8 Cable Street, Manchester M4

Report on structural condition including recommendations on how to stabilise & refurbish the building



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1 Introduction

1.1 In March 2001 Price & Myers were commissioned to report on the structural condition of this building. A report was prepared for the benefit of the Manchester Chinese Christian Community who subsequently purchased it and converted it into a church. In the years that followed the church completed a series of works with the aim of stabilising the building. This included replacing all the windows, repairing the external brickwork face and reroofing the building. Unfortunately few of the churches plans for the conversion of the building into a full Community Centre were realised. Ultimately it became evident that the community did not have the resources to realise their ambitions. Limited funding ultimately meant that the church could only secure the envelope of the building. These works were completed in 2006 and are referred to as the Envelope Works

1.2 New owners have purchased the building with plans to convert the building into residential apartments. They have employed us to complete this report based on the strength of our long association with the building. We have an extensive record of past investigations and records of subsequent work. The new owner's plans for the building are far less intrusive structurally which is ideal considering the grade 2 listed status of the building and its value as an increasingly rare survivor of Manchester's early industrial and commercial heritage.

1.3 The purpose of this report is to outline the buildings current structural condition and assess the implications of further structural repairs and alterations. Detailed consideration and design of the proposed alterations goes beyond the scope of this report.

1.4 As structural engineers we are unable to advice on issues related to timber decay, water ingress and building services unless there are obvious structural implications.

2 Description of Existing Structure

2.1 The form of structure can be briefly described as follows:

- The building has a solid loadbearing brickwork structure of varying wall thickness.
- The walls support a regular grid of heavy timber cross beams which in turn support timber joists at ground, first, second and third floor levels.
- Intermediate support is provided by a line of steel stanchions.
- The roof is formed of heavy timber trusses spanning the full width of the building. These in turn support timber purlins and rafters.
- The building has a half depth basement with concrete floor slab.
- Foundations are likely to be spread brick on mass concrete onto the underlying natural soil.

2.2 Apart from a few historic shallow trial pits no ground Investigation has not been carried out on the site however we have seen borehole logs from close proximity to number 8. The trial pits and borehole logs suggest that the underlying soil is a firm to hard brown silty clay with occasional pebbles. It would also appear that the water table is below the level of the basement.

2.3 We suspect the building dates from the early to mid-19th century although the subsequent history of the building is unclear. We understand that conservation specialists may have determined this history in more detail.

2.4 It has always been a standalone building although it is believed small infill sections may have linked it with a building which once stood in the adjacent car park to the south east.

2.5 We suspect the building was originally used for warehousing linked with the extensive cotton or wool trade of times past. The building stayed largely untouched until the 1920's-30's when a series of major structural alterations were completed. These included:

- Introduction of a new brick and concrete staircase at the narrow end of building.
- Introduction of a secondary brick and concrete staircase at the wide end of the building.
- Introduction of a steel framed goods lift from basement to third floor accessible from all floor levels. This effectively replaced an external hoist system, evidence of which can be seen at the wide end of the building.

In the decades up to the 1920's-30's the building must have become distorted in plan (as described later) and to address the problem an extensive streel framing system was introduced to stabilise it. A lack of load beaming capacity in the primary timber floor beams was also addressed plus remedial work aimed at holding the building together.

2.6 The building changed ownership in 1945 and the family who purchased it used it for general warehousing. We believe that in 1977 some work was completed to address structural problems. This included some local rebuilding of the Cable Street elevation and all the parapets. There was also some rebuild of the main elevation at the Addington Street return which may have addressed some historic local settlement in the structure.

2.7 In 2001 the building was purchased by the Manchester Chinese Community Church. Under their ownership the building was left largely untouched apart from the reconstruction of the roof structure, external brickwork repairs and replacement of all the windows. This constitutes what we have described as the Envelope Works.

3 Structural Observations

During the inspection of the building in April numerous photographs were taken. These supplement the collection of photographs taken of the building and its defects since first inspected in 2001. All of these are available for inspection if required. The following is not intended to be a detailed record of every structural defect identified during our inspection in April. The purpose of the following is describe the general flavour of defects.

3.1 The building exhibits significant evidence of severe distortion in plan starting from the first floor upwards. This is almost certainly a problem which developed early in the buildings life. Eventually a past owner took the decision to arrest the movement by introducing steelwork trusses below all four floors in the 1920's-30's. Steelwork portal frames were also introduced at third floor level to further stiffen the structure at the upper levels. When the roof structure was refurbished and re-braced in 2006 these frames became redundant and were removed. It was also noticed that the stairshafts introduced in the 1920's-30's remain essentially vertical but the original rear wall has pulled away from them at both ends of the building.

