1 Introduction

This report has been prepared by Heyne Tillett Steel to accompany the current proposals of a façade retention scheme for the alteration and conversion of 1 Sloane Gardens and to respond to recent comments from Kensington and Chelsea, following the pre-application submission in December 2015 by Reardon Smith Architects.

A previous planning application submitted by Jestico + Whiles for the scheme was granted permission in 2012. A new scheme was then submitted by Reardon Smith Architects for pre-application advice in July 2015. These schemes involved a possible ‘cut and carve’ refurbishment of the existing building as opposed to the improved façade retention scheme currently proposed.

The report includes an initial structural appraisal of the existing structure and an assessment of the structural implications for a change of use of the existing building from the current residential use to hotel, restaurant and bar use.

Key issues have been analysed as follows:

- Load Capacity Assessment of Existing Floors
- Load Capacity Assessment of Existing Walls
- Robustness and Disproportionate Collapse
- Fire Resistance and Integrity of the Existing Floor
- CDM Regulations

Preliminary calculations have been carried out to verify the compliance of the existing structure with the current Building Regulations and British Standards.

The report is to be read in conjunction with the Construction Method Statement submitted by Heyne Tillett Steel to accompany the pre-application submission in December 2015.
2 Existing Structure

The existing building is a 19th century mansion block distributed over six storeys above ground with a single level of basement. It includes an external lightwell on Sloane Gardens and vaults under the pavement in both Sloane Gardens and Holbein Place. An existing extension currently occupies part of the roof.

The existing superstructure typically comprises six storeys of load-bearing masonry frame with filler joist concrete slabs. A mezzanine floor is formed between ground and first floor in the corner of the building towards Holbein Place. The existing ground floor and the mezzanine are constructed with timber joists supported onto the loadbearing masonry walls.

All the principal external and cross walls are load bearing brickwork walls extending from the basement to the roof. The wall thicknesses typically vary and increase in the lower floors.

The existing basement is formed with retaining masonry walls and a ground bearing concrete slab. Trial pits undertaken on site indicate that the building is typically founded on corbelled strip footings. These are approximately 0.9m deep with widths assumed to be varying between 1.0m and 1.7m, if the trench footing is mirrored internally and centred on the wall. The formation soil is on Kempton Gravel.
**3 Load Capacity Assessment of Existing Floors and Walls**

An initial structural appraisal of the load carrying capacity of the existing floors and walls for the proposed use of the building has been carried out.

### 3.1 Design Loadings

#### 3.1.1 Imposed Load

The change of use involves a general increase of imposed floor loadings throughout the entire building in accordance with the type of activity and occupancy as per BS EN 1991.

The assumed original imposed loads requirements based upon the historical use of the floors are as follows:

- Lower Ground Floor – Retail shops/Storage – 4.0 kN/m²
- Ground Floor – Retail shops – 4.0 kN/m²
- 1st to 5th Floor – Domestic and Residential – 1.5 kN/m²
- Roof – Maintenance Access and Snow – 1.5 kN/m²
- An allowance of additional 1.00 kN/m² has been considered from LGF to 5th floor to account for partitions.

The proposed imposed loading requirements based upon the proposed use of the floors are as follows:

- New Basement – Plant – 7.5 kN/m²
- Lower Ground Floor – Office/Bar – 2.5/5.0 kN/m²
- Ground Floor – Retail shops/Office/Bar – 4.0 kN/m²
- Hallway – 4.0/2.0 kN/m²
- 1st to 5th Floor – Hotel Accommodation/Corridors – 2.0/4.0 kN/m²
- 6th Floor – Bar/Restaurant – 5.0 kN/m²
- New Roof – Plant – 5.0 kN/m²

An allowance of additional 1.00 kN/m² has been considered from LGF to 6th floor to account for partitions.

Based on the above, an average increase of 1.0 kN/m² of imposed loading per typical floor will be experienced by the existing structure following the change of use to hotel.

#### 3.1.2 Dead Loads

Additional superimposed dead loads have been considered to allow for repairing and upgrading the existing concrete filler joists slabs to meet current regulation requirements (e.g. fire protection, acoustic etc.) and modern standards and expectations for a luxury hotel.

