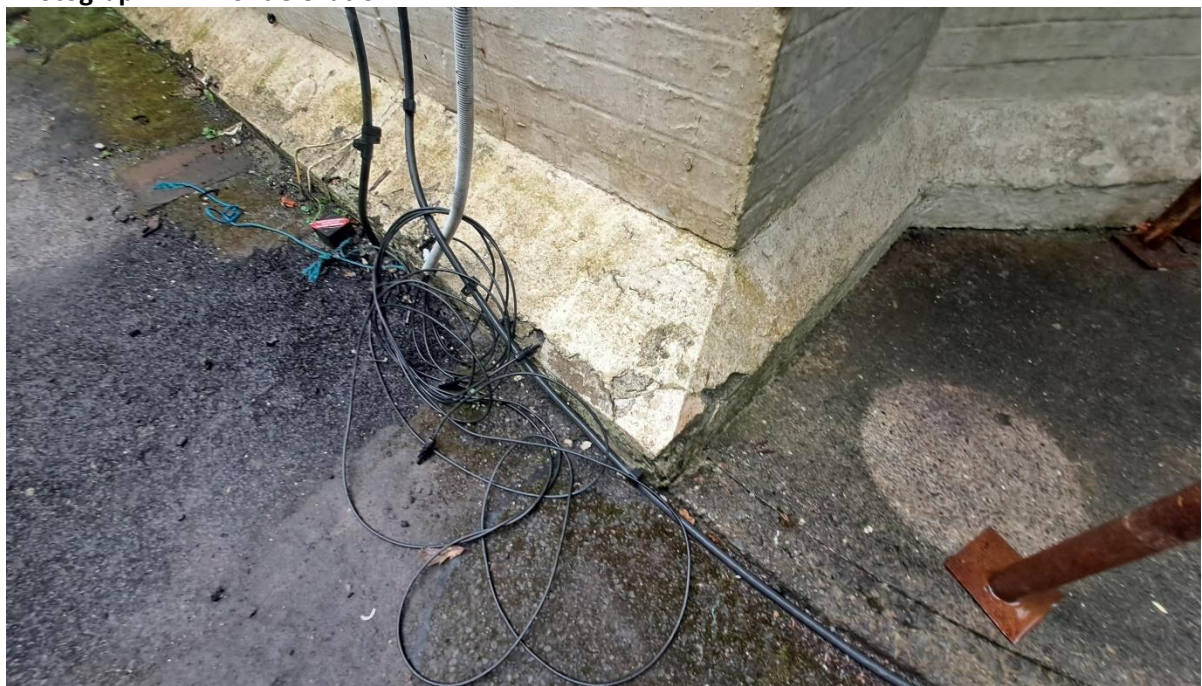
5.4 Drainage/Damp/Timber Surveys

Trees and Drains are significant primary issues associated with subsidence and we regularly recommend drainage and damp surveys. Specialist Xpress can arrange the necessary surveys to suit your needs. Additionally, dampness can impact the condition of timber within properties and roof space.