3.2 No evidence of foundation settlement or movement was detected in the basement walls and stanchions despite the historic evidence of local settlement in the superstructure at the Addington Street return.

3.3 The basement walls were rather damp but nothing that cannot be addressed via an appropriate waterproofing solution specified and installed by a Specialist Contractor.

3.4 All four external elevations were inspected from street level. In 2006 these elevations were extensively repaired and consequently there is little to record in terms of active defects. Extensive areas of brickwork were repointed, cracks were stitched, holes filled and evidence of distortion corrected. The one area that hasn't responded well to the repair work is the Cable Street elevation above the main entrance. Arches have slipped and cracks have reopened over and below window openings. Some temporary propping of the arches was introduced c.2009 in response to concerns raised by the Church.

3.5 Internally the walls were not repaired in 2006. Consequently what we see now is essentially unchanged from our first inspection in 2001. Cracks and brickwork disruption exist above and below virtually every window opening to the three street elevations. Some of the cracks are quite large but apart from some cracks to the Cable Street elevation none of these cracks is readily identifiable externally. The general conclusion is that the cracks are largely historic and can be made good with confidence that they won't reappear. The same confidence cannot be applied to the cracks in the Cable Street elevation which suggest a deeper problem still exists with this wall as discussed in section 4.

3.6 The roof structure was rebuilt in 2006. This work was done in accordance with the design we produced at the time. The roof structure as rebuilt shows no signs of distress.

3.7 Around the perimeter of the building at street levels are a series of pavement lights. Nine of them can identified, six along Chadderton Street and three along Addington Street. They are set over small recesses in the basement walls. All nine basement structures are in good condition structurally with no signs of movement. In the refurbishment of 2006 we believe all remaining evidence of the pavement light inserts were removed and the voids covered over with concrete slabs and asphalt paving.

3.8 Although not a structural matter it is worth noting that the internal drainpipes that can be seen at third floor were considered temporary in 2006. Unfortunately 10 years later these downpipes are still in use. In would be advisable to get a Builder to make sure these pipes are well supported and not leaking. A failed drain could cause considerable internal damage if the building is left empty for any length of time.

3.9 The floors are defined by a series of timber beams that span between front and rear long elevations and take intermediate support from a series of cast iron stanchions. These beams are undersized for any reasonable level of domestic floor loading. The steel frames introduced in the 1920's-30's has effectively strengthened virtually all these timber beams making them fit for retention. The greatest concern with most of these timber beams is the fact that they are generally built into the external walls which presents a risk of decay. Previous works have removed many of these buried ends and re-supported the beams. There are many instances of bearing replacement being combined with the introduction of some restraint straps to help protect the building from further distortion developing.

3.10 Between the floor beams are an array of timber joists. Most of these joists are in reasonable condition structurally although once again there is a concern about the number of joist ends built into the solid external walls at each end of the building.

3.11 At the entrance end of the building a remnant of the original internal vertical structure is retained. A cast iron column exists at basement level. The column is missing at ground floor but continues at first and second floor in solid timber.

4 Discussion

4.1 Building Stability

4.1.1 The steelwork bracing frames described in 3.1 remain essential to the long term health of the building and cannot be removed. During our visit in April we noted a collection of cracks in the end elevations including some slippage of the windows arches. It's possible that these are the result of a lack of mass to restrain the spread of the window arches but we have suspected for a long time that the simple horizontal reaction from the floor trusses is too large for the masonry end elevations to resist without some help.

4.1.2 It is interesting to note that in a conversation with the owner of the building prior to 2001 it was remarked that they had monitored the movement and scale of building distortion over the previous 30 years and were convinced that the movement had stopped. We were not convinced of this at the time and the subsequent 15 years of continued movement in the end elevations suggest that the elevations are not fully stable and more work is required.

4.1.3 Within the scheme for the Church as developed after 2001 we had plans to substantially rebuild the ends of the building to introduce some stiffness in the building. The residential conversion will not offer the opportunity to introduce such work so we need to consider two actions:

- Action 1 - The end elevations need to be effectively clamped to resist the tendency for arches to spread. This will also assist the walls in resisting the reaction from the steelwork floor frames. These works are illustrated throughout the sketches in Appendix A.
- Action 2 – At mid length of the building we recommend that an additional full height steel frame be introduced within the plan. This will greatly reduce the reaction loads applied to the end elevations and take the load through a path to new foundations in the basement. These works are also illustrated throughout the sketches in Appendix A.

