Kings College Court
London
Stage D
Structural & Civil Engineering
Design Report

Project Ref: 23725

18th December, 2012

Issue P1

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Report Title : Stage D Structural & Civil Engineering Design Report

Date : 18th December 2012

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Images Courtesy of Jim Garland Architects Ltd (preliminary scheme impressions)

1 Introduction

1.1 General

This document reports on the structural and civil engineering aspects of the proposed extension at Kings College Court in London (NW3 3EA). It describes the development since the inception of the project and explains the forms of construction which are to be adopted, with options where appropriate, and records the parameters influencing the development of the structural design.

1.2 The site and existing building

The site is located in the North-West region of London. The site is in a built up area of residential houses and apartments between 'Swiss Cottage' and 'Chalk Farm' underground stations.

The existing structure is a 9 storey residential building with the bottom storey predominantly open for car parking and some closed plant enclosures. It is a reinforced concrete frame structure built in late 1960s.

The existing structure will be a combination of columns and walls supporting the vertical gravity load of the concrete floor slabs and fabric. The actual arrangement of columns and walls has been estimated at this stage as a series of walls surrounding the central core areas (lifts and stairs) and outlying columns supporting the floor slabs. Some of the columns run directly down through the ground floor parking area although there is some evidence of corbelling and offsetting of the column positions through the 1st floor structure visible from below. The lateral strength of the building will predominantly come from the stiffness of the wall configuration around the central core and stair areas. In concrete frames of this type the inherent stiffness of any continuous wall systems will almost always attract the majority of the lateral load.

Determining the exact detail of the existing structure and load paths is not straightforward. Buildings are built to construction tolerances so they are not perfectly level or vertical. Also the foundation systems are designed to settle in a limited way as load is applied. As this building has a high dead load to live load ratio, as it was constructed the foundations would have been taking up the applied dead load and settling accordingly. Equally the vertical and horizontal construction tolerances would have been progressively realigned floor by floor causing a certain degree of lateral loading that would be distributed around the frame. These effects are accommodated in the design by allowing for global notional lateral loadings which allows a safe design without the need to understand the actual stress distribution within the frame or exact detail of the load distribution into the foundations.

A common issue with buildings of this era is that the brick cladding and internal blockwork infill walls were often built solidly into the frame without any movement joints. There are numerous papers published on the problem of the natural expansion of brickwork versus the natural shrinkage associated with the concrete frame causing the brick cladding to become stressed and carry some of the applied dead and live load. Internal block walls act in a similar vein that although they do not expand, if the connection between the wall and the floor slab is not designed to accommodate movement then the long term deflection of the floors under applied loading will probably load the wall in some way. These unknown stress paths develop over time and usually are not a problem and don't show any signs of distress to the frame or fabric, however any sudden increase or change in the load distribution can cause immediate distress and cracking may occur. The proportion and distribution of the existing load carried in this way is impossible to accurately assess.

Currently there is a consultation underway in relation to safeguarding the High Speed 2 Route that is currently shown as passing under the South end of the existing building (http://highspeedrail.dft.gov.uk/consultations/property-compensation-london-to-west-midlands). We are monitoring the situations and awaiting the outcome of the consultation before assessing any likely impact on the proposed foundation solution.

1.3 The proposed extension

The proposed extension will add three storeys of high specification residential accommodation to the roof of the existing building. All the plant requirements for both the existing and new flats will be accommodated within a storey height services buffer between the old and new construction. Additionally new balconies are to be added to the existing flats.

The development will provide 3 extra floors of residential accommodation. The bottom two floors will accommodate 2 apartments each and the top will be utilised as a top of the range penthouse; with premium views across North-west London.

The option of utilising the existing building frame to accommodate the new load was considered at a first stage. However, taking into account the problems associated with determining an exact load distribution to the foundations outlined above and the need to avoid disruption to the existing flats that will remain occupied during construction, a potential increase in load in the region of 30-40% on the existing frame and foundations was not considered appropriate.

The chosen solution is to distribute the new load to new foundations by four corner columns located on the outside corners of the existing building. The load of the new construction including the plant space and balconies is transferred back to these columns such that no additional vertical gravity load is carried by the existing building frame. A concrete bracing system is also provided in the South and North façade. Lateral load will still need to be accommodated by the existing building but this will be limited to short term wind loading and the notional load due to lack of fit and building tolerance inherent in the construction of the new extension

During the construction phase of the development the existing residential apartments will remain occupied with all construction works designed to cause minimal disruption to existing residents.

Specific topics covered in this report include:

- Description of the architecture in terms of the structural engineering;
- Description of the structure including substructure;
- The design loads and actions;
- The performance criteria;
- The Codes and Standards to be used.

Information is also given on construction issues, likely temporary works requirements and programme implications. In instances where investigations have not been carried out or where information from other parties is outstanding, these are highlighted.

