

Confidential

**Students Residences, London Road,
Bognor Regis**

Preliminary Structural Feasibility Study

For

Cover Storey Architects

Project Number:

12634

July 2017

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1.0 INTRODUCTION

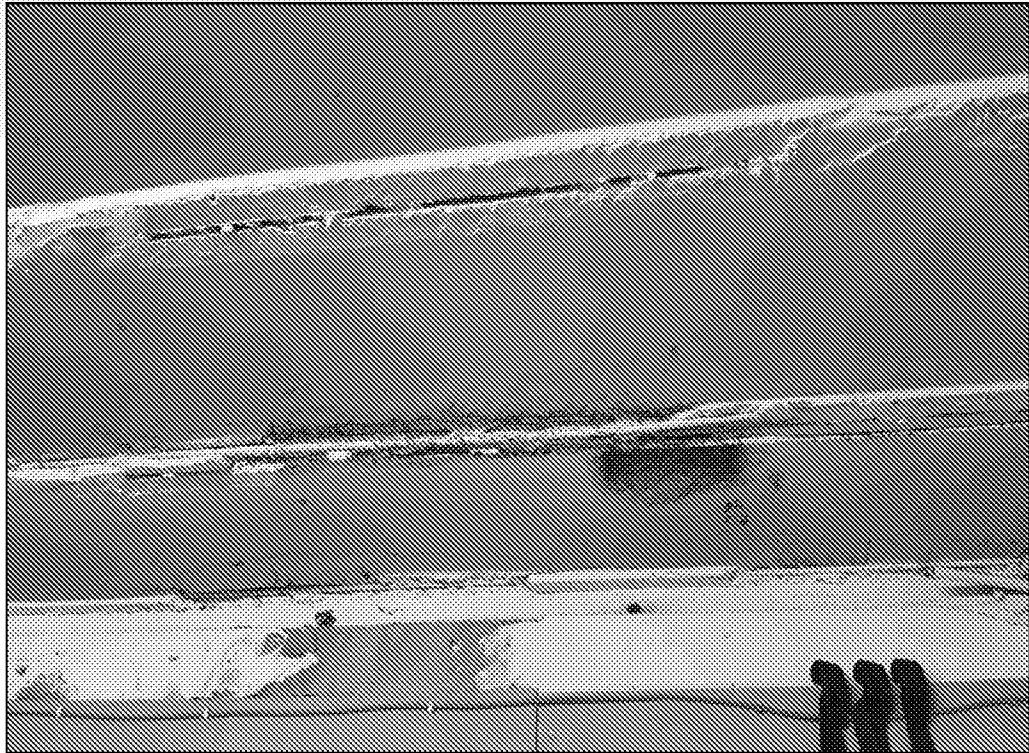
- 1.1. In April 2017, Campbell Reith Hill LLP (CampbellReith) was instructed by Cover Story Architects LLP to provide preliminary structural engineering advice in relation to a proposed residential development above the existing Wilkinson Store on London Road, Bognor Regis. An initial inspection was undertaken on 15th June 2017 and did not involve any intrusive works.
- 1.2. The purpose of this report is to outline the options for the structure and to identify the likely risks associated with in the development proposals.



Photograph 1: Aerial view of existing building

2.0 STRUCTURAL FORM

- 2.1. The existing building is L shaped on plan and varies in height from two storeys up to three storeys (excluding lift overruns). The large open plan retail space is located at ground floor level and extends over majority of the building footprint. A storage area is located at this level on the north western corner of the building directly adjacent to the lift stair core. The first floor accommodation comprises an office area fronting London Road with a large storage area to the rear. The storage area at this level occupies the majority of the building footprint. Further office accommodation is located at second floor level directly above the first floor office area. The flat roof above the first floor storage area can be accessed from this. The roofs are flat throughout and a lift overrun structure is located towards the north western corner of the building. A small basement is present in the south western corner of the plot.
- 2.2. The structure itself appears generally to comprise a combination of load bearing masonry walls to the perimeter and internal steel columns and beams supporting precast concrete floors at 1st and 2nd floor level and woodwool type panels at roof level. The front elevation includes load bearing masonry and structural framing to achieve the clear spans required for the shop front. Lateral stability is likely to be provided by the floor/roof diaphragms acting in conjunction with the load bearing walls to the elevations and internal lift/stair cores.
- 2.3. Initial research into the likely ground conditions suggests that the underlying substrate is likely to comprise Head to a depth of around 2.7m below ground level (bgl) over saturated River Terrace Deposits to a depth of 4.6m where the top of the London Clay is likely to be encountered. There is a risk that Made Ground could be present as a result of historical developments in the area. As such it is anticipated that the building is likely to be founded on traditional pad and strip foundations. This would need to be confirmed via intrusive investigations. The ground floor slab within the retail unit and storage area feels solid when trafficked and as such is likely to be ground bearing rather than suspended. Again this would need to be confirmed by carrying out intrusive investigations such as coring or trial pitting.
- 2.4. A structural condition survey has not been undertaken as part of this commission. However, a number of structural defects were noted during the initial inspection carried out on 15th June 2017. Of particular note was the spalling of concrete to the inverted precast concrete C section units above the first floor storage area of the northern most site of the building (see photograph 2).



