Consultant's Advice Note – Derby House

Date: March 2017 **Doc No: CAN/01** **Pages 4**

From: Richard Houghton **File No: 16021**

Attention **Bench Architects** **Company Email / Fax**
Helen Boulton

TO:

Structural Condition Report

GENERAL STATEMENT

This report is the result of a walk round survey carried out on 20th December 2016. The roof void was accessed, but no intrusive opening up was carried out.

Derby House appears to be a well constructed and well maintained large 3 storey residential building which predates 1879. Historic mapping suggests that the footprint of the building may have been modified to infill a recess on the southwest elevation and to add feature bay windows to both the southwest and northeast long elevations.

The main structure consists of thick coursed sandstone masonry perimeter walls with brick internal subdivision walls. Floors are generally timber joisted but with some zones of solid ground floor towards the southeast end of the site. The house has been re-roofed (advised in the 1990s) with a felt membrane added beneath natural slates.

This report focuses on defects noted during the initial survey. It is not intended to be a commentary on all aspects of the structure of the building.

EXTERNAL PERIMETER WALLS – BAY WINDOW UNITS

The walls are generally in very good condition with some superficial erosion of the more exposed ashlar units. As is common with a building of this age and nature, several of the stone lintels have cracked. These cracks are historic and are due to settlement bedding in / stress relieving within brittle parts of the structure. There are also occasional diagonal cracks (within bed and perp joints) which again are historic and indicative of a minor degree of differential settlement. The house is built on sloping ground (about 10-15% gradient originally) and has two cellar rooms under the middle of the building towards the SW side. Foundations are therefore likely to be at varying depths and in differing soil strata. Nevertheless there is very little real evidence of differential movement, and the ground floor surveyed levels correlate well.

Around the bay windows there is evidence of moderate movement of some of the large stone mullions and lintel units. Often in buildings of this age there is little or no tying in of such components to the main structure. It is therefore not uncommon for there to be small relative

movements which can be ongoing. Annual and diurnal temperature variations cause regular expansion and contraction of masonry. These movements can be taken up locally in soft mortar joints, but can also sometimes affect whole wall panels especially if the mortar joints are hard. For example a south facing stone wall in summer could reach 35 degrees centigrade, and yet be around 0 degrees in winter. For a solid stone wall this correlates to an unrestrained movement of about 11mm in a wall length of 30m. Solid stone projecting feature bay windows (of which there are 4 on Derby House) are vulnerable to such thermal movements as they can be pushed / twisted by expanded planar walls in summer. When the wall subsequently shrinks back in cold weather vertical butt joints tend to open up. If these are then mortar filled to seal out possible rain ingress, a hard spot is created, and the pattern of movement can repeat. During the conversion works consideration should be given to stitching some of the bay window units using stainless steel bars to stabilise displaced / cracked items.

EXTERNAL PERIMETER WALLS – BULGING

There is one area of wall above second floor level on the southeast elevation which appears slightly bulged. It is possible that the panel was built like this, or has been in this stable condition for a long time, but it is also possible that it is indicative of movement. A more detailed check of this panel is suggested. If the inside face of the wall is found to be flat and plumb, then the bulge may be the result of de-bonding of the rubble fill within the wall. The second floor joists locally appear to span onto this wall, and therefore should offer sufficient restraint. At second floor ceiling level there is likely to be far less restraint. During the conversion works an allowance should be made for further investigation and possible stitching using proprietary ties such as “Helifix” or “Cintec”.

Within the window reveals any evidence of possible splitting of the external walls due to de-bonding of the rubble fill appears minimal. However with a well maintained building, regular resealing and repainting of window frames can mask such movement. It is recommended that the reveals are inspected more closely when scaffold access is in place.

EXTERNAL PERIMETER WALLS – PENETRATING DAMP

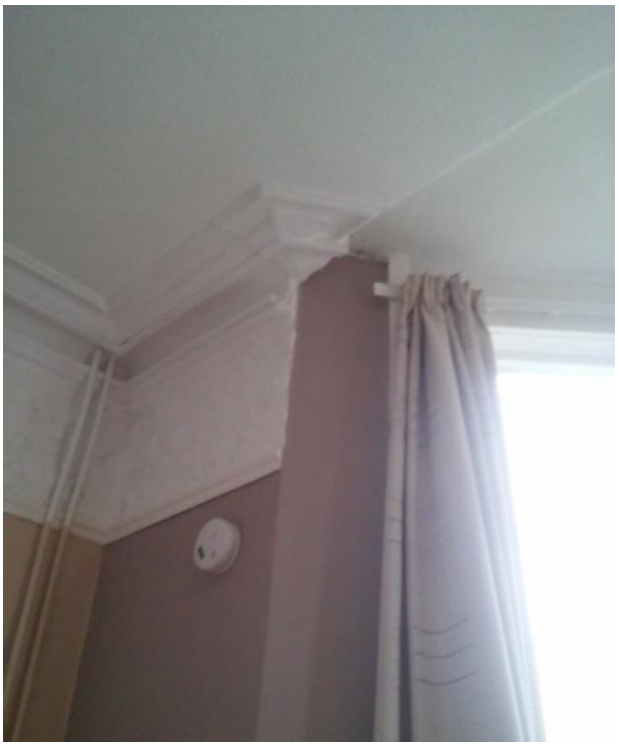
The most exposed corner of the building is where the northwest and southwest walls meet. Here internal dry-lining is evident. In winter this corner is likely to be cold and liable to condensation, but could also be subject to penetrating damp from wind-driven rain. There are several other locations where dry-lining has been installed