4.2 Timberwork in the floors and walls

4.2.1 In 2001 we completed a number of checks on the various floor joist and beam sizes and their capacity. The conclusions from this work remain equally valid in 2016:

- The floor joists have a reasonable capacity suitable for the planned use of the building i.e. residential use with partition loading.
- The main beams supporting the floor joists have a much more restricted capacity. Fortunately and as described earlier the framing introduced to stiffen the building effectively strengthens the cross beams to a level consistent with the supported floor joists.

Despite this positive assessment precise quotation of actual capacities is not possible at this stage. This is dependent on more detailed interpretation and analysis of the structure.

4.2.2 Some local repairs and strengthening will be required but such work should be relatively straightforward although the total amount of such work will be extensive.

4.2.3 Of greater concern is decay of the timber buried within the external brickwork walls. This was identified as a problem in 2001 and very little remedial work was completed in the subsequent years. Particular areas of concern are the bearings of the main floor beams and joists where they sit in the walls plus all timber lintels and bonding plates.

4.2.4 We would expect a general rehabilitation internally to include a proper allowance for replacement of timber beam and joist ends. We would also recommend the replacement of all timber lintels and bonding plates unless they can be demonstrated to be fully intact and without decay.

4.2.5 At the Cable Street end of the building one of the original cast iron columns has been retained in the basement. At ground floor the stanchion is missing but continues above in timber. The missing section at ground floor needs to be reinstated, ideally in cast iron or steelwork. The basement cast iron section and timber sections above remain satisfactory subject to the same conditions on fire-protection described below.

4.3 Fire protection

4.3.1 All the exposed steelwork and floors in the building are devoid of any form of fire protection. For the proposed residential use the floors need upgrading to one hour protection as a minimum and possibly more in common areas. Any form of building refurbishment should treat resolving this problem as the highest of priorities.

4.3.2 Since the steelwork framing is essential to the stability of the building it will all need fire protection. This can be achieved with an intumescent paint finish or overcladding with a board finish steelwork framing.

4.3.3 A typical joist in the building is of modest size and allowing for the normal rate of charring (say 20mm in 30 minutes) and reduced emergency loading they have a modest rating of considerably less than 30 minutes under fire load. Unfortunately the floor boards are even more lightweight and under fire load have no meaningful fire rating.

4.3.4 We would strongly recommend overcladding all ceilings and steelwork to ensure an appropriate level of fire protection is provided.

4.4 Basement

A new drainage system will be required within the building. The scale of refurbishment plus waterproofing works suggest the need for a new reinforced concrete floor slab throughout the basement. The current underground drainage is not fully defined but is believed to exit the building in the direction of Cable Street.

4.5 Pavement Lights

4.5.1 The 6 pavement lights along Chesterton Street will be reopened for use. The slabs installed in 2006 will be removed. The lintels/beams carrying the external wall over the voids will be replaced or repaired as appropriate. New proprietary pavement lights will be installed. The most obvious solution would be to use a Cast Iron product. It is not proposed to design these for Planning since the selection of the appropriate grade and section thickness would come out of detailed design. It is reasonable to expect that they will need to be designed for vehicle

loading including possible HGV loading. The location of these six pavement lights is shown in the sketches in Appendix A.

4.5.2 The 3 pavement lights along Atherton Street will remain redundant and work should be completed aimed at ensuring the long term support of the wall above and existing pavement infill. This work should be done in a way that can be reversed at a future date.

5 Conclusions & Recommendations

5.1 The intention of the following works is to stabilise the building and make it more robust long into the future. The works will not impact on the integrity of the Listed Building and could be reversed at some future date without damaging the listed fabric of the building. The key remedial work is as follows:

5.2 To address the spreading action from the window arches plus the in-plane thrust from the steel frames under the floors we propose the installation of steel restraint straps on the inside face of both end elevations. The plates will be 50 x 8mm mild steel set within the depth of the internal wall linings and plugged & screwed back to the brickwork. The ends of each plate will have welded mild steel threaded rods set through drilled holes in the brickwork. Externally they will be fitted with cast iron pattress plates with nuts or internal turnbuckles for tightening. Such plates are commercially available from Iron Foundries or Blacksmiths. We will define the tightening torque required to develop an effective clamp action on the end walls. Apart from the pattress plates these restraint straps will not be visible although it should be noted that at one end the plates will pass through the back of the obscured liftshaft.

