parmarbrook

Bedford Row Chambers

6-7 Bedford Row, London, WC1R 4BS

STRUCTURAL INSPECTION REPORT

Job No: 1800

June 2018

Prepared by James Holland

Approved by Peter Cosgrove

Document: 1800 IR1 Rev 0

PRELIMINARY

1.0 Introduction

Parmarbrook were commissioned to undertake a structural inspection of the existing properties at 6-7 Bedford Row, London. The inspection was to consider the condition of the existing masonry and timber structure and highlight any areas where further investigation or remedial works were necessary. Particular attention was to be given to apparent settlement, particularly to No. 7, as observed by sloping floors, internal cracks and uneven masonry to the front (Bedford Row) elevation of the building.

To help inform this report, Parmarbrook commissioned intrusive opening up works intended to reveal the structure at certain locations throughout the building and these were inspected and reviewed on site on 23rd May 2018.

This report has been developed with the assistance of the client and design team described below.

Client:	7 Bedford Row Chambers
Architect:	Fit Out Expert
Opening up Works Contractor:	Lumia I.S.

2.0 Executive Summary

The structure of the existing building is generally in good condition for its age. Throughout the building there were instances of superficial cracking to the timber framed walls and finishes however these do not appear to have translated through to the brickwork which appeared to be in sound structural condition.

The structural timber (joists, rafters etc) appeared to be in good condition with no significant deterioration or section loss due to rot or insect attack noted. The floor joists to the upper floors were typically 190x55mm sections at approximately 400mm centres. They were typically spanning 4m and were considered adequate for the usage of the building for office space.

Settlement was apparent to the central wall running from front to back in No. 7 and given that settlement was noted to both the front and rear elevations this appeared to have occurred to the full length of the wall. This settlement was further evidenced by areas of cracking to the wall and a slope to the adjacent floors which are supported on the wall. It is unclear if this settlement is historic or ongoing and to substantiate this monitoring of the cracking will be necessary.

Information from the proposed monitoring and survey works will confirm if the settlement can be attributed to the current usage of the building and what remedial works are required, including a possible requirement for foundation improvements to the central wall.

3.0 Site

The existing building comprises of two 5 storey grade 2 listed Victorian terraced structures (6 & 7 Bedford Row) which have been combined at some point by small door openings in the party wall to form a single property. The combined property is generally rectangular in plan and is bounded by the public highway to the west and party walls with Nos 5 and 8 Bedford Row to the south and north respectively.

To the east there are several modern extensions, believed to date from the 1980s, fronting onto Jockey's Fields. These also form part of the property and are connected to the historic Bedford Row building by a courtyard and a link building. These do not form part of the scope of this report.