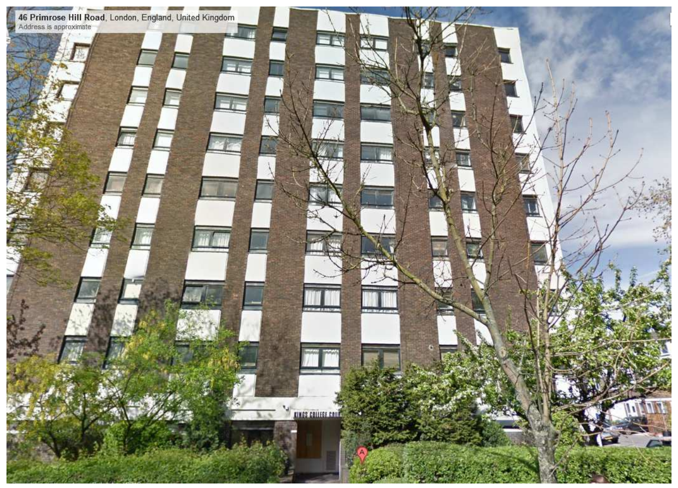

Figure 3: View from Primrose Hill Road

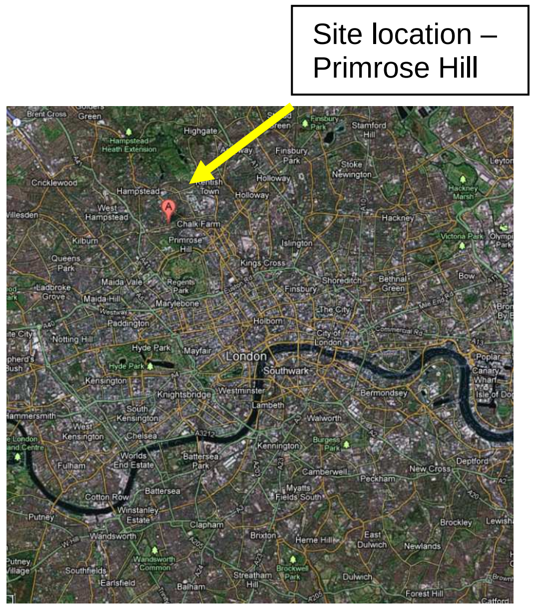

Figure 4: Arial view of site location

2 Ground Conditions

2.1 Introduction

A preliminary site investigation was carried out in August 2012 to determine the size and impact of the existing foundations in relation to the proposed substructure. The fieldwork included the excavation of 2 trial pits (north-east and south-east corners) to depths of around 1m below existing ground level. The pile cap dimensions at the south-east and north-east corners of the site were: 2.0m x 0.8m (0.8m deep). The top face of the foundation is 240mm below ground level and the stabilising beams are 300mm wide and 500mm deep.

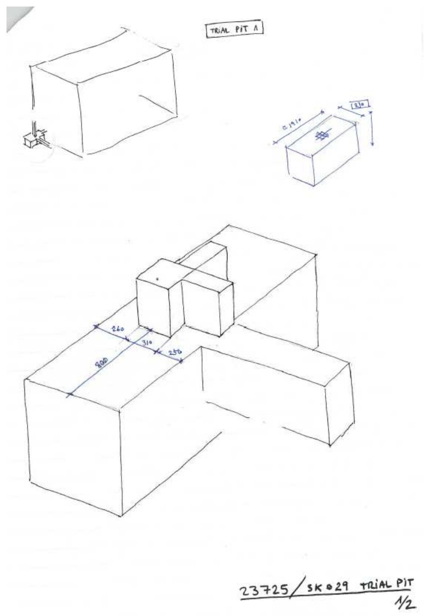

Figure 5: Sketch of trial pit 1

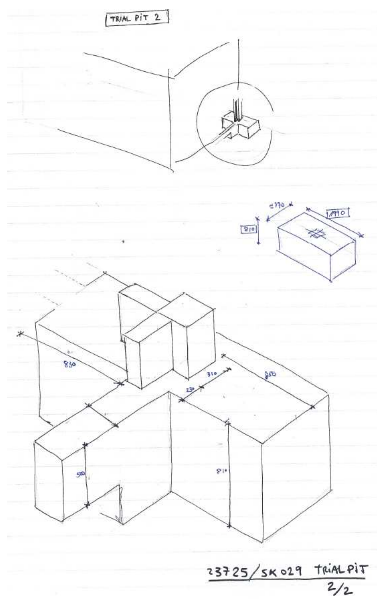

Figure 6: Sketch of trial pit 2

A provisional allowance has been made within our submission to account for differing ground conditions, which will be confirmed during the preferred bidder stage following intrusive site investigations and subsequent reports.

2.2 Geotechnical and geoenvironmental

According to historical data collected in the area, London clay has an average depth of 80m. That depth has been adopted for concept design. The preliminary investigations did not encounter any significant contamination during the excavation of the trial pits (by visual inspection). At this stage, no samples of ground have been taken neither have any laboratory tests been carried out.