A proposed additional superimposed dead load of 2.50 kN/m² has been allowed for in the hotel accommodation areas to include a new screed, concrete encasement to existing steel joists and new finishes.

New in-situ concrete slabs have been considered for the new floors at lower ground, ground and basement level.

The existing roof slab originally designed for maintenance access and snow will not be adequate to support the proposed roof extension and alterations, therefore will need to be entirely replaced with a new in-situ concrete slab.

A lightweight steel frame with metal decking infill has been considered for the new roof extension above 6th floor level.
3.2 Assessment of the Existing Floors

The filler joists slab are typically formed from 8”x4” steel joists spaced up to about 1.5 m apart spanning between cross walls and infilled with approximately 150mm thick unreinforced clinker concrete. Loads applied to the concrete are transferred to the joists, with the concrete acting as a shallow arch. The soffit of the slabs are flat and the joists are partially encased in the concrete.

The steel joists span is typically between 3.2m and 4.5m.

Preliminary calculations have been carried out and demonstrate that the majority of the existing steel joists fails in bending and cannot accommodate the new loading associated with the intended change of use.

- Max allowable stress (from the Historical Structural Steelwork Handbook) = 123.5 MPa
- Design stress = up to 163.5 Mpa

In addition to the above, the dynamic performance of the floors will need to be assessed, primarily in terms of floor vibrations and more onerous user comfort for hotel rooms.

As such, additional strengthening of these areas of the floors will be required.

The strengthening required would take the form of one or more of the following:

- Additional supporting steelwork to reduce the spans of the supporting steel joists
- Strengthening of the supporting floor beams with the introduction of additional steel plates, angles and/or channels.

An indicative layout of the proposed floor strengthening and an example of these types of interventions are indicated in the images to the right.
3.3 Assessment of the Existing Walls

All the principal external and internal cross walls are load-bearing brickwork walls extending from the basement to the roof. The wall thicknesses vary and the walls typically thicken in the lower floors.

Typical wall thicknesses are as follows:
- Lower Ground Floor – 550mm
- Ground Floor and 1st Floor – 440mm
- 2nd to 5th Floors – 340mm

Preliminary calculations have been carried out and demonstrate that all the internal loadbearing masonry structure below 4th floor level cannot accommodate the additional imposed loading associated with the intended change of use and floor and wall strengthening and stiffening will be necessary.
- Max allowable stress (for historical buildings) = 0.42 MPa
- Design stress = up to 1.0MPa

The strengthening required involves the introduction of additional steel framing to the existing structure.

In addition to the above, historical alterations to the existing walls and defects inherent to the retained structure will reduce further the effective strength of the walls and their stability. Examples of these defects are shown in the photos to the right.
4 Robustness and Disproportionate Collapse

To determine whether the current building structure complies with the Building Regulations Approved Document A3, the building must demonstrate sufficient robustness so as to ensure a disproportionate collapse cannot occur in the event of accidental loading. To determine this, stipulations outlined in section A3 paragraph 5.1 of the regulations must be adhered to.

The existing building has been identified as being a Consequence Class 2B building. The conversion from residential to hotel is considered a 'material change of use' and as such the entire building must either comply with the requirements of a Class 2B building or would need to be retrospectively upgraded to conform to the current regulations.

To determine the conformity of the building to the current regulations, the latent robustness of the existing structure has been checked using the following guidance sources: IStructE guide Practical Guide to Structural Robustness and Disproportionate Collapse in Buildings, British Standards and Building Regulations.

The strategy used based on these guides is as follows:

1. Performing a member check, whereby the designers check that the removal of notional lengths of load bearing walls (considered individually in turn) does not give rise to overall instability of the building structure. Furthermore, with each element removed, the total area at risk of collapse must be no more than 15% of the total floor area of that storey or 100m², whichever is smaller. The collapse area must also not extend further than the immediate adjacent storeys.