Photograph 2 – Exposed steel reinforcement

The structural concrete on the downstand has deteriorated and the steel reinforcement is exposed and in some areas severely corroded.

In one location the main bar appears to have been severed (see photograph 3)



Photograph 3 – Severed steel reinforcement

Whilst the roof slab in this area does not appear to be exhibiting signs of significant distress at this stage, it is recommended that a repair is carried out in the near future.

3.0 PROPOSALS

- 3.1. The current proposal indicates an additional three storeys of accommodation directly adjacent to the existing second floor offices and an additional five storeys of accommodation towards the rear of the building. Previous outline structural assessments have suggested that a single storey could be added to the existing structure without the need for extensive strengthening works to the existing superstructure framing. The assessments did not include the foundations, substructures or lateral stability provision. In addition to the new build works, it is noted that the existing office space at second floor level is to be converted into communal kitchen, living and dining space.
- 3.2. A preliminary load take down has been completed for a number of structural elements within the existing building pre and post development to establish the magnitude of load increase onto the existing structure/foundations that could occur as a result of the proposed works.
- 3.3. On the basis that a new structural grillage is provided above the existing roof, the potential increase in vertical load applied to an internal column is likely to be in the region of 100% under the area where a three storey extension is proposed. The increase in vertical line load on the existing flank wall is likely to be around 95% in the same area. For the areas where a five storey extension is proposed the increases are around 170% and 160% respectively. This level of increase is not considered acceptable without significant strengthening works being undertaken at foundation level and to the superstructure frame.
- 3.4. Underpinning of the existing pad and strip foundations could be carried out to increase the bearing width and effectively keep the ground bearing pressures within acceptable limits under the increased loading. However, this would be extremely disruptive to ongoing trading as large areas of the retail area would need to be closed to facilitate the works. The strengthening works to the columns themselves are likely to be more straightforward but disruptive nonetheless. Party wall agreements would need to be put in place before any works could be undertaken to the party walls.
- 3.5. **Surveys/ investigations**
- 3.5.1. In order to fully assess the implications of utilising the existing structure, the following surveys/investigation works would need to be undertaken:
- Trial pitting to existing party walls and rear elevation wall to establish type, depth and extent of existing foundations.
 - Geotechnical testing of existing formation to determine ground bearing capacity.
 - Coring of existing ground floor slab to confirm if ground bearing or suspended.
 - Brick and mortar testing of existing load bearing masonry walls to establish residual structural capacity.
 - Removal of casings and concrete encasement to existing steel columns to determine section size.
 - Localised breaking out/drilling of external masonry walls to determine form and width.
 - Detailed service trace to identify any buried services within the building footprint.

- CCTV drainage survey
- 3.5.2. In order to carry out the surveys/investigations, it will be necessary to close off areas of the retail space and/or undertake the works outside of normal trading hours.
- 3.6. As an alternative to strengthening the existing foundations and superstructure, consideration has been given to installing new foundations and an independent frame to support the proposed upper floors.
- 3.7. New piled foundations could be installed adjacent to the existing external walls within the retail space. The topographical survey information suggests that there is approximately 2.8m of clear head room available to accommodate a piling rig. Consideration would need to be given to access; the most suitable location likely to be via the deliveries entrance at the rear of the building. Preliminary research suggests that 220mm diameter piles could be installed with an axial capacity of around 300kN to 400kN. In order for the piling rig to carry out the installation it would be necessary to close off a circa 4m zone along the entire length of the existing flank wall either side of the retail space (to be confirmed following trial pitting and with input from a specialist piling contractor).
- 3.8. Preliminary structural design calculations suggest that a primary beam could be installed above existing roof level, supported on new columns that punch through the existing flat roof adjacent to the masonry parapets. If the new primary beams are located at 2.7m centres a 1400mm deep structural zone would be required to support the three storey structure proposed over the eastern side of the building footprint.