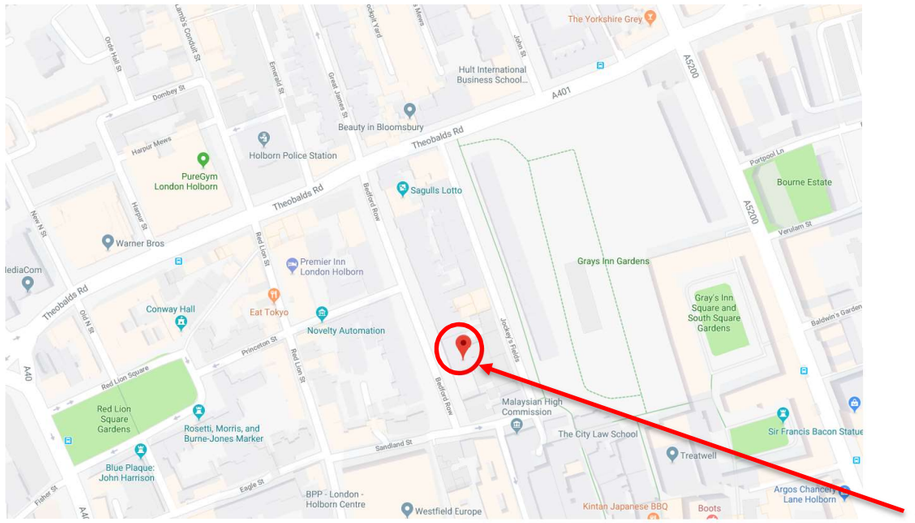


Figure 1. Local Map ©Google

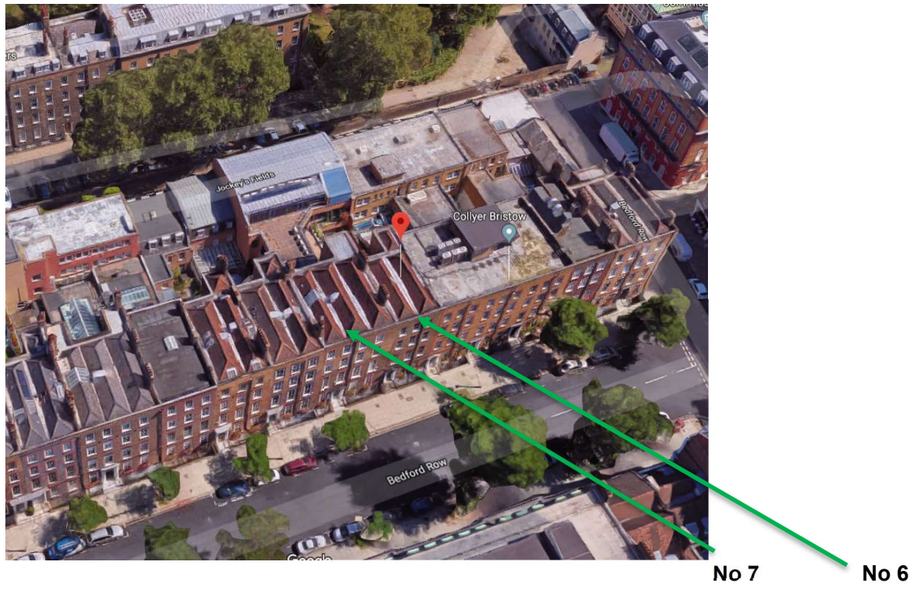


Figure 2. Aerial view of site from west © Google

4.0 Existing Structure

4.1 Available Information

Fit Out Expert provided Parmarbrook with Architectural survey plan drawings completed by Pario Architecture (dated August 2017) for the existing building which have been used to inform and complement the inspection works carried out on site. Given the age and style of the building and surrounding area it is likely that the building was originally constructed as 2 separate residential dwellings and later (at an unknown date) converted for office use.

Parmarbrook carried out an initial site visit on 14th December 2017 with the aim of identifying areas where the structure was to be opened up for further investigation and again on 24th May 2018 to inspect the areas opened up and identify any additional distress or cracking to that identified during the first visit. Refer to appendix A, for notes from the site visit on 24th May 2018.

The British Geological Survey records indicate that ground conditions close to the site comprise of made ground to a depth of approximately 2-3m, overlaying a layer of sands and gravels to a depth of approximately 6m, overlaying London clay to depth (depths are below street level). Given that the basement level of the building is approx. 2m below street level this would suggest that the formation level for the foundations is likely to be in either the made ground or the layer of sands and gravels.

The routes of both the new Crossrail (Elizabeth Line) tunnels and the Piccadilly branch of the middle level sewer, a large Victorian era interceptor sewer, are known to pass under the immediate area but their exact proximity to the site is not known (see figures 4 and 5).

A desk study was carried out to obtain record information of the existing building but that has not yielded any useful information.

The conclusions derived in this report are based only on the information described above and that gathered during Parmarbrook's site visits, including hand measurements of the structural member sizes.

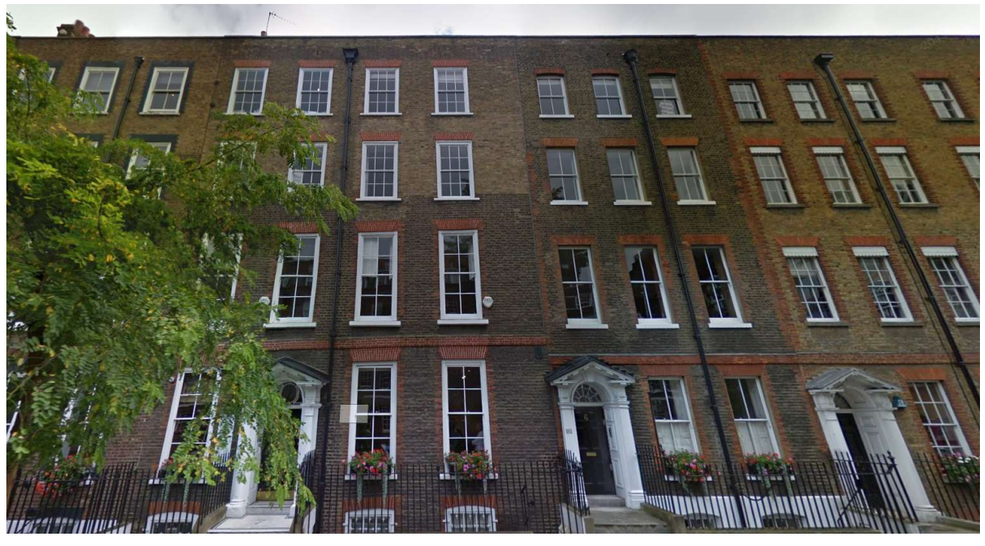


Figure 3. Bedford Row elevation © Google

Figure 4. Approx. route of new Crossrail tunnels © TFL

Figure 5. Map of Central London Victorian era Intercepting Sewers © AECOM/Thames Water

4.2 The Existing Structure

As is common for the style of building, the primary structure consists of timber floor joists spanning onto solid brick walls. The main roof comprises several hipped structures approx. 1.5m high made up of cut timber rafters spanning onto brick walls or timber transfer beams and which together form a series of valleys and ridges running from front to back.

4.3 Floors

Inspection of the opening up works showed that the joists typically are 190mm deep x 55mm wide sections at approx. 400mm centres spanning approx. 4m parallel to the street onto a combination of the solid brick party walls, the solid brick internal wall in No7 and internal timber transfer beams spanning from front to back. The transfer beams typically comprise of 2no approx. 200mm deep x150mm sections bolted together to act as a single section (see figure 6).

Figure 6. Typical timber joists and transfer beam

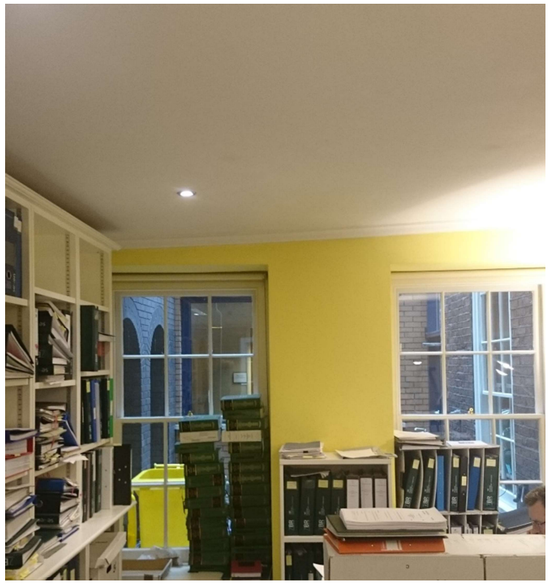


Figure 7. Sloped floor to No7

Both the joists and transfer beams appear to be in good condition with no major deterioration or section loss due to insect attack or rot noted. However, neither the joists nor transfer beams appear to be original suggesting that at some point in the past they have been installed as part of a refurbishment of the building – this could possibly explain why they appear to be in good condition.

