engenuiti

Mr John Farrell
Sterling Property Developments Ltd
6th Floor, 60 Gracechurch Street,
London EC3V 0HR

3rd August 2018
Ref: 20180803/01089/JB

Dear Mr Farrell

5 DENMARK STREET – CONDITION SURVEY OF REAR EXTENSIONS

As requested, a visual condition survey of the above property was undertaken on Monday 30th July 2018, with an additional survey of the Book Mews elevation on Tuesday 31st July. This letter summarises the findings of the survey. The survey relates to the rear extensions behind the original 17th Century terraced building that fronts Denmark Street.

Engenuiti have previously surveyed the rear extensions and raised concerns about both element condition and capacity, as well as overall stability. As a result of these concerns the adjoining owner has erected an external temporary steel bracing frame (designed by others) around the East, South and West sides of the building to protect the adjacent buildings (4 and 6 Denmark street) and the Book Mews construction site from further movement or deterioration of the rear extensions to 5 Denmark Street.

Following our visit to re-survey the building in more detail, our original concerns remain:

Structural Capacity of Rear (South) Wall
The rear masonry wall contains large arched windows at ground, first and second floor levels. The masonry is showing significant cracking due to arch spread at ground and first floor. Review of record photos of the wall and close inspection of the cracks from a MEWP show that this is a historic problem of the façade likely due to the inadequate size of the piers to resist the thrust. A steel tie has been installed at first floor level, however this does not appear to have arrested the spread with cracks measured up to 7mm wide at this level. At second floor level half a window has been infilled which appears to have resolved the spread at this level on the east side. In the short term the external temporary steel frame should limit further movement or spread of the arches provided that it is packed tightly to the existing structure, however, this is a fundamental problem of the design of the building that requires rectification.

Stability of West Flank Wall
The wall has a significant lean over adjacent property, particularly between first and second floor. It is likely that the floor structures are not adequately tied to the wall. No direct measurement of the lean of this wall has currently been completed. Should the wall lean be outside of 1/3 of the wall thickness, the wall should be rebuilt as continued movement could lead to collapse of the wall. Below this trigger level of incline, a view could be taken to adequately tie the building and monitor it in situ. In the short term the external temporary steel frame should limit further outward movement of the wall provided that it is packed tightly to the existing structure.

Engenuiti Limited
3rd Floor
The Pavilion
1 Newham's Row
London SE1 3UZ
United Kingdom

www.engenuiti.com
+44 (0)20 7089 5760

Engenuiti Limited
Registered in England &
Wales, Reg No: 7098752

engenuiti

West and East Flank walls above Second Floor

These walls have a significant bow and lean in towards property. The Masonry east wall has a measured bow of approximately 60mm over the first to second storey. The western stud wall (northern section) has an approximate lean of 100mm over a single storey. We believe the wall was built straight. The western masonry wall (southern section) has a significant lean out over the adjacent Grade II* listed building at 6 Denmark Street. The

1950's masonry roof top extensions are likely to have caused settlement of the roof and floor structures which has caused the walls to bow and lean. These extensions should be removed as soon as is practical and the walls of the second-floor structure should be rebuilt.

Second Floor Structure

There is a significant fall from east to west of circa 100mm. The access door to outside is heavily distorted and shows signs of continued movement to the west, with cracks at the door head of 3 to 4mm since it was last cement rendered. There is an internal column with high level moulding that shows signs of movement of the column to the east. Given the degree and variety of movement, we would recommend that the bearings of the beams and floor joists are checked to be adequate by intrusive investigation.

Ground floor Pier Capacity

The high level (first floor) continuous (300mmx300mm) timber transfer beam is supported by a central masonry pier. The beam end to west shows signs of rot and requires repair. The brick wide masonry pier supports the majority of floors above and is therefore a critical element. A back calculation of the pier shows it to be at capacity, based on assumptions of material strength. The pier has been previously stripped of finishes which has likely led to its current condition with heavily chipped and missing corners. Any failure of this element will likely lead to the disproportionate collapse of the building. This element and the support of the floors above requires significant additional strengthening or tying so as to achieve an adequate level of robustness.