2.3 Recommended future ground investigation works

The ground investigation work carried out to date has concentrated on determining the location and size of the existing pile caps. The fieldwork only included a limited trial pitting exercise carried out at the north-east and south-east corners.

Further investigations are required prior to Works commencing on site. The scope of these proposed additional investigations would include additional trial pits, cable percussion boring and rotary drilling; as well as in-situ and laboratory tests.

Figure 7: Example of trial pit

3 Superstructure

3.1 Design criteria & constraints

The specification for the project has been developed in-line with Building Regulations, British Standards and current best practice guidance with specific consideration to the following design criteria:

- The proposed structure is to be designed as such that the impact on the existing building is minimised as much as possible; this is the simplest method to ensure the structural stability of both the old and new structures.
- Throughout the building design considerations have been made to reduce the weight and load of each structural element, this will in turn reduce the overall load on the newly constructed foundations.
- During the construction phase of the development project it is a requirement to restrict the effects of the construction on the existing apartments and residents. All residents will remain in the building throughout the construction process: making this an essential requirement.
- Standard design criteria – such as economy, structural performance, durability, acoustics and fire resistance etc. are all required to be met.
- Services integration – The building requires the structure to integrate efficiently with M&E services, producing economy for both structure and services, and minimising the overall floor zone. The use of the new 9th floor for new plant and equipment will facilitate this integration.
- In the design and selection of materials consideration has to be given to issues such as transportation to site. Structural elements must be of a manageable size for transportation through London. In addition to this consideration has been made to utilise the simplest and most cost effective method of construction. Working at height means elements have been sized appropriately to make for safe lifting into place.

3.2 Concept design

To minimize any load transmission to the existing building, all vertical load of the extension is distributed to new foundations by four corner columns located on the outside corners of the existing building. The only exception is the new lift and stairs cores, which will have to be taken through into the existing structure. The extension floors will be a steel frame structure which at the transfer deck level will be transferred by steel trusses to the four corner concrete columns.

Although the new construction will have some connections to the existing building, it has its own stability systems in both directions. This way, minimum lateral load is to be accommodated by the existing building. With wind from the north and south, lateral stability is provided by the stiffness of the concrete columns together with the 28m spanning truss. Wind loads from the East / West direction are stronger so a stabilising concrete frame is connected to the concrete columns to resist this lateral load.

3.3 Corner columns & bracing frame

The new corner columns will be made of in-situ reinforced concrete and designed to support the entire load of the new floors. The columns are situated just outside the original corner columns and will sit overlapping the current edge of the building. The columns taper outwards at the base to ensure the load is transferred to the new foundations. The columns will be connected to the existing building at every floor level to limit their effective length without vertically loading the existing building. These connections will allow elastic and thermal movement of the new columns relative to the existing building.

On the south and north elevations a concrete stabilising frame will be used to counteract the eastern and western wind loads. This frame will also be supporting the new balconies to the North and South elevation.

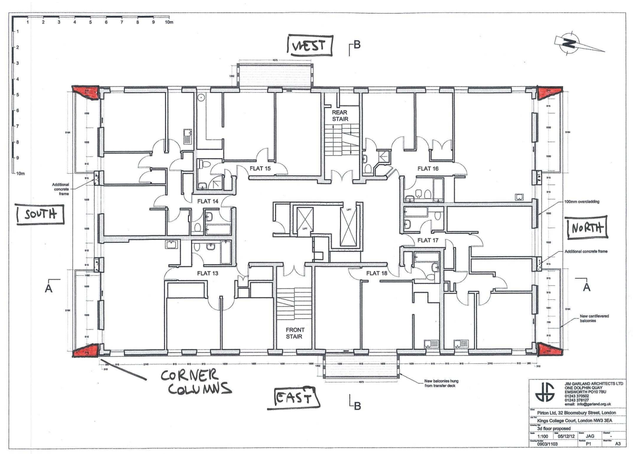

Figure 8: Corner column locations

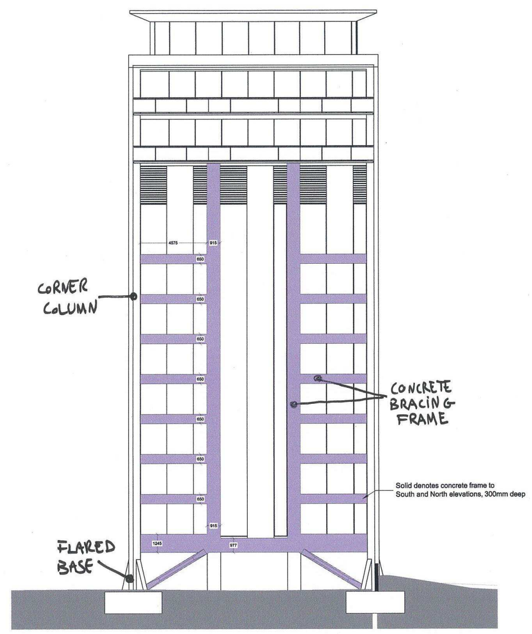

Figure 9: Concrete frame bracing

3.4 Steel frame – transfer deck

The new structure is a steel frame made up of a uniform grid of steel columns and beams. These elements rest on a series of trusses which act as the transfer deck to the four corner columns below. The bottom chord of the trusses holds the floor slabs containing plant and services.

