Structural Assessment Report

Project information

Job No: 2017-017
Date of Report: 28th April 2017
Client: Mr B Mortstedt
Address: 21 Mulberry Walk, London SW3 6DZ.

Structural Assessment

Overview:-

The existing structure has been altered over its life span to provide for the needs of the occupiers not only current but previous. This is a natural process that happens with many London properties, due to their age and the needs of the occupier’s, alterations and upgrades of the structure are often carried out or required. It is also common given the age of this type of property that inherent defects in the original quality of material used and design details that were adopted at the time of construction, once uncovered can require extensive remedial works. Examples of these can include floor plates not being sufficiently tied into external wall, floor plates have been carved up to fit new or replace previous services and so forth. These alterations can have the side effect of reducing the structural capacity of a building over time. As a result careful examination of the building as a whole and its current condition must be carried out with a view to the potential impacts of any proposed works.

The approved works are significant in their nature and require heavy plant and machinery to operate in close proximity too, and under the existing structure. The difficulties these present to the construction of the project and, in addition given the constrained nature of the site, there is a strong argument that the safest and most practical path forward for the project would be to completely demolish the existing property and start the new works from this point. However, in order to conserve as much of the property as possible, much time and effort has been spent detailing ways to retain as much of the existing building as possible. In reality the practicalities suggest that only the front facade can reasonably be retained, therefore the recommendation of this report is to undertake the complete rebuilding of the entire façade rear and internal walls, along with the roof structure allowing a cohesive structural system to be put in place.

Project description:-

21 Mulberry walk is situated mid terrace, backing onto the large residential properties Elm park road. The property consists of a three storey structure and would appear to have been constructed in the later part of the 19th century. The building is typical of other properties along the street of similar age and construction.

An original walk through survey was carried out prior to any works beginning on site and this didn’t reveal any particular signs of issue with the original structure, however the current owners have described several alterations that have been carried out to the property by themselves over time. Stripping out works will be carried out at a suitable point however from previous experience of this type of structure and in particular in this locality we are expecting the original stability system of the building to have been altered significantly.
The opening up works are expected to show that the structure has seen many changes and alterations over the years as new owners adjusted and redesigned the internal layouts of the property. This has resulted in an eclectic array of construction methods and structural supports potentially ranging from a mixture of concrete and steel framing through to more traditional methods of timber upon masonry supporting walls.

Given the potential mixture of the different structural solutions, a detailed assessment is required of the interaction of the proposed new alterations and the existing structure to ensure the structural elements of the project are sufficient for future use. However the solutions for these can be expensive and time consuming to implement and therefore our suggestion to remove as much of the existing structure as possible in order to eliminate this issues.

The proposed works are extensive and will include the complete refurbishment of the existing structure in addition to the construction of a rear extension with basement levels.

**Client brief:-**

The client requested for our opinion as to the potential implications and issues between incorporating the proposed works into the original existing fabric of structure. Previous experiences on similar projects in close proximity to this development have led to construction issues for the contractor through the works. In an effort to minimise the impacts and as a preemptive precaution, Elite Designers have been requested to carry out an inspection of the existing conditions of the structure forming the original building and produce a report as a record.

**Existing Structure:-**

**Foundations:**

The existing property is likely to sit on a variety of different types, widths and depths of foundations around the property. This is most due to parts of the structure being constructed by different methods and at different times through its life span, there is evidence suggesting the rear of the building was subjected to bomb damage and may have been previously rebuilt. This means that the bearing pressures capacities under the footings are not uniform throughout, therefore the potential issue is that the possibility of differential settlement between the various foundation types is increased.

While this doesn’t appear to have affected the existing structure to date, given that we will be underpinning large portions of the existing structure the potential for settlements even of a small nature is relatively high. It is necessary therefore to minimise the potential impacts of these settlement by ensuring they are as uniform as possible and suitably controlled. It is therefore recommended that as many of the internal walls and the rear façade (as this is supported on the new concrete slab) be removed and rebuilt after the basement works have been completed and the supporting steel frame installed. This will allow any settlement movements to be controlled by construction sequencing and reduces the risk of the internal structure pulling at the external façades requiring invasive remedial repairs down the line.