The floors appeared to be solid throughout with little to no bounce or springiness noted at sample locations where a dynamic load, simulated by light jumping up and down, was applied. This would additionally suggest that the floor joists are in good condition. There is a notable slope to the floor in some areas, particularly in No7 where the floors appear to slope towards the internal supporting wall (see figure 7). This is likely to have been caused by settlement of the supporting wall (see section 6) and is not thought to indicate any structural issues with the floor joists themselves.

4.4 Roof

The roof rafters typically comprise 100mm x 50mm deep sections at approx. 400mm centres which are supported at eaves level either directly onto the solid brick party walls or onto a series of timber transfer beams arranged similarly to those at the lower floors (see figures 10 and 11).

The rafters were inspected via the loft access hatches in the ceiling of the top floor. The loft areas appeared to be dry with no damp or evidence of water ingress being noted. The rafters appeared to be in good condition with no evidence of sagging and no significant deterioration or section loss due to insect attack or rot noted.

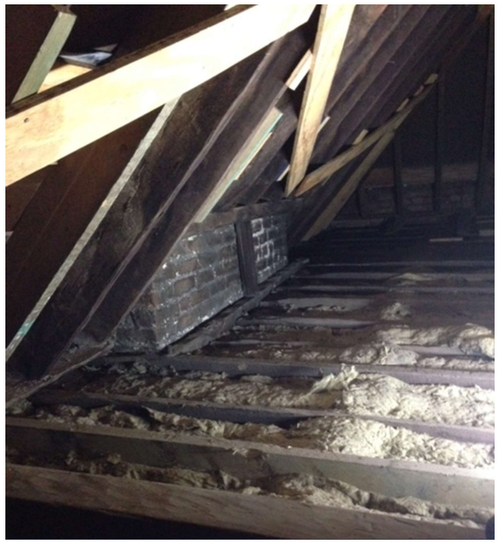


Figure 8. Typical timber roof rafters and loft joists

Figure 9. Typical timber loft transfer beams

Externally where visible, the roof slates appeared to be in good condition however these could only be inspected locally via the small dormer windows present in some of the loft areas and a full survey of these was not carried out.

Arrangements for the drainage of rain water from the pitched roofs appeared to comprise an open valley gutter in the space between the pitched roofs with the water flowing down a series of steps to downpipes located in the front and rear elevations (see figure 10). Again, this guttering was only inspected locally from the small dormer windows but where visible appeared to be in good condition and well maintained. However, we would note the importance of good ongoing maintenance of these areas as any water ingress down to the structural roof timber due to defective guttering or ponding could cause problems with rotting of the timber. The potential for ponding is particularly pertinent as the level of the overflow pipes appeared to be approx. 100mm above the surrounding roof level.

Figure 10. Typical guttering to roof valleys

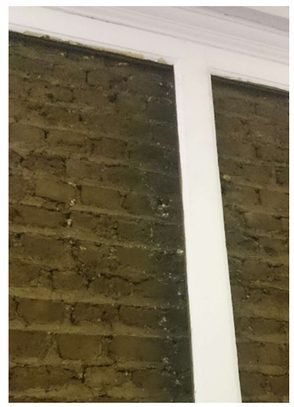


Figure 11. Typical solid brick wall at basement

4.5 Walls

The inspection of the load bearing brick walls where the finishes had been removed generally confirmed that the cracking visible to the plaster and timber panelling was not evident to the brickwork (see figure 11). The brickwork workmanship did appear to be somewhat adhoc in places however this was fairly common at the time of construction and structurally the walls appeared to be in sound condition. Wall thicknesses ranged from 440mm at basement level to 215mm further up the building.

5.0 Floor Loading

As would be expected for the type of building, calculations for the span, size and spacing of the floor joists show that they can support a residential imposed floor loading of 1.5kN/m2 as stipulated in BS6399:1 Loading for Buildings.

The buildings current usage as office space requires a minimum imposed load of 2.5kN/m2 as per BS6399:1 and calculations do suggest that the floor joists may not meet this requirement. However, the building has been used as office space for a long period of time and given that the floor joists do not appear to be exhibiting any signs of distress we do not anticipate any requirement for floor strengthening works to enable the continued usage of the building as office space.

In fact, the current floor arrangements and layouts (locations of desks, files/paperwork etc) are generally sympathetic to the floor structure and any future alterations to the layouts will need to consider this.

6.0 Settlement

6.1 Evidence of Settlement

Settlement to the front elevation of No 7 is visible from the public highway as can be seen in figure 12 where there is a visible slope to the red brick banding and lintels above the windows immediately to the right of the front door. A similar occurrence, albeit less pronounced, was noted to the rear elevation. The location of the above slopes to the brickwork matches the location of the sloped floors to No 7 (see section 4) – i.e. adjacent to the central brick wall in No 7.