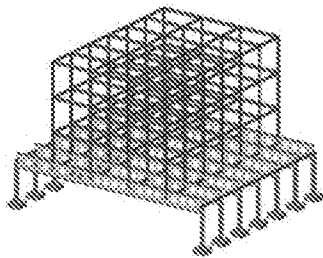


Image 1: 3 Storey Frame

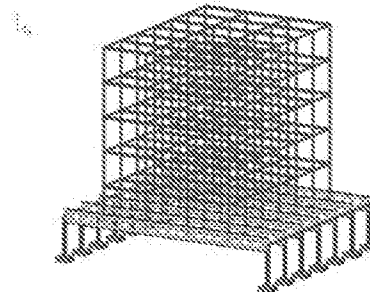


Image 2: 5 Storey Frame

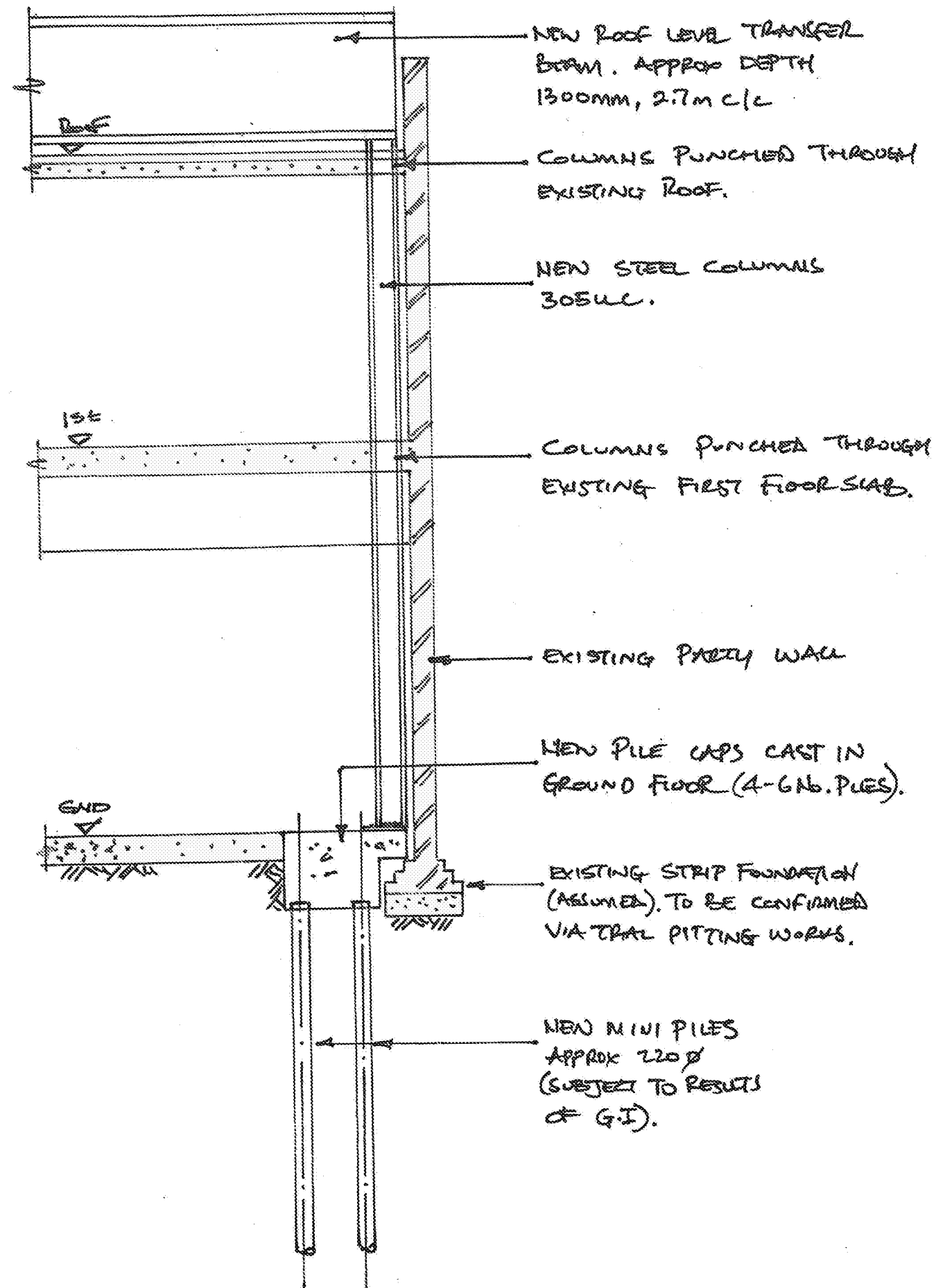
- 3.9. On the western side of the building, where five storeys of additional accommodation is proposed, a structural zone of around 1500mm would be required at existing roof level.
- 3.10. Foundation loads at the base of the new columns would be up to 1100kN and using the mini pile system, would result in 4No. to 6No. piles beneath each new column.
- 3.11. Lateral stability of the new frame (at low level) could be achieved by introducing horizontal wind girders within the structural zone at roof level to transfer the horizontal loading back to vertically braced bays located between the new columns adjacent to the existing walls within the retail space. Lateral stability of the new superstructures above existing roof level could be provided using vertical bracing in conjunction with the floor diaphragms to transfer the loading back to the new primary structure installed above existing roof level.