5.3 None of this work is particularly difficult or complicated and apart from scaffolding and working platforms no significant temporary works will be required. We could debate the choice of external restraint plate material but we believe that the ones in place at present are a little too crude. We would recommend products from a firm like Redgwick at http://www.redgwick.co.uk/ who specialise in components which respect the heritage value of the underlying building.

5.4 To help resist any further long term movement in the rear elevation adjacent to the car park we propose the installation of a further six restraint plates similar to the six already in place at the moment. It may be appropriate to replace the six simple and rather crude mild steel cruciform plates with cast iron pattress plates. These would be more acceptable visually and more in keeping with the age of the building.

5.5 We propose the installation of an internal braced steel frame about half way down the floor plan and set within the depth of the proposed partitioning between apartments. The frame will need to extend from new basement foundations upto the soffit of the third floor. The frame will be physically connected to the existing timber and steel internal frame but not replace any of the latter. The intention is that the frame relieves load from the steel floor frames at each level and consequently reduces the in-plane forces on the end elevation.

5.6 The internal faces of all the external walls need to be cleaned of old finishes and fittings. Once clean the numerous cracks and defects are identified and a comprehensive schedule of repairs needs to be agreed with the conservation officer. The works are likely to focus on brickwork stitching and repointing. A similar but far less extensive schedule of external brickwork repairs needs to be agreed and completed.

5.7 The missing stanchion in the ground floor entrance lobby needs to be reinstated.

5.8 The six pavement lights on Chadderton Street can be reopened and covered with a proprietary cast iron pavement light panels. The choice of appropriate loading and detailed design of the solution is beyond planning requirements. The three pavement light voids on Chadderton Street will remain redundant and will be made secure for possible opening at a later date.

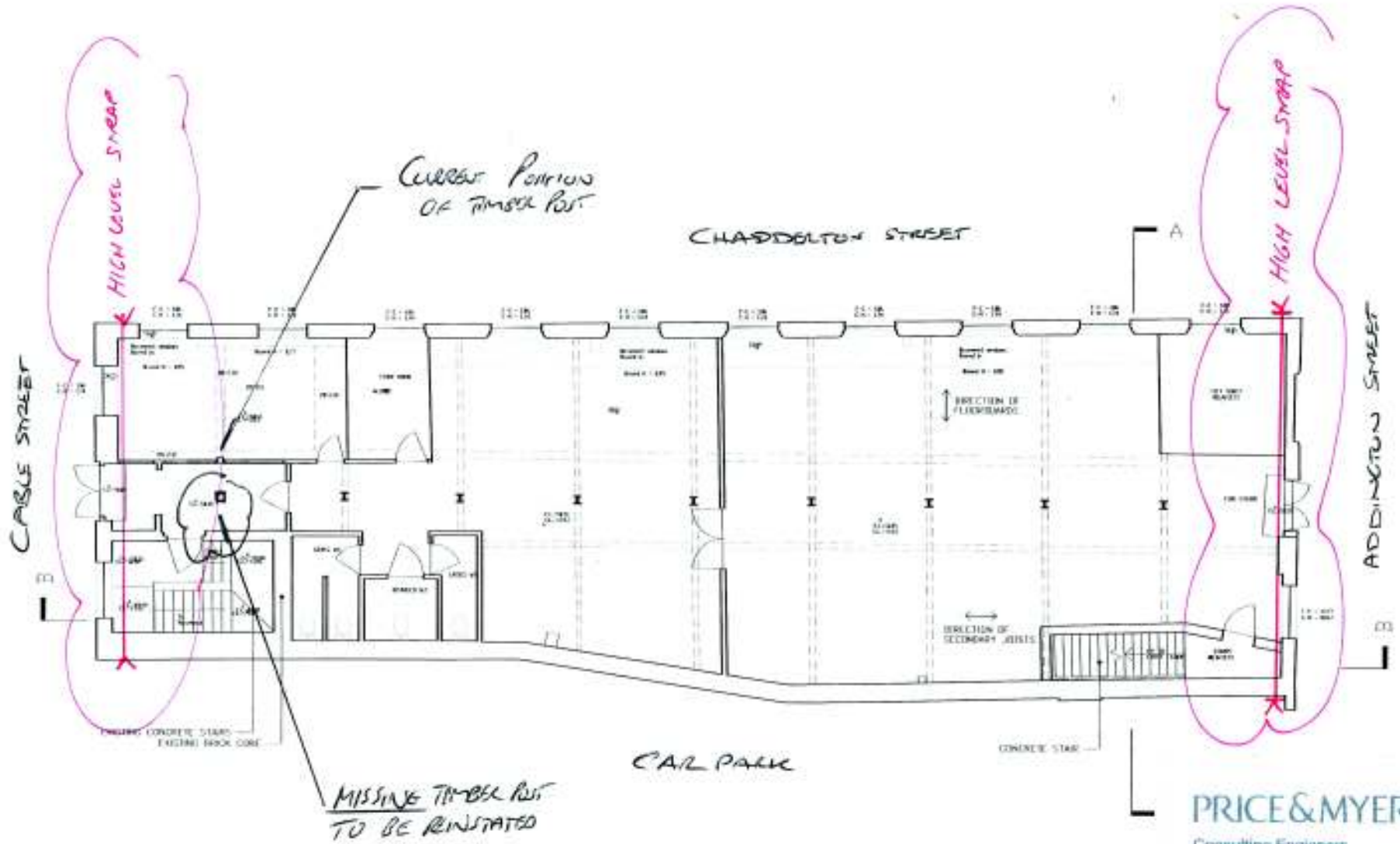
5.9 The floors have little inherent fire protection. We recommend applying intumescent paint to the steelwork in the building plus the application of fire rated boarding to the soffit of all floors.