Lateral Stability (East-West direction)

The rear extension has no discernible lateral stability system in the east-west direction as the large arched openings in the south wall make the wall insufficient to resist lateral loads over the full height of the building. It is possible that the height if the building has been extended multiple times from an original height that was acceptable. The 17th Century terraced building that fronts Denmark Street has a more recent masonry stair core and as part of the terrace shares its lateral stability system with the adjacent buildings and is therefore not a cause for concern.

In the short term the external temporary steel frame will provide some additional stability in the East-West direction provided that it is packed tightly to the existing structure.

Existing / historic buildings are often built without discernible lateral stability systems. The acid test of a building that has stood for 50-100 years is - has it moved; is it moving and is it or will it soon be stable as a result of any movement? In the case of the rear extensions to 5 Denmark Street, they have moved, they appear to be continuing to move and it is potentially not stable and will not become stable as a result of the movement, therefore intervention is required.

Engenuiti Limited
3rd Floor
The Pavilion
1 Newham's Row
London SE1 3UZ
United Kingdom

www.engenuiti.com
+44 (0)20 7089 5760

Engenuiti Limited
Registered in England & Wales, Reg No: 7098752

engenuiti

Initial Recommendations

It is not acceptable that a building be reliant on the temporary works of its neighbours to be a safe structure. Swift and effective remediation is required.

Most of the individual element problems identified above stem from a combination of the lack of stability of the overall system in the East-West direction, as well as the later roof top masonry additions. As the wall and floor elements are not laterally braced back to anything, this had led to the leaning and spreading without constraint making the building almost "a house of cards".

Individual elements could likely be replaced or repaired, however together they account for a large percentage of the building fabric. There is an issue of practicality and safety of trying to replace and repair so many elements that are directly adjacent. Replacement or repair would also not address the fundamental design flaw of the building – the lack of lateral stability.

Could lateral stability be retrofitted? In theory a frame could be added inside the building to provide this stability, with floor and wall elements tied to it. Alternatively, at least one of the windows in the rear (south) wall could be infilled with masonry over the full height of the building, although this would reduce the natural light into the floor spaces. An additional core wall within the building may also be considered to give balance to the stability system of the structure.

Such remedial works and repairs are likely to significantly alter the character of the rear extension and are unlikely to be economic, affecting the viability of the building as a whole.

After careful consideration, our recommendation is the dismantling of the building to at least first floor top of wall level. Rebuilding the rear wall from high level ground floor level would have the added benefit of properly addressing and rebuilding all the arched windows to the rear façade. The building should be rebuilt in its current form around a new frame that provides lateral stability and secures walls and floors adequately. This will be reliant on a safe and systematic approach to the rebuilding being identified within a very tight site. The temporary stability of the eastern wall from ground to first floor, as well as the masonry section of the western wall from first to second floor, are of particular concern given the lean over the neighbouring buildings. The rear wall will be required to be adequately stitched and repaired and effective ties installed from wall to wall to prevent the continued spread of the arches. To address the issue of the single pier at ground level supporting the floors above, it is recommended that the new frame through the rear extension should be installed to directly support the floors, removing the requirement for this pier and requiring the replacement of the first floor as well.

Engenuiti Limited
3rd Floor
The Pavilion
1 Newham's Row
London SE1 3UZ
United Kingdom

www.engenuiti.com
+44 (0)20 7089 5760

Engenuiti Limited
Registered in England &
Wales, Reg No: 7098752

engenuiti

Alternatively, given the level of intervention detailed above, which is in effect a limited façade retention and new framed structure within, due consideration should be given to the complete replacement of the building with a fit-for-purpose structure and inherent stability.

Yours sincerely,

John Bailiss MEng CEng MIStructE
Associate Director

John.bailiss@engenuiti.com

Engenuiti Limited
3rd Floor
The Pavilion
1 Newham's Row
London SE1 3UZ
United Kingdom

www.engenuiti.com
+44 (0)20 7089 5760

Engenuiti Limited
Registered in England &
Wales, Reg No: 7098752