

# ELITE ENGINEERING

12020-c230511cl-kam

11 May 2023

Jack Carter  
UK Gunitite Ltd  
Unit 2, Orchard Business centre  
Kangley Bridge Road  
Sydenham  
London SE26 5AQ

Dear Jack,

## **47 ETON AVENUE BELSIZE PARK LONDON NW3 3EP: STRUCTURAL ENGINEERS REPORT**

### **1.0 INSTRUCTIONS**

- 1.1 We confirm our brief to inspect the chimney stack at the above property and provide any recommendation. We made the inspection on 11<sup>th</sup> May 2023.
- 1.2 Our inspection has been restricted to the chimney stacks only.
- 1.3 Elite Engineering cannot accept any liability to any third party for the whole or part of its contents. This report does not comprise a full building survey, it is limited to the discrete areas we were asked to inspect.

### **2.0 GENERAL OBSERVATIONS**

- 2.1 All directions within this report are based upon an observer standing in the street facing the building.
- 2.2 47 Eton Avenue is a substantial four storey detached property which dates from around the turn of the last century and is of traditional construction, i.e. solid masonry walls, timber floors and roof structures, and a combination of load bearing masonry and load bearing timber studwork internally. It has been converted to several flats in the past. The date of conversion is unknown.
- 2.3 The chimney stacks of concern are located on the left-hand side flank wall of the property. Both the front and rear chimney stacks have a width of 480mm and are approximately 4 meters tall.



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- 2.4 The two chimney stacks have a noticeable lean towards the right side. Specifically, the front stack is particularly significant and prominent because it lacks support from its base. Without a plumb line survey, it is difficult to determine the exact extent of the lean, but it seems excessive, especially in the upper 1.5 meters of the stack. On the other hand, the rear stack is partially restrained by the pitched roof, resulting in a less pronounced lean. However, the top portion of both chimney stacks is tilted.
- 2.5 The front chimney stack has a steel tie rod embedded within it, which is connected to the rafter to provide some restraint. However, the tie rod has corroded over time and has become loose. In its current state, it is unlikely that the tie rod offers any support to the stack.
- 2.6 Both chimney stacks have defaced brickwork and spalling pointing including cracked haunching. This type of defect is commensurate with the age and type of construction.

### 3.0 **COMMENTS**

- 3.1 We comment on our observations as follows:
- 3.2 Both chimney stacks lean towards the right, but the front stack is leaning more severely than the rear stack. The main cause of this is the inadequate support for the front stack throughout its entire height of 4 meters, aside from an ineffective tie rod. In contrast, the rear stack receives partial support from the rafter, resulting in a slightly lesser degree of leaning.
- 3.3 In general, if you are planning to carry out any works on a chimney stack within a conservation area, it is advisable to notify the local conservation officer or the relevant planning authority. As Belsize Park is a conservation area, there are likely to be specific regulations and guidelines in place regarding alterations or repairs to buildings, including chimney stacks.
- 3.4 With reference to Approved document A – Structure (current edition): this provides guidance on the proportions of masonry above roof space.
- 3.5 Tall slender chimney stacks are vulnerable to the wind and can deflect in extreme conditions. The general rule is that the height of a chimney stack, as measured from its intersection with the roof, should be no more than 4.5 times its width provided that the density of the masonry is at least 1500kg/m<sup>3</sup> (London stocks are approx. 1850kg/m<sup>3</sup>).

With a nominal width of 480mm, the height x width is the maximum permitted Slenderness Ratio (4.5W).

Slenderness ratio of the front chimney stack=  $4200/480 = 8.75$

As you can see this is significantly higher than the guidance.

A1/2

ONLINE VERSION

## Section 2D: Proportions for masonry chimneys above the roof surface

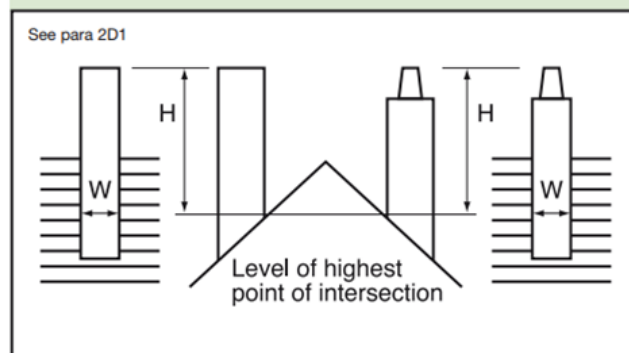
### Height to width relationship

**2D1** Where a chimney is not adequately supported by ties or securely restrained in any way, its height if measured from the highest point of intersection with the roof surface, gutter, etc. should not exceed  $4.5W$ , provided the density of the masonry is greater than  $1500\text{kg/m}^3$ , where:

**W** is the least horizontal dimension of the chimney measured at the same point of intersection, and

**H** is measured to the top of any chimney pot or other flue terminal (see Diagram 20).

Diagram 20 Proportions for masonry chimneys



### 4.0 RECOMMENDATIONS

- 4.1 The front chimney stack height significantly exceeds the slenderness limit, (exceeds  $4.5 \times$  the width of the chimney stack. The height of the stack includes the chimney pots). If it is demolished and rebuilt plumb the new stack would need to comply with modern design standards and codes.
- 4.2 The rear chimney stack is less of an issue as it is tied to the rafters. The top section of approximately 1.5m height can be rebuilt and tied to the existing rafters for restraint.
- 4.3 We recommend that the front chimney stack is demolished down to approximately 4m and rebuilt with matching bricks (minimum  $1500\text{kg/m}^3$  density) with 1:1:8 cement:lime:sand mix.