The transfer deck is a key element for the overall stability. Special effort has been made to minimize the height of this element (2.8m between chord axes).

At the 12th floor level transfer beams have been included as the supporting columns do not line up with the ones below. This is because the floor is inset within the perimeter of the main frame as shown in figure 9.

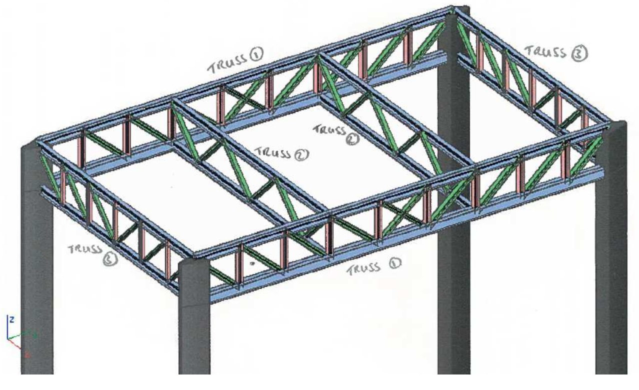

Figure10: Truss arrangement

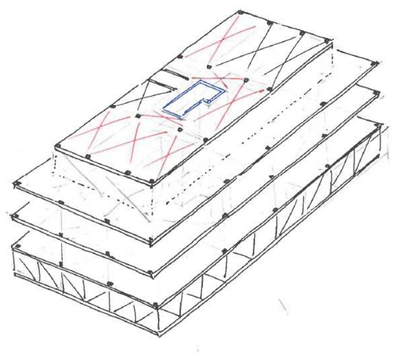

Figure 11: Bracing arrangement

Balconies will be added to all existing apartments as well as the new apartments located on the top floors. Most of the load will be transferred through the new structure. The new proposed balconies on the east-west edge are suspended from the transfer deck above. The balconies on the north-south edge will be supported by the new concrete frame and corner columns.

The proposed roof structure is a lightweight METSEC steel framing system. This lightweight option will reduce overall loading of the new structure. This will require further investigation during detailed design development.

Further consideration is required to establish the suitable sizes of structural elements to enable simple transportation and lifting. The steel trusses may be divided into sections and bolted together on site, allowing the sections to be transported in manageable sizes. More detailed design is required with regards to this. Note that it may be possible to utilise the existing roof surface to work from and bolt sections together before installation.

3.5 Floor slabs

We have recommended that a composite flooring system is used for the majority of the new floors. There are areas of grating meshed flooring on the 9th level where plant is located, for reduced weight and improved ventilation.

The slabs are one-way spanning between the secondary beams. The composite flooring is to be made of standard *"Multideck 60-V2"* trapezoidal decking, with the inclusion of shear studs. The slabs will include under floor heating and a lightweight non-structural screed.

Composite floors utilise the compressive strength of concrete with the tensile capacity of steel to reduce the overall required depth of slab, thus reducing the volume of concrete required. The composite floors provide an option for fast and simple construction as the pre-fabricated steel decks are securely fitted in place and then provide the formwork required for the in-situ-concrete to be poured. The steel decks also provide a safe working platform during the construction phase. Note that props will not be required.