The slopes to the brickwork noted above, together with the slopes to the floors noted in section 4, appear to have been caused by settlement of the central brick wall in No 7. The floors it supports then settle unevenly to give the slopes noted during the inspection. Areas of cracking to the plaster were also noted internally to both the central areas of this wall and the corner junctions where it meets the front and rear elevation walls (see figure 13).

This cracking was noted during Parmarbrook's initial site visit and appears to be largely historic however further survey works will be required to substantiate any progressive movement.

Figure 12. Settlement to front elevation

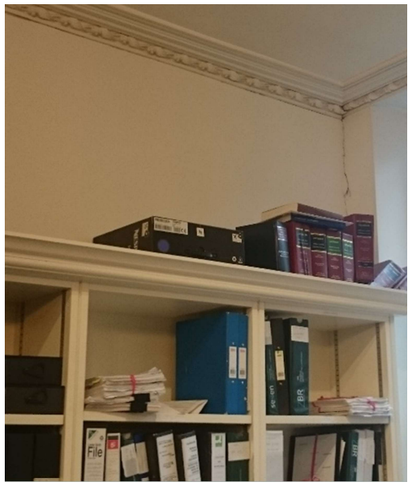


Figure 13. Cracking to corner of internal wall and rear wall

6.2 Potential Causes

Borehole logs, available from the British Geological Survey, for the immediate surrounding area show that the likely ground conditions on site comprise 2-3m of made ground overlaying a shallow layer of sands and gravels. The basement level is approx. 2m below the street level and thus the foundations are likely to be bearing in either the made ground or the top of the sands and gravels.

Close inspection of the front elevation of No7 (see figure 3) reveals what appears to be newer (lighter) brickwork above 1st floor. This suggests that the upper floors were either added as additional floors or that they were re-built. Given the similar height of the adjoining properties, which from the appearance of the brickwork do not appear to have been significantly altered, it is likely that the upper floors of No7 were re-built, possibly after sustaining bomb damage during the Second World War. This, unlike the addition of new floors, should not have added additional load to the foundations.

Given the level below the public highway and granular nature of the probable bearing strata for the foundations it is unlikely that the settlement is the result of any clay shrinkage.

Although the route of the new Crossrail tunnels is known to pass under Bedford Row the construction of these is unlikely to have caused the settlement since it appears to be localised to the internal wall of No7 only. Due to the depth of the new tunnels, any settlement caused by the construction of the tunnels would be expected to be more widespread and also affect the adjoining properties.

Any settlement associated with the interceptor sewer which is also known to pass under Bedford Row is almost certain to be historic since the sewer dates from the 1860's.

6.3 Further Survey Works

To establish if the settlement is ongoing or historic it will be necessary to monitor the cracks and the central wall. This is typically carried out by a line and level survey using fixed base points which can be used to accurately measure any movement over time. We recommend that this is started as soon as possible with measurements being taken every 6 weeks over a period of 6 to 9 months.

Where cracking has been identified at the junction of two brick walls, particularly to No7 where there is known to have been settlement of one or more of the walls (see figure 13) we would recommend that the wall finishes are removed to expose the brickwork and determine the extent of any cracking within the brickwork, how effective the bonding between the walls is and how much they have moved apart from each other. The separation and de-bonding

of brickwork walls at corner junctions is a common occurrence in historic buildings of similar age where there are known to have been problems with settlement and remedial works to tie the walls back together may be required.

6.4 Remedial Works

The cracking to internal walls is largely confined to the plaster and timber panelling and any remedial works associated with this should be largely cosmetic in nature such as infilling and making good cracks to the plaster or replacement of timber panelling. At any locations where the cracking has propagated through to the brickwork the most common form of repair would be to introduce small steel reinforcement bars (e.g. helifix bars) into the mortar bed across the crack as shown in figure 14. However, based on the sections of brickwork walls that were exposed and inspected it is unlikely that these works will be necessary to the internal walls. Any improvement works to the central wall base will be subject to the results of monitoring.