- 4.4 Reconstructing the front chimney stack will present a challenge due to its unrestrained height of 4m. The existing single rod solution is unlikely to provide adequate support, so a properly designed solution is necessary to withstand wind loads and to comply with current standards. This may involve using a steel band around the chimney stack with multiple rods and likely reinforcing the existing rafters to support the load effectively. Refer to sk01 for illustration. Note the roof tiles will need to be removed exposing the rafters. If this space is habitable then there will be disturbance internally to gain access to the rafters.
- 4.5 As a less likely option, if the front chimney stack is not being used, an alternative solution could be to consider reducing its height and capping it off. This potential course of action can be explored through discussions with the conservation officer and the client.
- 4.6 In general the existing stacks repointing appears to be spalling and it should be repointed to match by raking out at least 25mm and by ensuring the new pointing is well rammed in. Additionally, all the haunching, as well as any cracked or broken pots, should be replaced during the renovation process.
- 4.7 To obtain approval from the local conservation officer, it will be necessary for you to engage an architect or surveyor who will be responsible for submitting an application. The brickwork and pointing for rebuilding the chimney stack will need to be to the approval of the local conservation officer.
- 4.8 This report examines several potential solutions, such as the implementation of tie rods and strengthening the rafters. However, the detailed design solution, including the necessary calculations, falls outside the scope of this report. Further analysis and design work would be required to determine the final design solution and ensure its structural integrity.
- 4.9 For the provision of a design solution, calculation package for building control approval, and sketch details, we propose a fee of £950 plus VAT. In the event that additional site visits are necessary to inspect the roof space, each visit will incur a charge of £300 plus VAT.

We trust that this report provides the information you require but if you have any queries, please do not hesitate to contact us.

Yours sincerely

Kamal Matin BEng (Hons)

**For and on Behalf of Elite Engineering**

Enc sketch proposal



Plate 1: Google view the property with the 2 large stack on the left flank wall



Plate 2: View of front stack leaning towards the building





Plate 3: Top section lean is more pronounced.



Plate 4: Top section of front chimney stack





Plate 5: Front stack side view

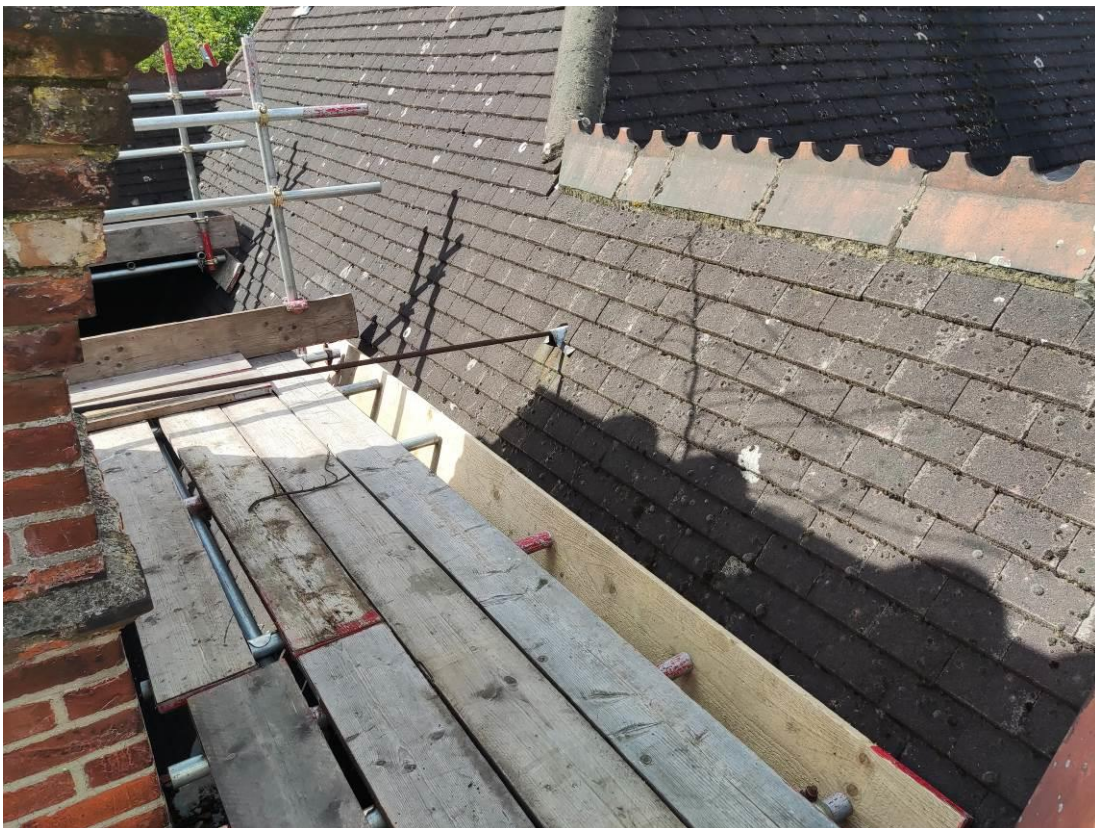


Plate 6: Front stack with tie rod between stack and roof





Plate 7: Rear chimney stack



Plate 8: Rear view of rear stack leaning against the roof