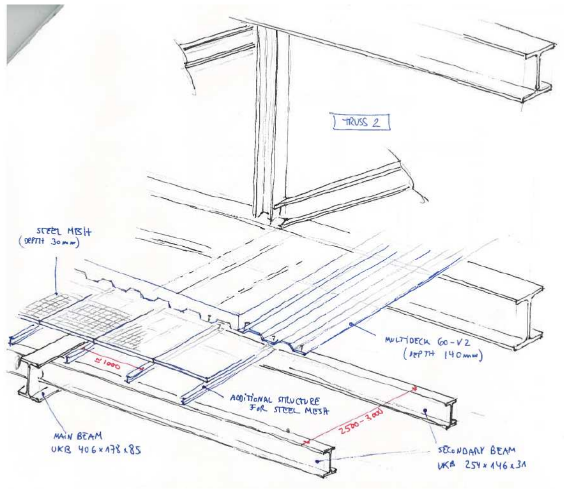

Figure12: Composite floor slab and meshed floor detail

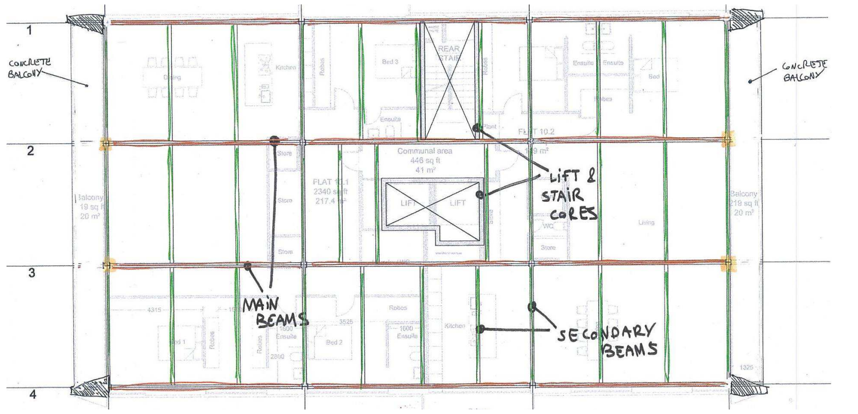

Figure13: 11th floor: beam layout

4 Substructure

4.1 Structural concepts / ground conditions summary

Trial pits have been used to look at the existing pile caps of the building. There has been no detailed analysis of the soil other than this to date. Therefore boreholes are required among other detailed methods of analysing the ground conditions.

4.2 Proposed foundations

The foundations for the new corner columns are to be piled foundations. Issues to be addressed include the location and size of the pile caps as the proposed location interferes with the existing pile caps. The location of the pile-caps overlaps the area of the existing ones. To prevent any unwanted load being transferred to the existing pile-caps and piles the new pile-caps will bridge over the original ones with a gap between the two. It is important that the newly designed piles do not affect the existing. The proposal is to have the new piles at a greater depth below the existing piles and at an adequate distance away to avoid interference. The loads will be transferred to different depths of soil and be independent of each other.

Due to the access ramp at the North-West corner of the building the corresponding column has been altered so that the flat section at the bottom does not interfere with the required space. The solution for the pile cap is to include a larger concrete section beneath ground level.

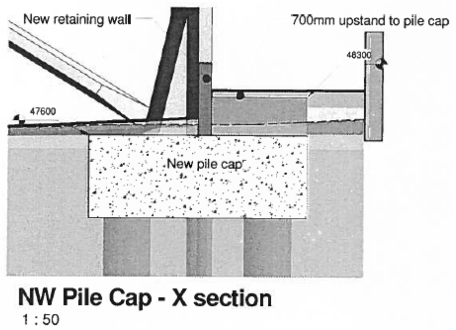

Figure 14: Pile cap – x section

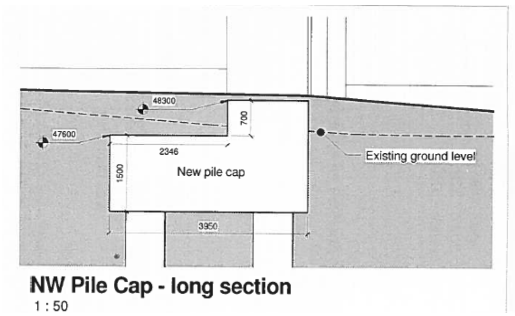

Figure 15: Pile cap – long section

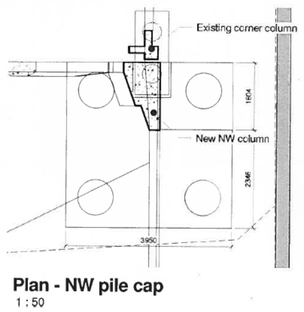

Figure 16: Pile cap - plan

4.3 Crane foundations

It is anticipated that a tower crane will be used during the construction of the new floors supported on independent foundations. Cost allowance should be made for a reinforced concrete pad foundation to the tower crane. The design of the foundation is subject to information provided by the crane supplier at a later date.

5 Structural Design Parameters

5.1 Vertical load path

All vertical load of the extension is distributed to new foundations by four columns located on the outside corners of the existing building. As a result of this no additional vertical gravity load is carried by the existing building frame. The only exception is the existing lift and stairs cores, which will have to be taken through into the new structure.

The perimeter columns supporting the roof are not aligned with the column arrangement beneath. Therefore, transfer beams have been provided at the 12th level. The columns from the 12th floor continue down in the same position to the supporting trusses at transfer deck (level 9-10) in a direct vertical load path. At the transfer deck level, the trusses transfer the load to the four concrete corner columns and directly to the pile cap foundations.

5.2 Lateral stability

Although the new construction will have some connections to the existing building, it has its own stability systems in both directions. Minimum lateral load is to be accommodated by the existing building.

From a northerly and southerly wind load, lateral stability is provided by the stiffness of the concrete columns together with the 28m spanning truss. From the easterly and westerly wind, with higher wind loads and weaker column stiffness, the stability is provided by a bracing frame connected to the corner columns in the north and south elevation.

Furthermore, horizontal cross-bracing below the composite deck will be provided to the upper floors. These are assumed to act as horizontal diaphragms to distribute lateral wind loads to the vertical bracing elements.

5.3 Transfer Structures

At the 12th floor several transfer beams will be introduced because all perimeter columns are not lined up with columns coming up from the 11th floor. Additionally, all columns in the steel frame are transferred by the trusses at transfer deck level to the four corner concrete columns.