**Internal Walls:**

On the ground floor a number of internal walls have been built directly off the ground floor concrete slab and as such do not have a footing to speak of. While these walls tend to be non-load bearing and are acting as partitions they are only 4” thick and approximately 2.8m high. The other main dividing walls are most likely original to the time of construction of the house but are likely to sit on corbeled brick footings. Again while they have been in place for an extended period of time, the proposal will require the use of heavy plant and piling rigs in close proximity to these walls. Being so slender these elements are particularly sensitive to vibrations and impact loadings and so therefore should be considered as a risk and actions should be taken to mitigate that risk (the easiest method is by their removal).
**Brickwork:**

The rear façade appears to be constructed of solid brickwork which varies in thickness from 13” to 9 “at higher levels. Externally the façade appears to be in reasonable condition for its age, however information suggests the rear façade has been previously rebuilt follow bomb damage during the war. The date of repairs is some time in the 1950’s given further evidence to the fact that the building will be sitting on a number of differing types of foundation. From site measurements taken the façade seems to be reasonably plumb. Lintels above windows appear to be intact and show little sign of being over stressed or in need of repair. It should be noted that the façade was inspected from ground level only.

**Comment on existing condition:-**

There have been numerous repairs and alterations carried out over time and these have had the effect of altering how the structure behaves to applied loads.

As described above many of the issues have not had a detrimental effect on the building in its present state but the proposed works are extensive and require heavy machinery and works to be carried out. It is important that we assess the potential impact of these works on the structure rather than looking at the state of the existing structure in isolation. Piling and deep underpinning works are required in close proximity to existing internal wall which sit on possibly poor foundations. Access is required through the existing structure to allow works to be carried out to the rear of the property. This will require large sections of the supporting structure to be carved up in the temporary situation. This will be subjected the structure to much more onerous loading patterns during construction and its future use than it would have experienced in the past.

Furthermore there is the opportunity for the entire structure to be properly supported on a new uniform foundation system; eliminating potential problems from differential settlement. Effectively this would require the removal of all the internal structure along with the rear façade and the reconstruction of these elements following installation of the new foundations and supporting steel frame.

Furthermore to this the contract is for a very high end property with the appropriate high end finishes and as such an attitude of patching and repair should not be adopted unless absolutely necessary. An approach should be implemented where by the end result of the works is of a priority. Trying to maintain workmanship and materials which may be adequate, but are sub-standard, will most likely lead to issues further down the line, issues which would require aggressive and unsightly remedial work unsympathetic to the project as a whole. While it is necessary to conserve features of the building, much of the existing structure is of a standard type and of little interest from a heritage or conservation point of view.

**Proposed Structural solution:-**

The proposal involves internal alterations to the existing property with a large basement excavation. It is proposed that the basement will be constructed using a combination of traditional reinforced concrete underpins and contiguous piling. This allows for maximum retention of the existing external facades of the building while allowing the proposed works to be carried out efficiently and safely.

The underpinning and piles are to be propped by a steel frame which is incorporated into the proposed layouts. The frame continues from the lower levels up into the existing property to carry floor plates and tie the existing structure together at high level. The resulting structure will be efficient and homogeneous in form while retaining the more visible facades and elements of the existing structure.

**Conclusion:-**
Over its life span numerous alterations have taken place, which alter the behavior of the structure. This has resulted in potential flaws and coupled with sections of poor materials and workmanship at the time of original construction, areas of weakness may now existing throughout the structure which have the potential to be exacerbated by the proposed works.

In addition the proposed works include a deep basement which will re-support the existing structure above, this would potentially introduce further foundation types to those present with the likely hood of differential settlement becoming a real problem. It would without doubt make the project easier to construct and execute if the property in its entirety was demolished and a clear site left to undertake the works. However, being central London and given the sensitivity of the surrounding properties, in the interest of conserving as much of the property as possible, it is the author’s opinion that it would be prudent to remove as many of the potential issues discussed above as possible while retaining any element of interest of the existing structure. This can be achieved by removing the all of the internal walls from the building (which consist of an eclectic mix of materials and methods of construction) along with the rear façade which will be supported by the frame rather than directly on existing foundations. This would have the result of addressing most of the issues discussed along with negating any potential future issues with differential settlement.

When viewed as a whole there is the opportunity to both improve the quality of the existing structure while negating future issues with the building and the retention of as much existing structure as possible. Given the brief to achieve as best an end result as possible it would seem sensible to carry out the works as described.

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