- 3.12. It may be necessary to enhance the capacity of the new transfer beams at roof level in the area between the three storey accommodation and the five storey accommodation to negate the need for additional internal columns within the retail space at ground floor level. However, the 1500mm structural zone should be adequate to accommodate the necessary structure.
- 3.13. Sketch 12634/sk001 indicates a possible piling zone and hoarding line for the installation of the piles within the ground floor area. The areas shown are preliminary at this stage and the input of a piling specialist would be necessary to confirm the working space required. Sketch 12634/sk002 shows a typical section through the southern party wall including the new piles, pile cap, steel column and roof level transfer beam (all subject to confirmation following the completion of the surveys/investigations and detailed design).
- 3.14. Savings on the proposed superstructure framing could be achieved by installing a third row of piled foundations and columns centrally within the existing retail space but this is considered to be too disruptive and therefore has not been developed further at this stage.
- 3.15. **Surveys/ Investigations**
- 3.15.1. In order to fully inform the design of a new independent structure, the following surveys/investigation works would need to be undertaken:
- Trial pitting to existing party walls and rear elevation wall to establish type, depth and extent of existing foundations.
 - Geotechnical testing of existing formation to allow pile design to be undertaken.
 - Coring of existing ground floor slab to confirm if ground bearing or suspended.
 - Localised breaking out/drilling of external masonry walls to determine form and width.
 - Detailed service trace to identify any buried services within the building footprint.
 - CCTV drainage survey
- 3.15.2. In order to carry out the above, it will be necessary to close off areas of the retail space and/or carry out the works outside of normal trading hours.
- 3.16. A further alternative could be considered by utilising a Vierendeel girder at level 1 within the new superstructures. This would involve re-planning the accommodation in its entirety and as such has not been developed at this stage.

4.0 CONCLUSION

- 4.1. Due to the risk of the existing structure not having the residual structural capacity to support the proposed roof top extensions, it is recommended that the independent structure option is considered further. The constraints on both the survey and construction stage are noted as it is understood that the complete closure of the retail space for any prolonged period of time is likely to be unacceptable. By closing off strips of the retail floor in sequence to suit the works, the impact on the current tenant can be reduced.
- 4.2. It is anticipated that the installation of the piles and pile caps will take around 4 weeks on the basis that several piling rigs could work concurrently. The steelwork column installation would then follow on from this and could be readily completed outside of store opening hours. Upon completion of the investigative works, the input from a specialist piling contractor and ground worker is recommended to confirm likely timescales for the construction works.
- 4.3. The input of a concrete repair specialist is recommended to address the concrete details identified in this report. A full detailed structural survey of the building should be carried out to establish the extent of repair works required.