5.4 Movement

The effects of relative movement within a structure are important and need to be taken into account by designing for the appropriate restraining force or by providing a suitable movement joint. CIRIA Technical Note 107 (Design for movement in buildings) provides interesting recommendations for the designing process. Movements due to temperature variations will be considered, especially in the 28m spanning truss between concrete columns. The response to that will be either allowing movement joints or considering the restrained stresses in the elements; or a combination of both.

Settlement of the new foundation will be limited to 25mm. Over-consolidated cohesive soils such as London Clay are expected to experience 40-70% of the total settlement during the construction period. No differential settlement between pile caps is expected.

The 39m long concrete columns are subject to creep and shrinkage behaviour. The creep is a gradual deformation under sustained loading. Shrinkage phenomenon is a result of loss of moisture and internal chemical changes. Both phenomena will tend to contract the column and large stresses might be induced unless we leave the element unconstrained.

Architectural movement joints to cladding systems and internal partitions will be required subject to sub-contractor design details.

5.5 Deflections and tolerances

Construction tolerances require careful consideration during detailed design and in particular the ‘long’ spans. The main issues to address are the cladding to slab edge zones & slab soffits and structural slab levels. Concrete tolerances will be as specified in *NSCS Section 7(i)* and a close control on workmanship will be required to ensure that these are achieved. Steel tolerances will be as the National Structural Steelwork Specification.

Typical tolerances which are likely to be achieved on site are given in *BS 5606(i), Accuracy of Building*. It should be acknowledged in a survey of completed buildings carried out for *BS 5606*, that 95% of the slab surfaces surveyed were found to be up to ± 25 mm out of level, with 5% outside the range. This range of tolerance should be considered as likely when designing any trunking or services cast into screeds even though specified ‘target’ values will be lower. Elsewhere, “loose fit” interface zones should be provided in locations where it might be too optimistic to expect specified tolerances to be achieved on site. For further guidance refer to *BS 5606*.

Deflection limits for the steel beams and trusses will be given in a PBA Performance Specification and are typically as stated in *BS 5950*. Horizontal deflection of the building under wind action will be in accordance with *BS 8110 Part 2(ii)*.

5.6 Robustness and structural integrity

The proposed extension is classified as a ‘class 2B’ building in Part A of the building regulations, and as such the structure will require tying together to guard against disproportionate collapse. The use of framed construction throughout and the inherent provision of ties in two directions to steelwork members at various locations throughout the building generally allows the tying requirements for robustness to be met in both vertical and horizontal planes. Where removal of an individual member such as transfer beams or columns would precipitate collapse of a large area of a building, these beams or columns are considered as ‘key elements’ and are designed for the 34 kN/m^2 accidental loading as stipulated in the Building Regulations. According to this, special attention will be given to the four corner concrete columns. The corner columns will be treated as key elements.

5.7 Design life

The primary structure will be designed in accordance with the relevant Codes of Practice and British Standards. We propose that a design life of 60 years minimum period, as defined in *BS7543 - Table 1*, be used. Any external galvanised steelwork will need inspection and may require maintenance after approximately 15 years.

5.8 Fire rating

The fire rating for the superstructure is to be confirmed by the architect / fire consultant. Any exposed primary steelwork elements will be sprayed with an intumescent coating to achieve the required protection. Concrete covers to reinforcement will comply with the requirements of BS 8110 to achieve the specified fire resistance.

5.9 Durability

The exposure conditions for the concrete elements are as defined in BS 8500-1:2006 and BS 8110. Generally concrete in contact with the ground will be RC35 grade, with cover adjusted to suit the ground conditions and contaminations results from the interpretive ground investigation when received.

Care is required in the selection of materials for structural components in the “rain screen” zone outside the dry envelope. Fixings are required to address both general corrosion and electrolytic corrosion induced by dissimilar metals.

Structural steelwork will either be galvanized or primed (subject to location) to achieve a life to first major maintenance of 20 years. Any steelwork that will be exposed in its final position will require extra care to protect the finished work during transport and erection and to ensure the finished work exposed to public view is of the highest visual quality.

5.10 Vertical design loading

The structure has been designed for the following Imposed floor loadings based on BS 6399-1:1996 Loading for Buildings - Part 1:

Loading Category	**Loading [kN/m2]**
Dwelling units	1.50 kN/m^2 + 1.0 kN/m^2 for partitions
Balconies / Terraces	1.50 kN/m^2
Corridors / Stairs / Landings	3.00 kN/m^2
Plant areas (9th floor-mesh steel flooring)	4.50 kN/m^2
Plant areas (9th floor-composite slab flooring)	4.50 kN/m^2
Roof (without access)	0.60 kN/m^2

Refer to Appendix 2 for detailed loading.