5.10 A new basement floor slab is needed plus a new underground drainage system.

5.11 A concerted effort is required to eliminate the last remaining elements of buried timber in the external walls i.e joist ends, lintels, bonding plates. In rehabilitating the floors we recommend the introduction of more restraint straps and ties. This particularly applies to the rear elevation overlooking the adjacent car park.

Appendix A

Sketches



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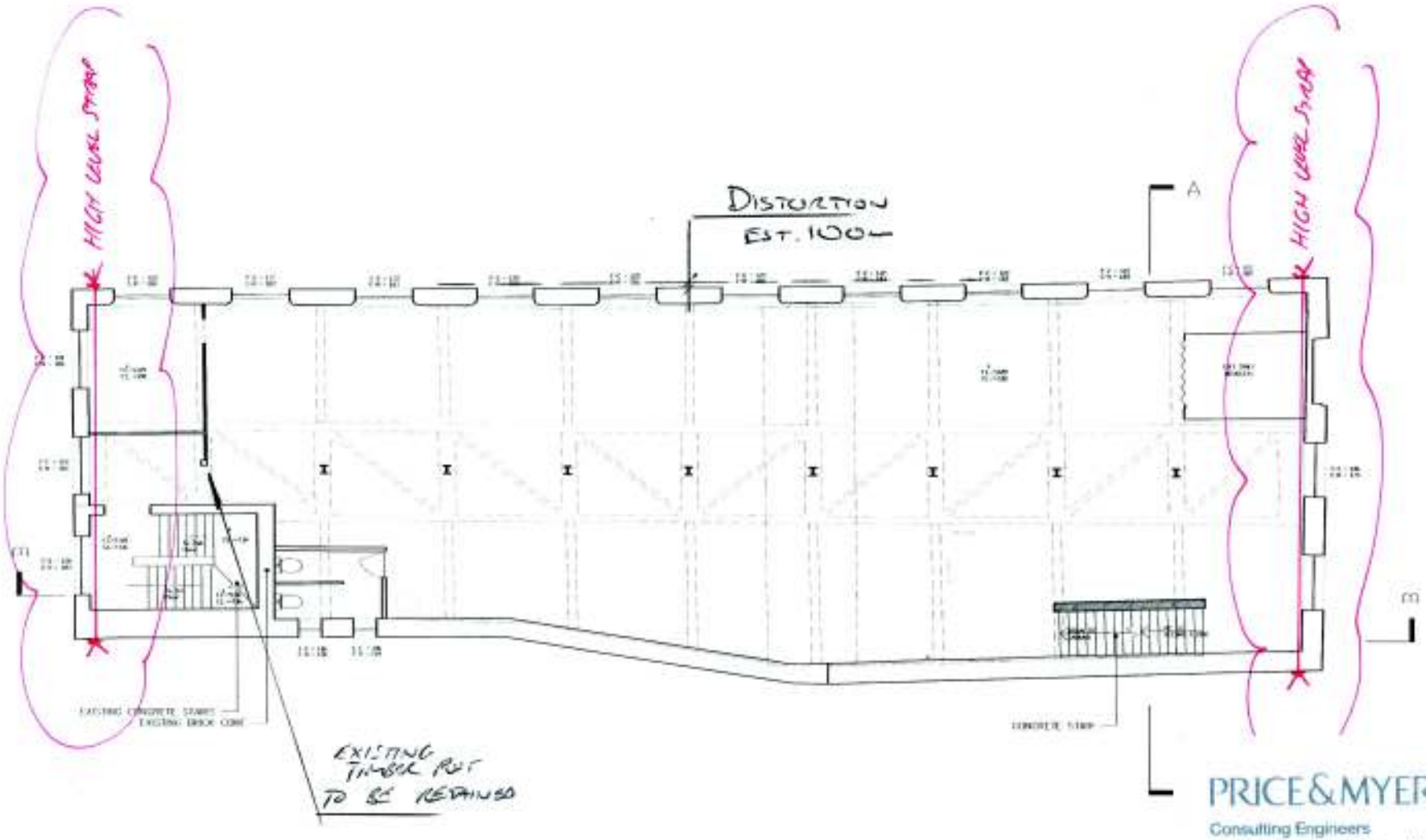