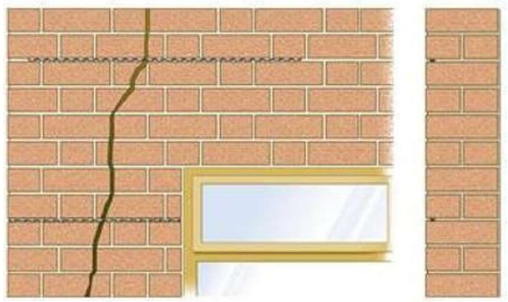
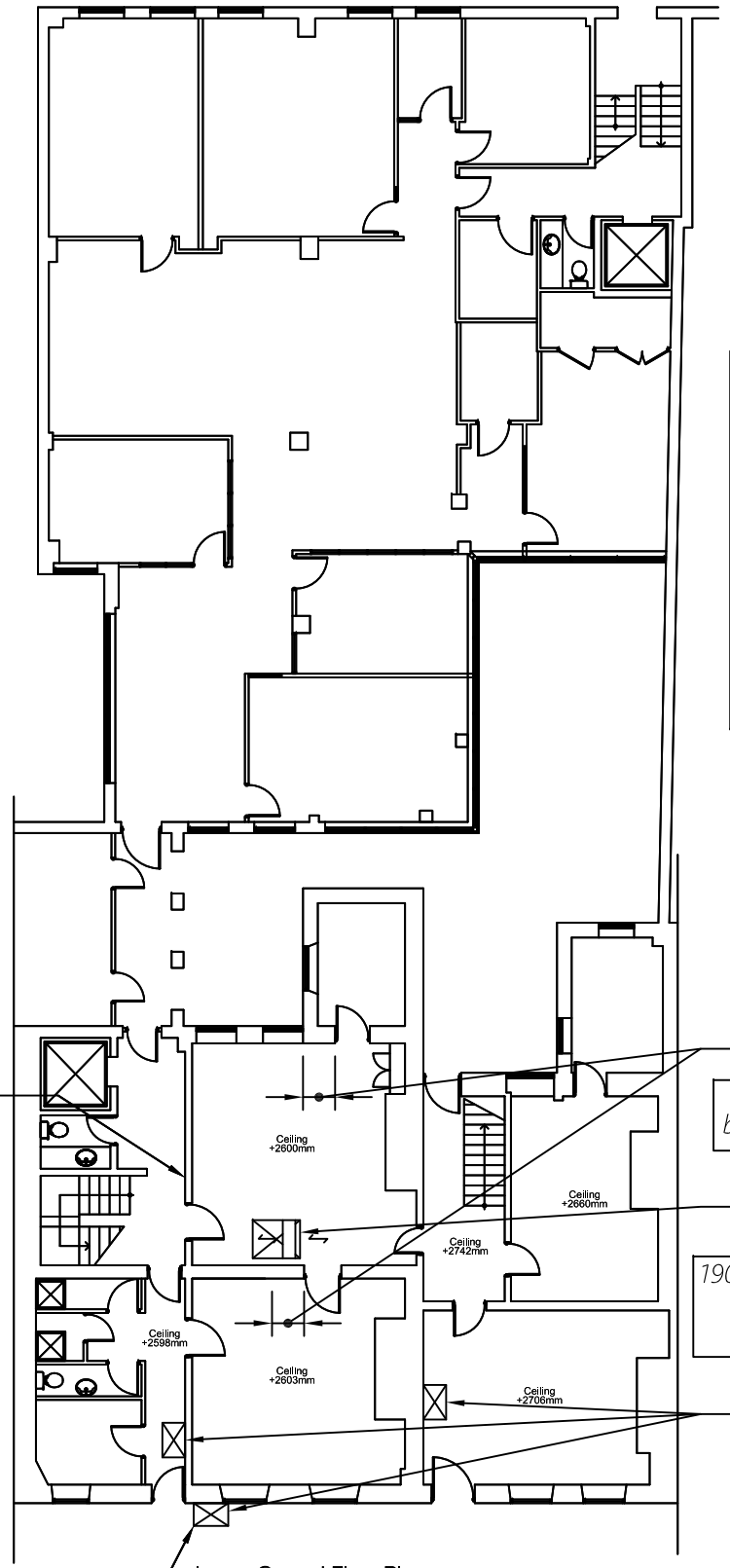


Figure 14. Bed joint reinforcement remedial works to cracking

Externally, any cracking that was identified was only hairline and localised in nature (see figure 15). If desirable these could also be repaired as above (this may require listed building consent) or by localised re-pointing, however these works would be considered cosmetic as there is no structural requirement for them.

Figure 15. Hair line cracking to front elevation

Appendix A – Opening Up Works and Site Visit Notes



Lower Ground Floor Plan

Parmarbrook notes from site inspection on 24/05/18 shown in italics

NOTES:

ALL HOLES MIN 600 x 600mm.

ALL PLASTER REMOVAL MIN. 600 x 600mm AREA AROUND CRACKS.

PRIOR TO REMOVAL OF WALL PANELS CONFIRM NO CONFLICT WITH LISTING OF BUILDING AND CONSERVATION RESTRICTIONS.

330mm thick brick wall. Appears to have settled along whole length

REMOVE PLASTER AROUND CRACK

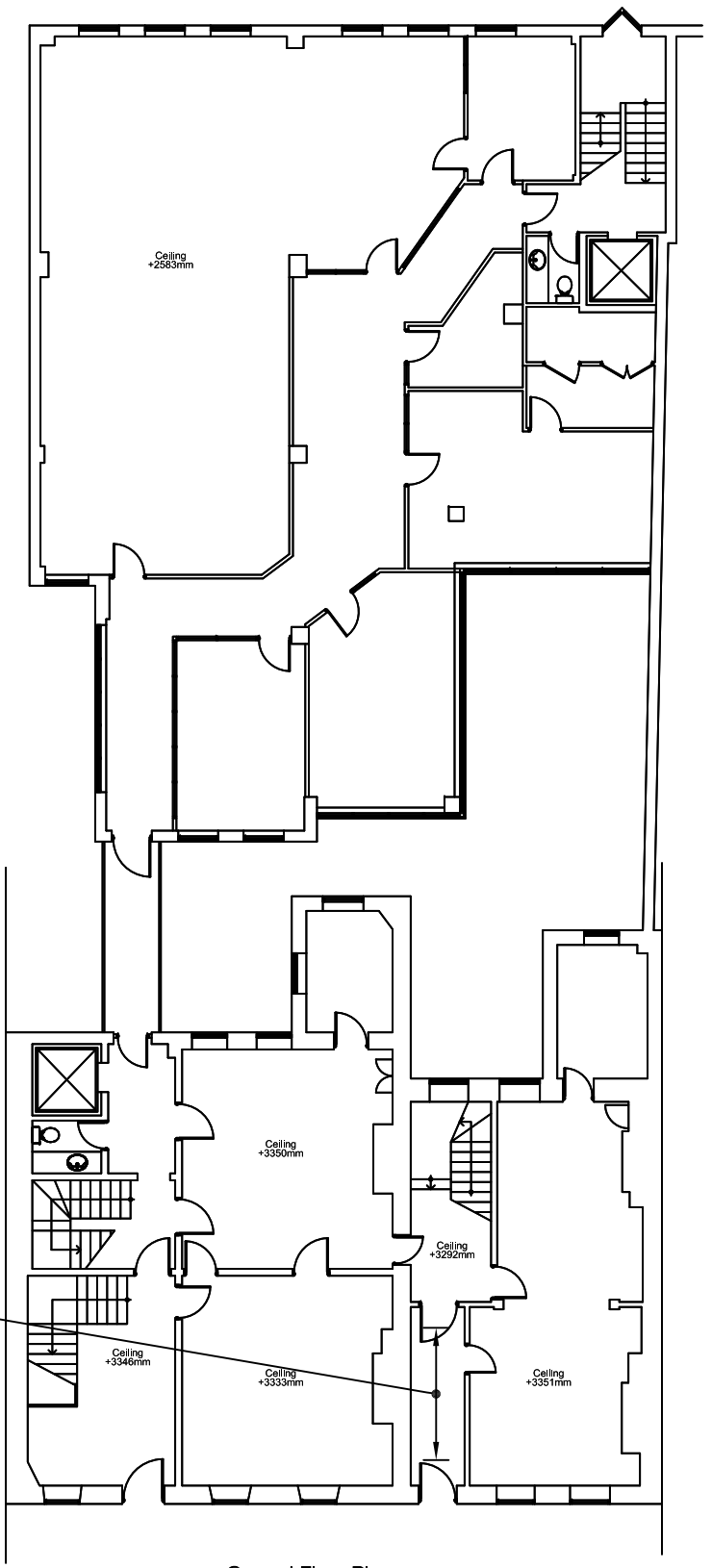
crack extends into brickwork(hairline only)