APPENDIX A
Photographs



Photograph 1 – Front elevation



Photograph 2 – Skirt



Photograph 3 – Left elevation



Photograph 4 – Rear elevation



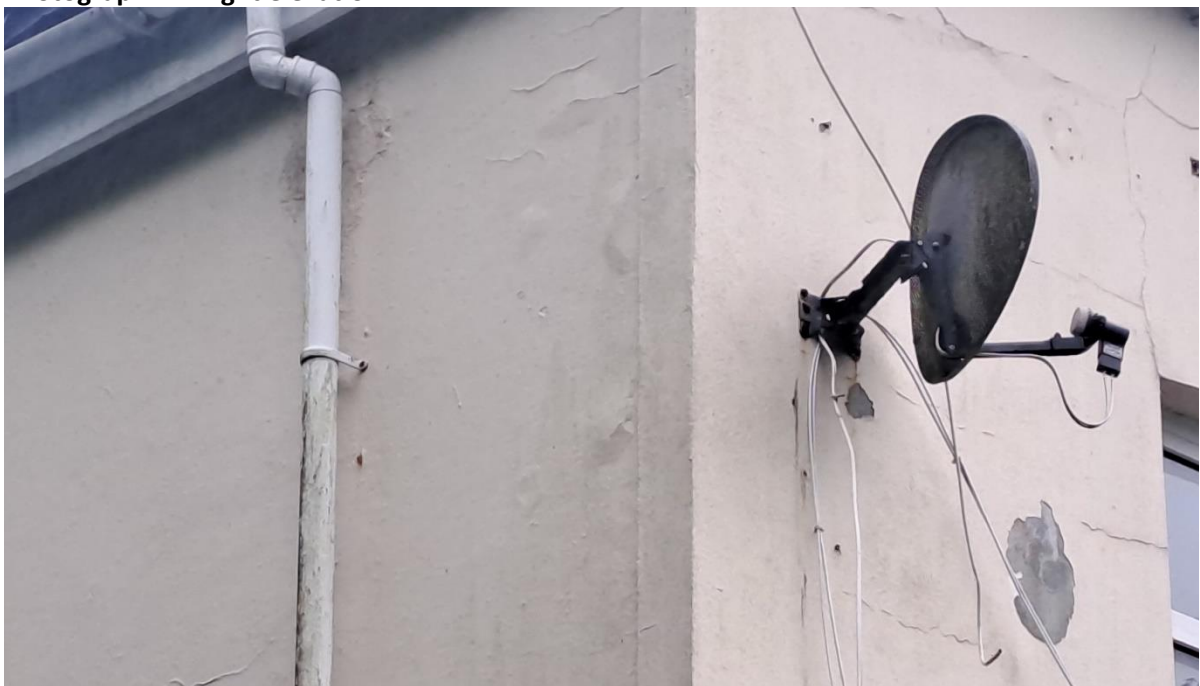
Photograph 5 – Rear elevation, cracking



Photograph 6 – Rear elevation, cracking



Photograph 7 – Right elevation



Photograph 8 – Blistering render



Photograph 9 – Diagonal Cracking



Photograph 10 – Render cracking



Photograph 11 – Corrosion staining to steel reinforcement within the roof



Photograph 12 – Drainage



Photograph 13 – Internal view



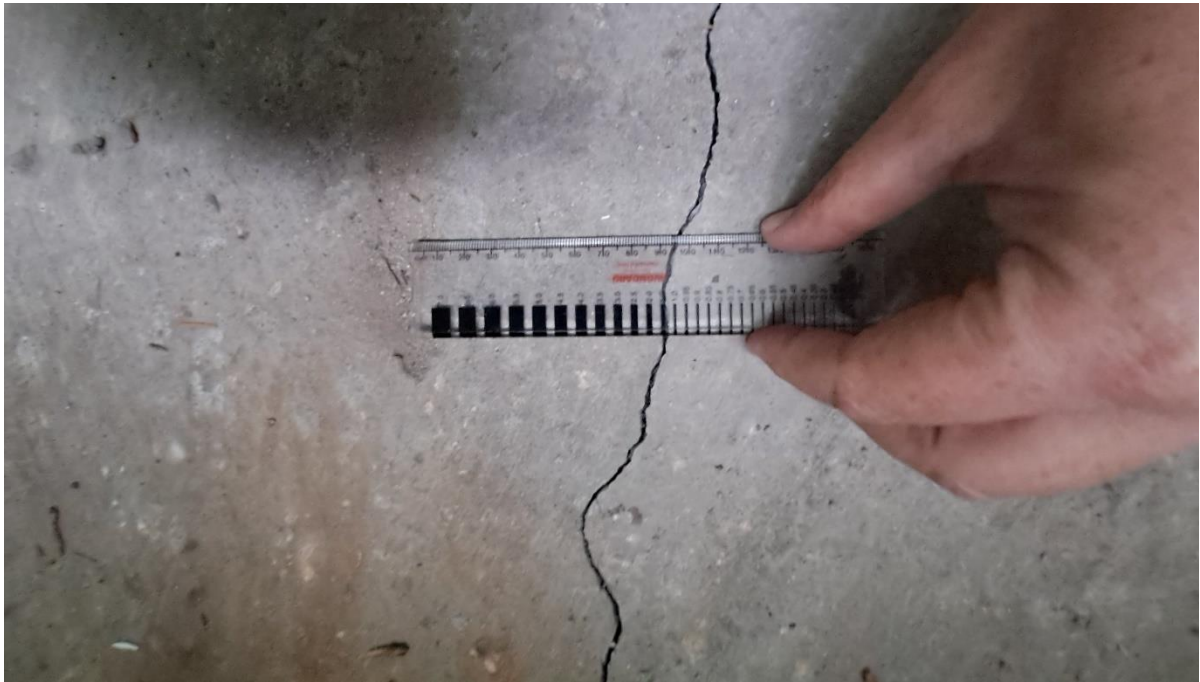
Photograph 14 – Section loss corrosion to steel beams supporting rear of property



Photograph 15 – Internal view



Photograph 16 – Ground slab



Photograph 17 – Concrete cracking in ground slab



Photograph 18 – Existing cracking



Photograph 19 – Internal view



Photograph 20 – Covermeter survey



Photograph 21 – Rear flat roof



Photograph 22 – Roof



Photograph 23 – Concrete roof depth 80-100mm



Photograph 24 – Corroded steel within roof structure



Photograph 25 – Corroded steel within roof structure