5.11 Horizontal design loading

Wind loads will be derived using *BS 6399 Part 2*:
Basic wind speed = 21 m/s
Site Altitude = 15m

Notional horizontal loads will be applied to account for imperfections in the structure. The notional horizontal load for steel structures is 0.5% of the ultimate dead and imposed load as defined in BS5950-1:2000. The notional horizontal load for concrete structures is 1.5% of the characteristic dead load as defined in BS8110-1:1997.

5.12 Standards and codes of practice

The following reference documents are used in the execution of the structural design. The latest version at the time of commencing the design will apply unless noted otherwise.

BS 8110	Parts 1-3	Structural use of Concrete
BS 5950	Parts 1-9	Structural use of Steelwork in Building
BS 6399	Parts 1-3	Design Loading for Buildings
BS 8004		Foundations
BS EN 1992-1-1:2004		Eurocode 2: Design of concrete structures
BS EN 1993-1-1:2005		Eurocode 3: Design of steel structures

5.13 Guides and publications

Steelwork Design Guide to BS 5950, Vol 1, 2nd Edition - SCI
Design for Movement in Buildings - CIRIA Technical Note107
National Structural Concrete Specification (NSCS) – 3rd Edition
National Structural Steelwork Specification – 5th Edition

5.14 Construction issues

Various construction issues have been outlined throughout the previous sections of this report; in addition to this the key issues are described below.

It is a requirement that the building remains fully operational throughout the construction process with the current residents remaining within the building. Therefore all construction activities must be carried out as to cause the minimal possible disruption to all residents and the surrounding local neighbourhood.

It is essential that the structural stability and integrity of the existing building is not affected by the inclusion of the additional extra floors. As previously explained all vertical loading from the new structure will be distributed down the new corner columns and to the deeper and independent pilled foundations. This is one of many design features that is put in place to ensure the existing building loads are altered as little as possible.

The contractor is likely to use a tower crane for the construction of the new floors. This will be required to distribute materials around the site and lift structural elements such as trusses, beams and columns into position. The location of the crane will require careful coordination with the phasing of the development.

Consideration is required to establish a safe and practical site for the storage of construction plant and materials throughout the construction process.

Throughout the design process efforts must be made to limit the required depth of structural elements; such as floor slabs and connecting beams.

6 Design Interfaces

Structural components need to be considered in conjunction with finishes and the requirements of other disciplines which usually follow in construction programming terms. This section of the report serves to highlight the various interfaces which need to be resolved at the final proposals stage.

6.1 Building services within the building

In order to accommodate all plant requirements for the new extension and the existing building, a storey height services buffer will be built between old and new construction (at 9th floor).

At the new upper floors, a flat slab soffit to the majority of the slabs has been provided to ensure maximum flexibility for the distribution of services. Where downstands are present i.e. to the composite slabs, careful coordination of the services will be required to ensure minimal intrusion into the clear headroom space below.

6.2 Building services/utilities serving the site

To facilitate co-ordination an integrated underground services layout should be produced for construction incorporating incoming utilities, underground drainage and substructure. Information on incoming utilities will need to be provided by the services consultant. Underground drainage will be fully coordinated with the substructure. Some diversions of services will be required in advance of the main construction as part of enabling.

6.3 Cladding / roofing

Cladding loading points – PBA practice is to issue schematic sketches indicating the deflection and loading parameters assumed during the primary structural frame design. These sketches should be incorporated into the performance specification for the external envelope produced by the architect to ensure that the cladding contractor is made aware of the design constraints.

6.4 Fire

Exposed steel members will require intumescent coating protection (subject to input from the fire consultant).

6.5 Acoustics

Acoustic detailing will need to be addressed as set-out in the acoustic report, and as such, guidance from Approved Document E of the Building Regulations may be used as a ‘benchmark’ for the detailing of the structure.

7 Health & Safety – Design Risk Issues

7.1 Construction (Design and Management) Regulations 2007

This construction project falls under the Construction (Design and Management) Regulations 2007. These regulations impose legal responsibilities on various parties involved in the procurement, design and construction of building projects, including the client.
PBA are classified as designers under the regulations. We confirm that we have the relevant experience to complete design services for projects of this type, size and nature and that adequate, competent resources have been and will be allocated to the project at the appropriate design stages.

7.2 Design risks

It is good practice, and a requirement under the CDM regulations, that competent contractors are appointed to carry out the works. It can be assumed therefore that a competent contractor will be aware of all the normal design risks involved in the construction process for projects of a similar type, size and nature. Design risks will be considered by PBA at each stage of the design progress. Where possible these risks will be designed out of the project. Where this is not possible any residual risks will be noted on the project drawings. An engineer’s risk identification sheet is included at appendix 3 which identifies the ‘abnormal’ design risks at this stage of the project.

7.3 Temporary works

Information about the responsibilities associated with temporary works can be found in the Institution of Civil Engineers Conditions of Contract and BS 5975:2008 temporary works procures and the permissible stress design of falsework. This requires a careful approach to temporary works design and a review undertaken by competent persons and the appointment of a Temporary Works Co-ordinator to oversee the process.