REMOVE CEILING AND EXPOSE FLOOR STRUCTURE ABOVE

190x55 joists @ 400C/C and 230x340 timber beam as shown

TRIAL HOLES TO EXPOSE BASE OF WALLS

300 thick concrete slab to well area. Base of wall not exposed



Ground Floor Plan

REMOVE WALL PANELLING

Brickwork appears to be poor quality but no evidence of cracking or significant movement

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8. ALL DEMOLITION WORKS SHALL BE UNDERTAKEN STRICTLY IN ACCORDANCE WITH THE PARTY WALL AGREEMENTS.

REV	DATE	DESCRIPTION	BY
A02	26.06.18	ISSUED FOR INFORMATION.	J.H.
A01	18.01.18	ISSUED FOR INFORMATION.	S.E.

AMENDMENTS

Project:
6-7 BEDFORD ROW LONDON

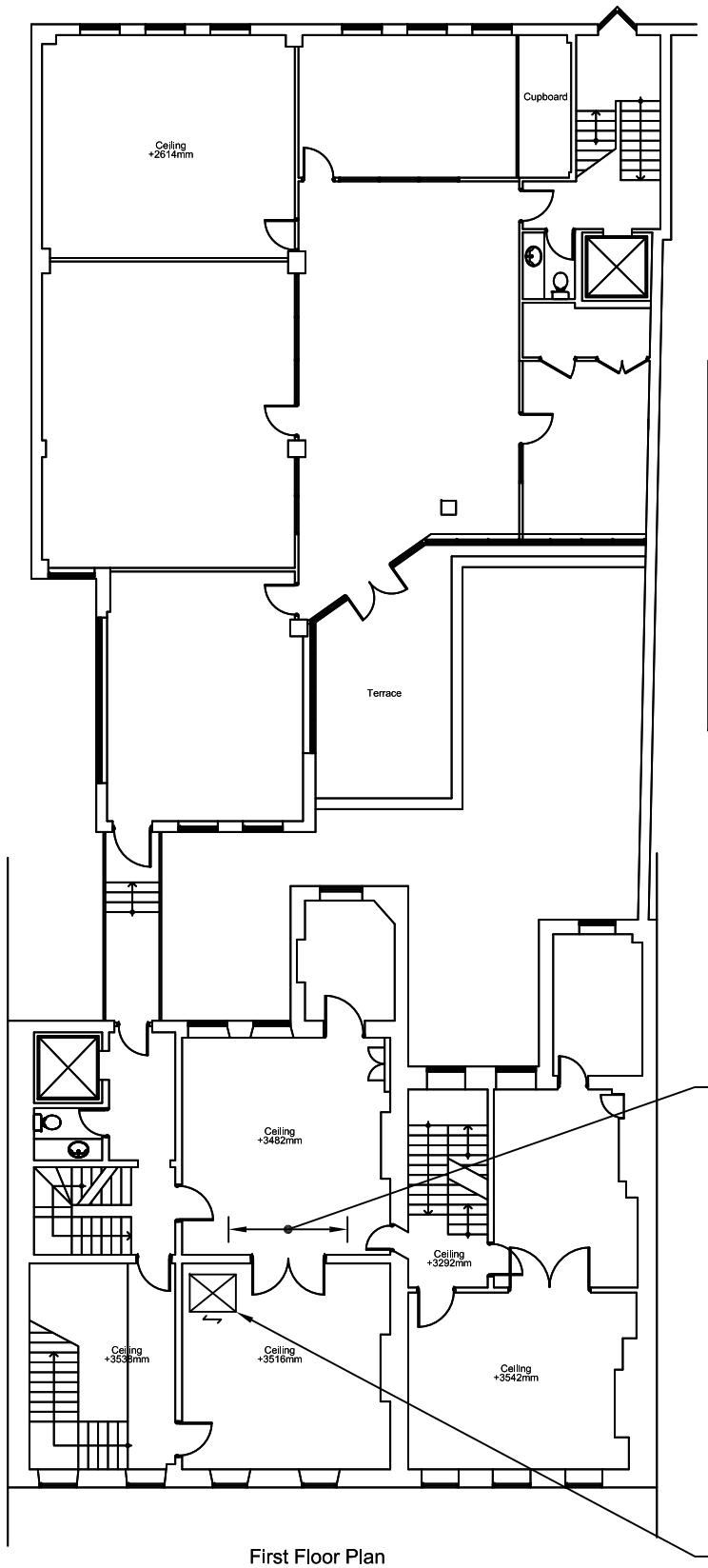
Title:
LOWER GROUND & GROUND FLOOR PLANS