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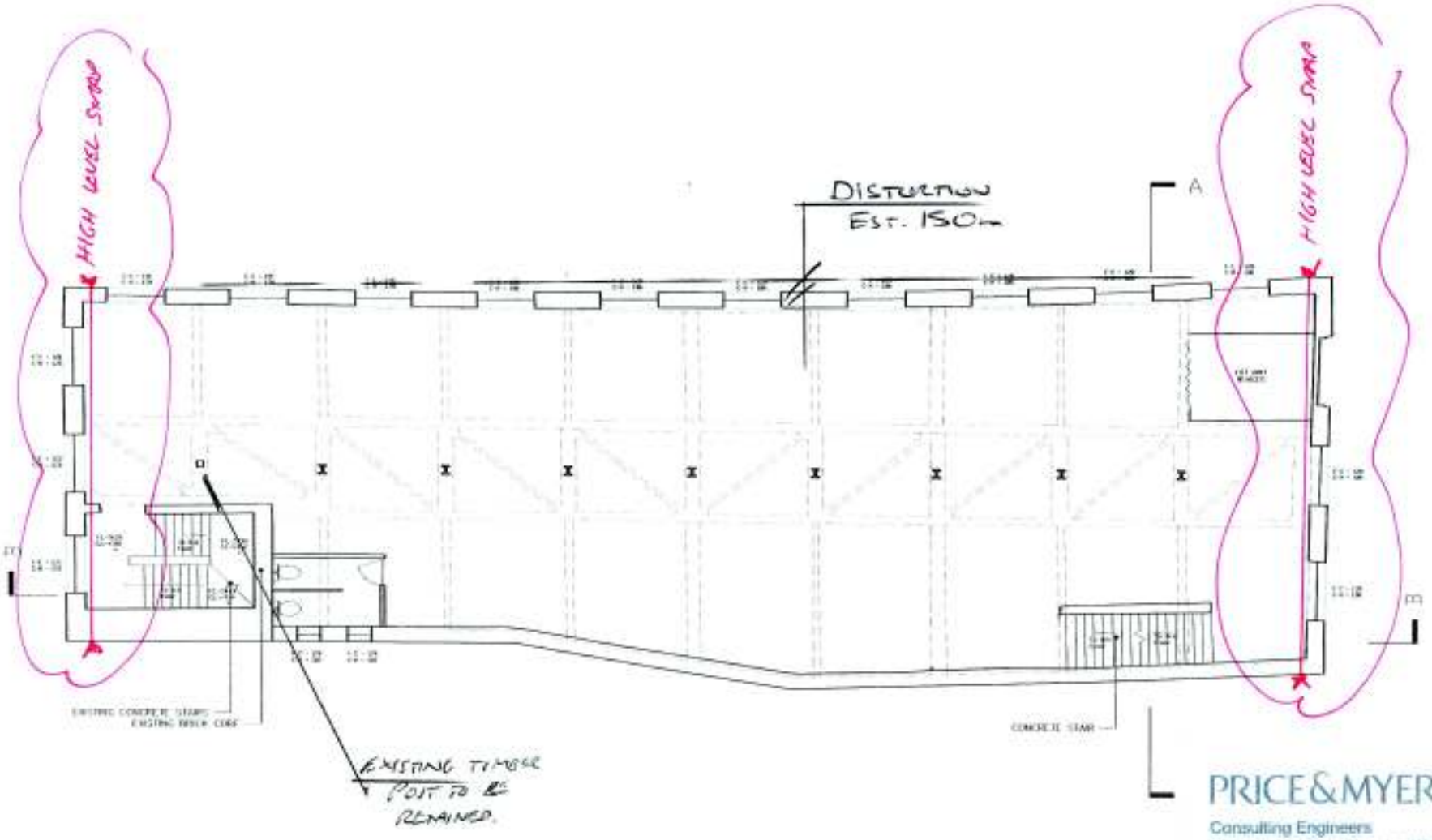
Job 83 CABLE STREET