SUSPENDED GROUND FLOOR

About half of the existing ground floor uses suspended timber joists, possibly spanning onto dwarf walls to reduce the spans to half the room widths for economy of timber. There is no access to the subfloor voids other than the 2 cellar rooms. At two of the door thresholds at ground floor level there is a significant variation in level. This could be indicative of decaying joist end bearings. Allowance should be made for access and thorough inspection of all ground floor timbers which are to be retained and reused. In the longterm consideration should be given to replacement of the joists with a more durable alternative. If the ground joist are found to be in poor condition, selected upper floor joist ends built into the external walls (NW end wall at first floor, and SW side wall at second floor) should also be inspected for possible decay.

PHOTOGRAPHS

Annotated photographs of identified defects follow.



NW corner at first floor– possible evidence of penetrating damp or condensation

NW corner at ground floor– possible evidence of penetrating damp or condensation

Recent patch repairs to bay window butt joint

Displaced stone masonry units and cracking to bay window

Recent mortar fillet cosmetic repair to butt joint at first floor bay window end mullion

Stitch repair to cracked stone lintel. Note cosmetic paint coating has de-bonded

Cracked lintel to squared bay below point load from offset mullion above (splayed bay)

Superficial erosion and mortar repairs to north elevation splayed bay lintel

Consultant's Advice Note – Derby House – Final Option

Date: February 2018 **Doc No: CAN/03** **Pages 2**

From: Richard Houghton **File No: 16021**

Attention **Raida, Adam Bench** **Company Email / Fax**

TO: **Bench Architects**

Structural Commentary to Conversion Proposal

SUMMARY

The final option (option 1 – refer 16021 CAN/02 RevA) is the less preferred structurally , however in practical terms, the extent of intervention does not differ widely. The formation of new doorway and access openings at all floor levels required for the final option carries a risk of stress releases which could lead to minor cracking as the more fragmented structure "beds in".

THE PROPOSAL (FINAL OPTION)

GENERAL

The proposal creates 6 large apartment units on 3 floor levels. Each unit is linear with the existent central corridor being retained as the main divider on each floor. The major effects on the structure of the building are discussed as follows:

FOUNDATIONS AND SUBSTRUCTURE

The proposal requires the formation of new door openings through loadbearing walls in a number of locations, and the provision of new non-structural partition walls in various locations. Loads to the foundations will remain relatively unchanged.

STABILITY

The adaptation of crosswalls to form new openings at each floor level will significantly weaken the resistance of the building to lateral loads, and also its tied integrity. In the current layout the stability resistance is more than adequate, but the degree of wall removal will require an assessment of the modified stability. Even if calculations prove the acceptability of the new layout, in reality there will be some "release" of locked in wall stresses such that cracks due to some bedding in of the modified structure should be anticipated. These movements could take several

months to stabilize. An allowance should be made for the insertion of new main ties across the central corridor at say 4 locations per floor, in order to ensure that the building acts as a single structural unit when subjected to lateral loads.

WALLS

New internal doorway lintels will be required at all of the new openings. These should incorporate ties to replace the tying action afforded by the original full wall panels. Refer also to the section above on stability.

SUSPENDED UPPER FLOORS

Due to the age of the building an assessment of the timber floors to carry the new loads, including any new lightweight partition walls and acoustic / fire protection treatment, should be undertaken. Whilst the upper floors generally appear sound an allowance for insertion of new joists under new partition walls (possibly even small steel beams to meet depth criteria) is recommended.

It is understood that the redevelopment will involve the universal lifting of floorboards in order to allow inspection of the structure, and upgrading of both the acoustic separation, and also the fire compartmentation. Joists will need assessing for current standard strength and deflection criteria for loads which include any additional dead loads due to acoustic linings, etc..

GROUND FLOOR

The intention is to replace the existing inaccessible suspended zones with RC slab on insulation. It is assumed that over the cellar rooms, precast concrete beam and block will be used. The ground conditions will need to be assessed for additional induced settlement if the new increased dead weight of fill, slab and screed is significant. Mechanical ventilation radon gas protection measures will need to be incorporated. Existing ground bearing floor zones would also be excavated and replaced using insulated RC slab panels.

ROOF

It is assumed that the roof will remain essentially as existing. Where supporting walls are to be removed below, transfer steel beams will need to be inserted into the loft space. The details for this will need to be confirmed once the exact structural arrangement of the roof has been investigated.

BUILDING REGULATIONS

The size, number of storeys and use of the building require a “lower risk” class 2A designation. This implies that for **new** construction there need to be positive horizontal ties between timber floor joists and loadbearing masonry walls. Dead bearing of the floor joists onto walls would not be sufficient. For an existing historic building a relaxation on this requirement would need to be discussed and agreed with Building Control.