Client:
BEDFORD ROW CHAMBERS

Architect:
FIT OUT EXPERT

PRELIMINARY

Designed:	P.C.	Drawn:	S.E.
Checked:	P.C.	Date:	JAN '18
Project No:	B1800	Scale @ A3:	1:200
Drawing No:	SK001	Revision:	A02



First Floor Plan

Parmarbrook notes from site inspection on 24/05/18 shown in italics

NOTES:

ALL HOLES MIN 600 x 600mm.

ALL PLASTER REMOVAL MIN. 600 x 600mm AREA AROUND CRACKS.

PRIOR TO REMOVAL OF WALL PANELS CONFIRM NO CONFLICT WITH LISTING OF BUILDING AND CONSERVATION RESTRICTIONS.

LOCALLY REMOVE PLASTER OVER OPENING TO EXPOSE LINTEL (IF ANY)

75mm thick non load bearing timber wall

LOCALLY REMOVE PLASTER OVER OPENING TO EXPOSE LINTEL (IF ANY)

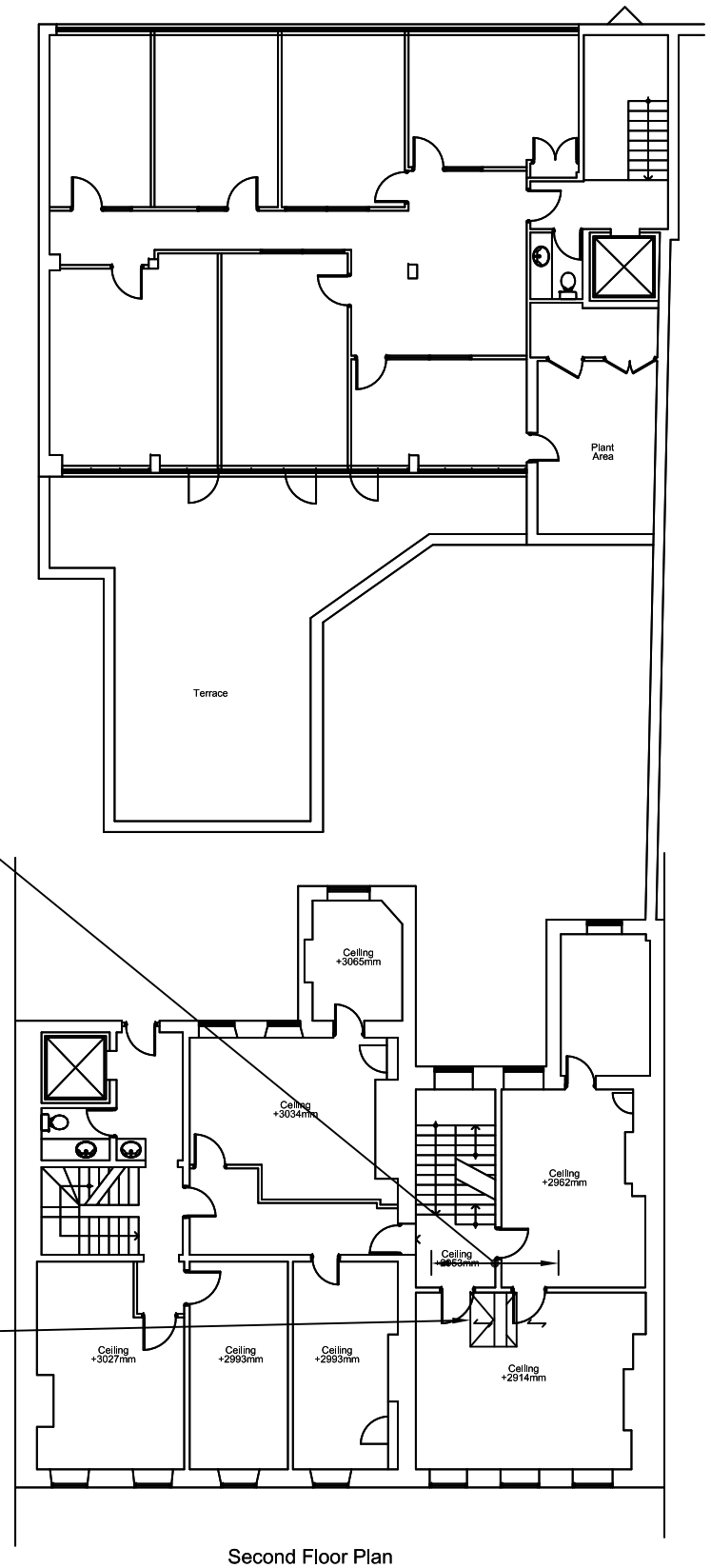
Load bearing timber frame. No lintel. Bracing cut

LIFT UP FLOOR FINISHES AND BOARDS TO EXPOSE FLOOR STRUCTURE & BASE OF WALL

190x55 joists @ 400C/C and 230x340 timber beam as shown

LIFT UP FLOOR FINISHES AND BOARDS TO EXPOSE FLOOR STRUCTURE

190x55 joists @ 400C/C as shown



Second Floor Plan

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A01	18.01.18	ISSUED FOR INFORMATION.	S.E.