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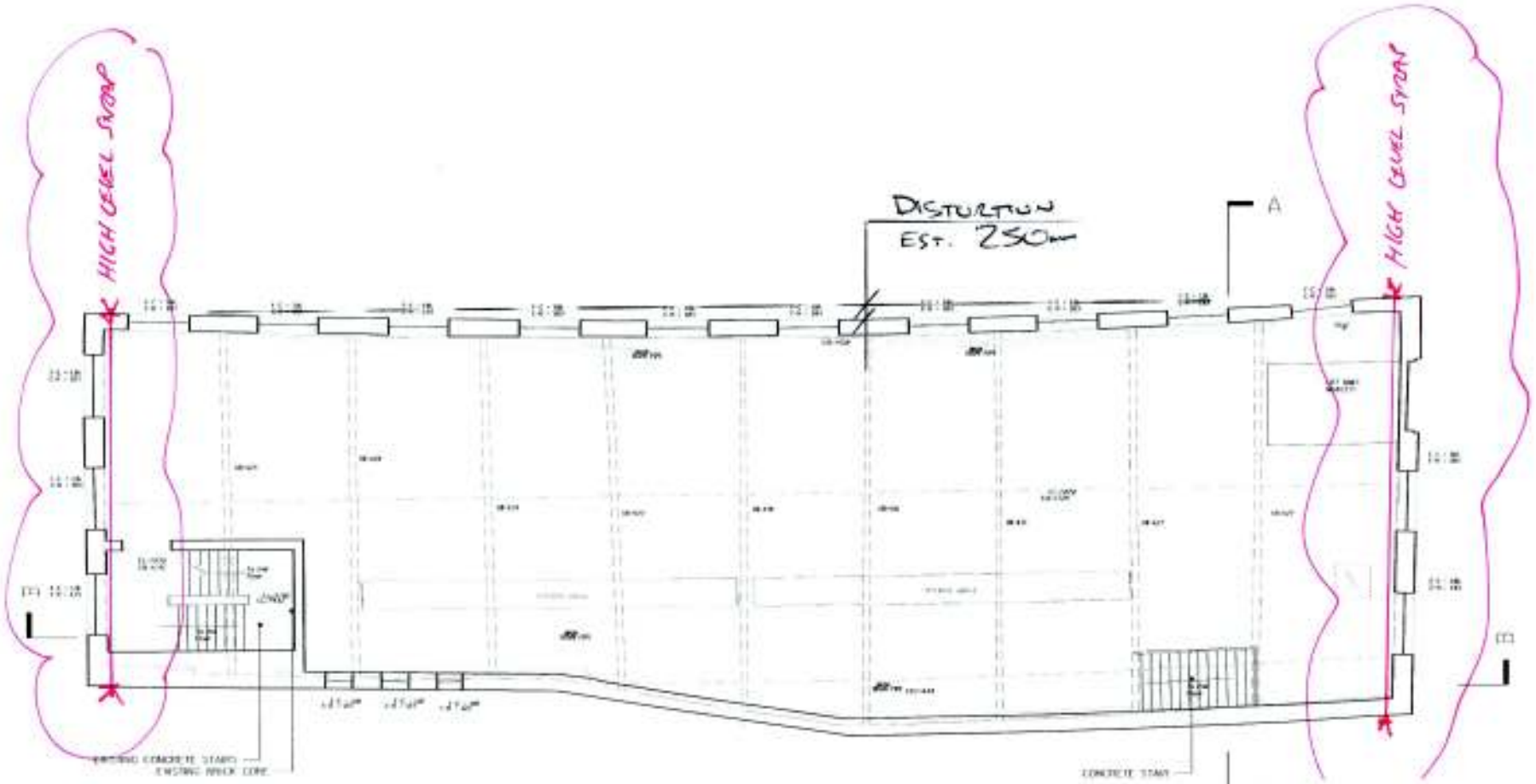