Specific temporary works items (not exhaustive) as follows:

- Crane base if required
- Piling Mat
- Foundation excavation, propping and sequencing

Appendix 1 – Loading Data

pba peterbrett	KINGS COLLEGE COURT	23725	
	DEAD & IMPOSED UNIT LOADING	Oct-12	JS

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Loading in accordance with BS648:1964 (dead loads) and BS6399-1&3:1996 (imposed loads)

9th floor (plant floor) - composite slab

	Dead kN/m²	Imposed kN/m²
140mm composite slab (multideck 60-V2)	2.50	
floor finishes	0.30	
Ceiling & Services	0.25	
	3.05	
Imposed: Partitions		1.00
Imposed: Access		1.50
		2.50
Total SLS	**5.55**	
Total ULS (1.4DL+1.6IL)	**8.27**	

9th floor (plant floor) - mesh steel flooring

	Dead kN/m²	Imposed kN/m²
steel mesh 30x3 (spacing 33x33)	0.50	
secondary structure	0.50	
	1.00	
Imposed: Access		1.00
Imposed: Machinery*		3.50
		4.50
Total SLS	**5.50**	
Total ULS (1.4DL+1.6IL)	**8.60**	

*to be reconsidered with final plant layout

10-11th floor

	Dead kN/m²	Imposed kN/m²
140mm composite slab (multideck 60-V2)	2.50	
UHF + lightweight screed (80mm)	1.60	
floor finishes	0.30	
Ceiling & Services	0.25	
	4.65	
Imposed: Partitions		1.00
Imposed: Access		1.50
		2.50
Total SLS	**7.15**	
Total ULS (1.4DL+1.6IL)	**10.51**	

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12th floor - interior

	Dead	Imposed
140mm composite slab (multideck 60-V2)	2.50	
UHF + lightweight screed (80mm)	1.60	
floor finishes	0.30	
Ceiling & Services	0.25	
	4.65	
Imposed: Partitions		1.00
Imposed: Access		1.50
		2.50
Total SLS	**7.15**	
Total ULS (1.4DL+1.6IL)	**10.51**	

12th floor - terrace

	Dead	Imposed
140mm composite slab (multideck 60-V2)	2.50	
Roof system finish	1.00	
Ceiling & Services	0.25	
	3.75	
Imposed: Access		1.50
		1.50
Total SLS	**5.25**	
Total ULS (1.4DL+1.6IL)	**7.65**	

roof - METSEC

	Dead	Imposed
Cold rolled + cladding	1.00	
Ceiling & Services	0.25	
	1.25	
Imposed: Wind / Snow / Maintenance		1.00
		1.00
Total SLS	**2.25**	
Total ULS	**3.35**	

Appendix 2 – Engineers Risk Identification Sheet

1.0 General introduction

This note provides evidence that there has been a process of risk identification within PBA as a part of its civil and structural design work. This PBA Design Report for the project should be read by the contractor and other designers as part of their communication duties under health and safety. Given the stage of work, it is likely that risks will emerge as a part of the normal design process during the project development; this section will therefore require updating.

2.0 Site specific risks

The ground investigation work carried out to date has concentrated on determining the location and size of the existing pile caps. The fieldwork only included a limited trial pitting exercise carried out at the north-east and south-east corners. Further investigations are required prior to works commencing on site. Construction of the extension will be undertaken with the tenants living in the existing building. Detailed coordinated planning of deliveries and plant movements will be required to mitigate the risks involved. No survey information of underground services have yet been acquired; therefore survey investigations will be required.

3.0 Building structure, specific risks

This PBA Design Report provides background information to the design and also setting out the design duties expected of specialist designer/suppliers. The risk to be addressed here is that timely and effective design co-ordination of specialist subcontractor inputs effectively mitigates the risk of site modifications; thus minimising site work known to be higher risk than factory manufacture.

The structural frame of the extension includes significantly heavy steelwork at height; requiring special truss transport and assembly. Particular attention should be paid to the safe handling and placing of these members to avoid the associated health and safety risks.

During the construction phase of the development the existing residential apartments will remain occupied. This will require careful planning of the deliveries, security measures and storage etc to mitigate the risks to the tenants.

Particular aspects of the building relating to the structural design that might need adjustment as the work of others becomes more advanced are:

- Window cleaning and fall restraint design - provisions tbc by the Architect, not known at time of writing.
- Cladding subcontractor interfaces with the structure.
- Temporary works design – this is to be carried out by the contractor and Method Statements should be prepared in accordance with the structural concepts designed by PBA and agreed with the design team in advance.
- Precast concrete slabs & stairs – full details to be confirmed by the specialist contractor
- Secondary structural element e.g. handrails, canopies, brise soleil, access systems, architectural metalwork, plant support – full details to be confirmed by specialist contractor
- Ground excavation and piling close to the existing building.
- Crane – The contractor needs to provide information on the chosen crane – crane information is to be provided in advance of the substructure design.
- Lift design – full details to be confirmed by specialist contractor.