AMENDMENTS

Project:
6-7 BEDFORD ROW LONDON

Title:
FIRST & SECOND FLOOR PLANS

Client:
BEDFORD ROW CHAMBERS

Architect:
FIT OUT EXPERT

PRELIMINARY

Designed:	P.C.	Drawn:	S.E.
Checked:	P.C.	Date:	JAN '18
Project No:	B1800	Scale @ A3:	1:200
Drawing No:	SK002	Revision:	A02

Parmarbrook notes from site inspection on 24/05/18 showin in italics

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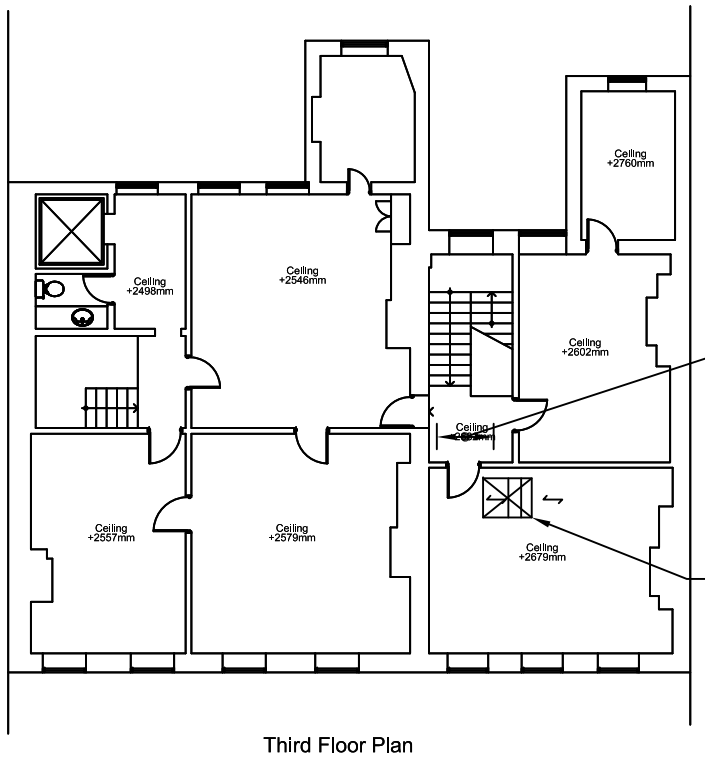


Third Floor Plan

ACCESS TO ROOF SPACE REQUIRED. BUILDER TO BRING SUITABLE ACCESS EQUIPMENT PLUS APPROPRIATE BOARDS FOR MOVING AROUND ROOF SPACE.

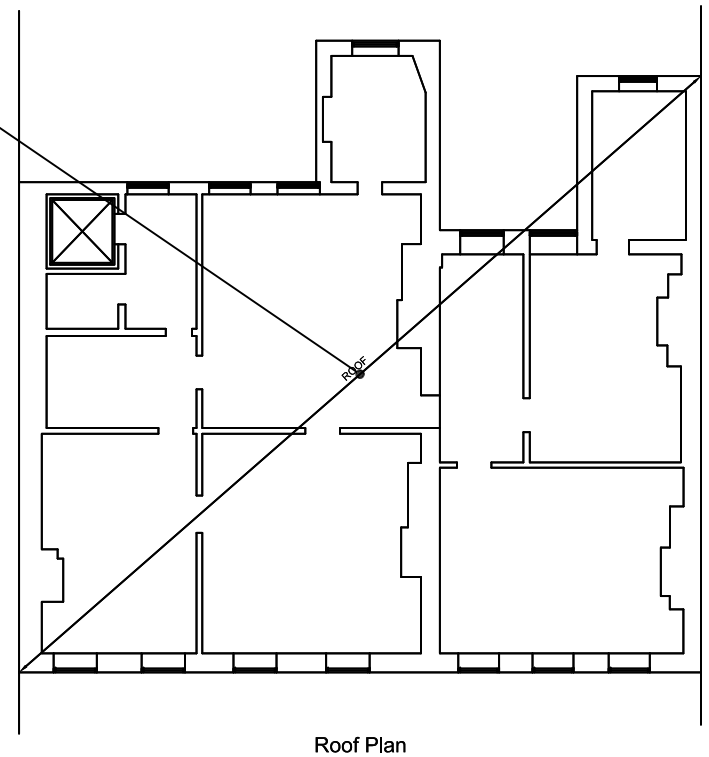
100x50 timber rafters @400 c/c supported on party walls or timber transfer beams

LOCALLY REMOVE PLASTER OVER OPENING TO EXPOSE LINTEL (IF ANY)

non load bearing timber wall

LIFT UP FLOOR FINISHES AND BOARDS TO EXPOSE FLOOR STRUCTURE & BASE OF WALL

190x55 joists @ 400C/C and 230x340 timber beam as shown



Roof Plan

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THIRD FLOOR & ROOF PLANS

Client:
BEDFORD ROW CHAMBERS

Architect:
FIT OUT EXPERT

PRELIMINARY

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Drawing No:	SK003	Revision:	A02