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CABLE STREET
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Job 8 CABLE STREET

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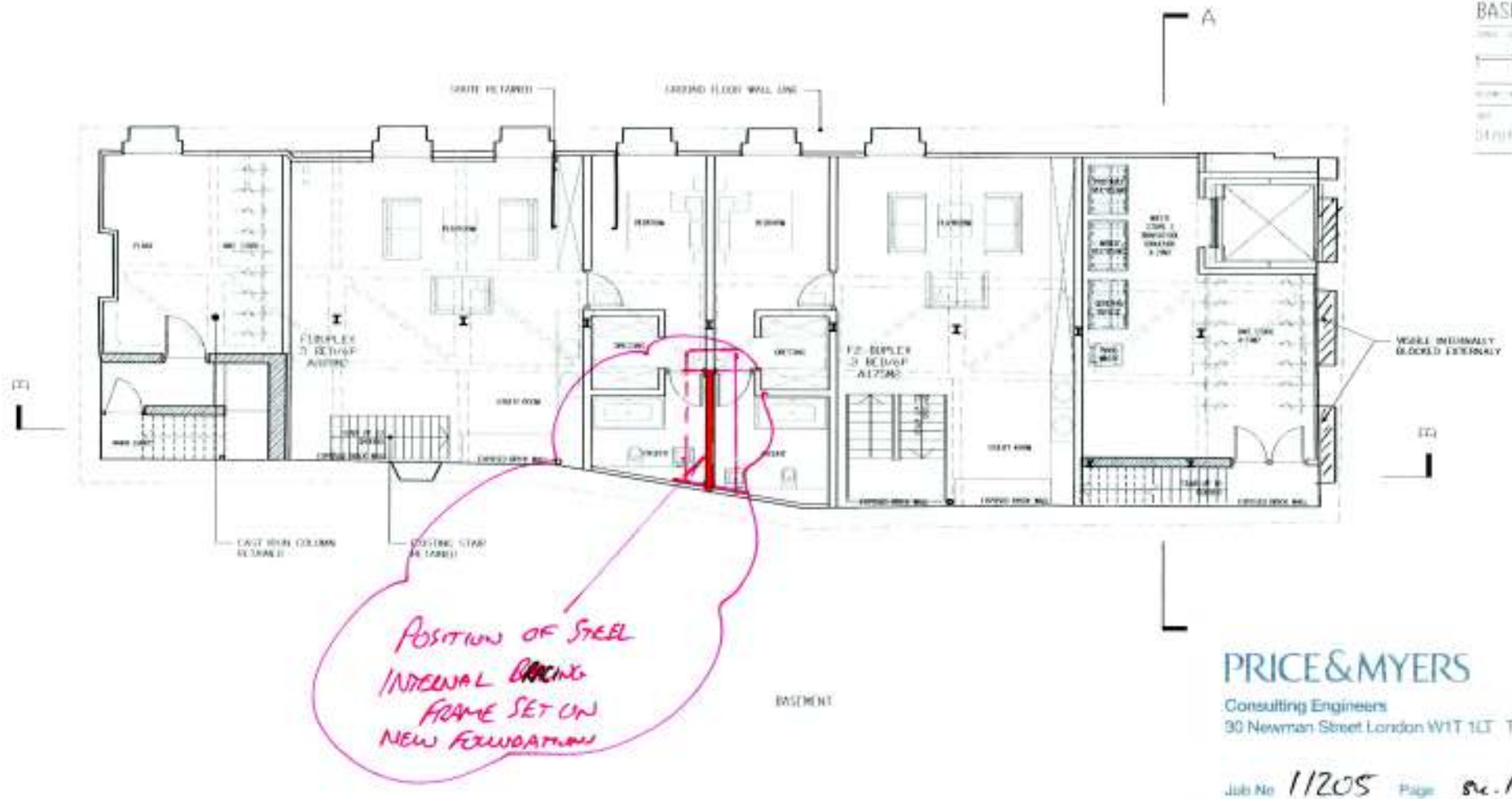
CABLE STREET
PROPOSED PLANS
BASEMENT LEVEL



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Job 85 CABLE STREET