Appendix A: Structural Sketches



Rev	Description	Date	By

CampbellReith
consulting engineers

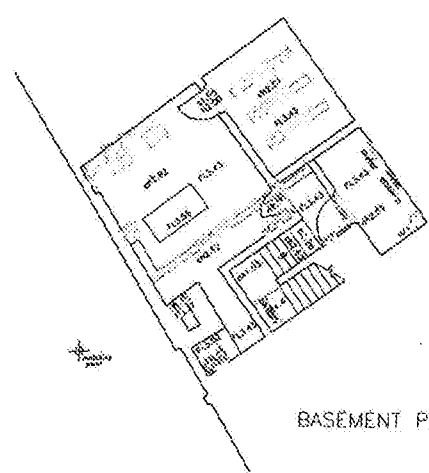
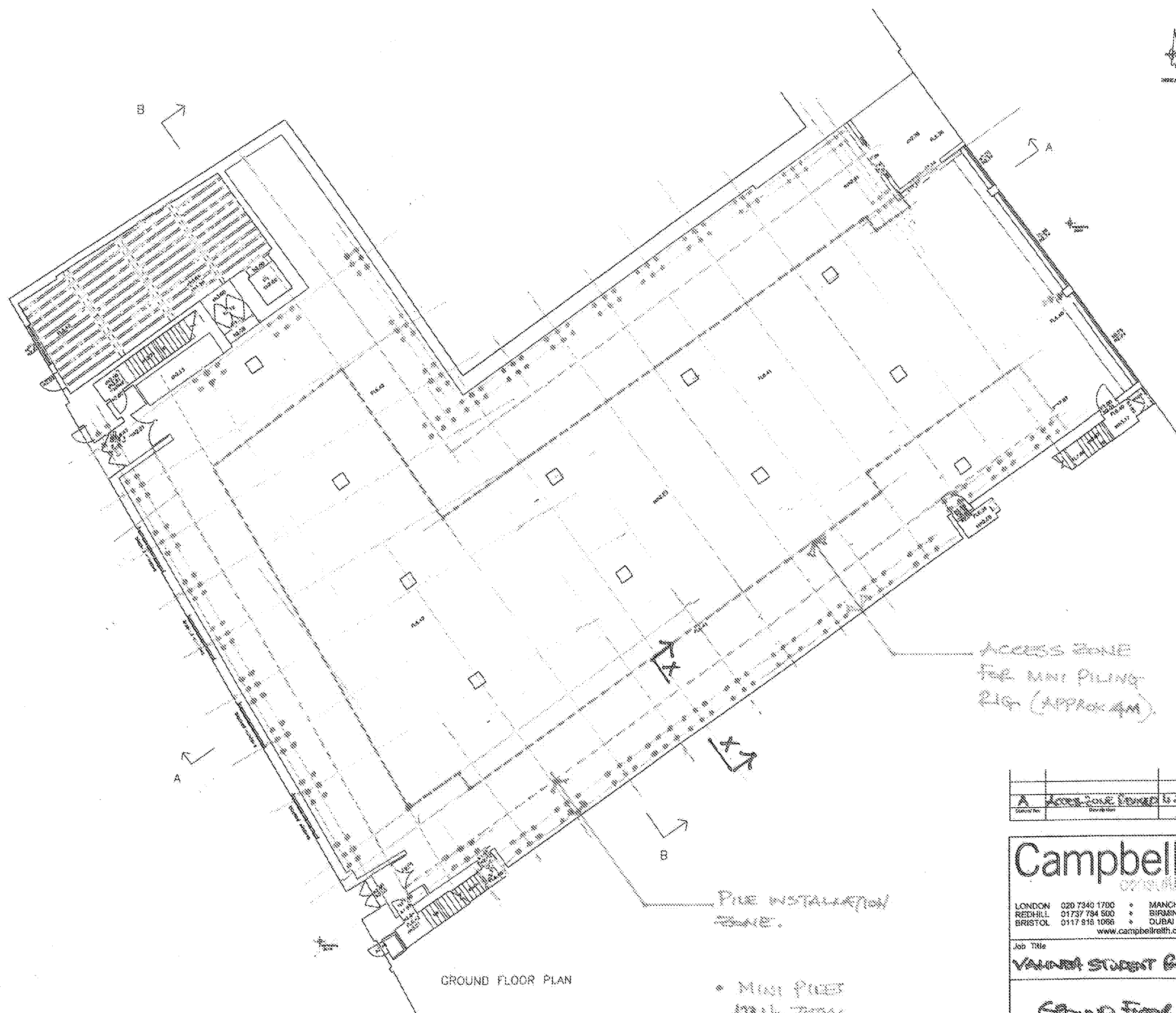
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Job Title
VAHNEA STUDENT RESIDENCES

SECTION X-X

drawn	date	scale	CI checked	CAD checked
AS	23.6.17	NTS		
Job No.	12634	Dwg No.	SK.002	Status

c/cn ceiling height
 ft floor level relative to external survey
 h head height from floor
 m maximum height
 min minimum height from floor
 max maximum height from floor
 s all heights from floor
 u/c height to underside



BASEMENT PLAN

GROUND FLOOR PLAN

Pile Installation Zone.

* MINI PILES
 1316 TOTAL
 APPROX.
 (200kN - 400kN
 CAPACITY)

ACCESS ZONE
 FOR MINI PILING
 216 (APPROX.)

Access Zone	Access Zone	Access Zone
Access Zone	Access Zone	Access Zone

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Job Title
VALUED STUDENT RESIDENCES

GROUND FLOOR PLAN

drawn	date	scale	checked	CAD	Revised
AS	23.1.17	NYS			
Job No.	12634	Dwg No.	Sk. 003	Sub/Rev	A

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