2. If the removal of a structural member results in damage in excess of the above limits, the member may then be designed (or in this case checked) as a 'key element' as defined in section 5.3 of the regulations, where the element must be able to withstand a horizontal and vertical loading of 34kN/m² (considered separately). The combination of loads to be used is 1.05*(1.0 dead + 1.0 accidental + 0.33 imposed + 0.33 wind).

3. Alternatively, provide both horizontal and vertical ties in all supporting walls to ensure a minimum capacity is achieved in accordance with the relevant material/construction standards.

The results of the analysis demonstrate that both notional removal of load bearing walls and the key element checks failed.

Effective horizontal and vertical ties to floor plates have not been provided in the existing structure.

It is therefore concluded that the existing building structure does not comply with the current regulations. Based on the above, significant structural interventions in the form of the introduction of additional horizontal and vertical ties, and additional steel framing in all supporting walls are to be installed to meet the requirements of part A3 (Disproportionate Collapse) of the Building Regulations.

An indicative layout of the proposed floor strengthening and an example of these types of interventions are indicated in the images to the right.
5 Fire Resistance and Integrity of the Existing Floors

A visual assessment of the condition of the existing concrete filler joists floors has been conducted on site.

As is often the case with this method of construction, areas of floor with low cover, some poor compaction around the steel joists and corrosion of the steel joists have been identified. These areas will require extensive repair or replacement to achieve the required fire protection and preserve the integrity of the structure.

Additional screed is to be provided over the existing floor and full concrete encasement is to be reinstated to the bottom flanges of the joists by placement of the repair concrete by spraying or installation of fire resistant boards throughout the soffit of the slab where the joists are exposed.
6 CDM Regulations

The scheme would require extensive and heavy internal temporary works to support the existing retained structure above during the works.

More complex phasing and methodology is required to complete the works to ensure health and safety requirements are met throughout the entire construction process.

Higher risk due to more complex construction and higher exposure to hazards by site personnel and retained shops at lower floor is therefore envisaged for this solution.
7 Façade Retention

A scheme has been provided in the CMS pre-planning report. Sequence of construction and temporary works requirements related to the formation of the basement and erection of the permanent structure have been outlined.

Methodology and sequence have been preliminarily discussed and agreed with a Contractor and will be finalised prior to construction.

Preliminary calculations for the façade retention structure have been carried out and are enclosed in the CMS report.

The construction of the basement using an 'hit and miss' underpinning solution is the most effective construction methodology to minimize the impact of the excavation on the retained façade and adjacent structure.

The proposed retention of the existing internal slab adjacent to the existing cantilevered balconies will ensure that the restraint of the bay windows is maintained during the works.

Based on the above the façade retention scheme is considered a perfectly sound system and will not result in any harm or damage to the retained façade.

A summary of the benefits of façade retention versus 'cut and carve' refurbishment are:

- New structure and foundations
- Less complex internal temporary works and phasing
- Lower risk construction / lower exposure to hazards by site personnel and retained shops
- Clean flat soffits
- Maximised services integration and floor to ceiling heights
- Opportunity to create preferred layout suited to hotel operator with no compromise on column or wall locations
- New cores to suit vertical transportation requirements
- Better quality asset at end of works
- Clean open plan floor plates
- Much easier and more straightforward to achieve an integrated, building regulation compliant building without compromise
- More efficient building from an M&E perspective in terms of energy use
- Building will be more flexible to change of use in the future (beyond hotel) should this be required
- Increased internal floor area
- Improved integration and support of additional floors, including the proposed 6th floor roof extension
8 Conclusions

Following an initial appraisal of the existing structure, it is concluded that in order to support the proposed roof extension and alterations as well as accommodate a change in intended use of the building and meet the current Building Regulations and British Standards requirements, significant structural intervention will be required to the original building structure.

Extensive repairing or replacement works will also be required in the existing floors to achieve the required fire protection and preserve the integrity of the structure. The existing roof slab originally designed for maintenance access and snow will not be adequate to support the proposed roof extension and alterations, therefore will need to be entirely replaced with a new in-situ concrete slab.

All these structural interventions will alter the original nature of the structure and will compromise the internal quality of the space.

The façade retention solution is considered more beneficial to the proposed scheme.