Hurst Peirce + Malcolm
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Our Ref: AHD/RS/23450

12th September 2018

Ms S Kendall
Bentham House
4 The Mount
Hampstead
London
NW3 6SZ

By Post & Email

Dear Suzy

Re: Bentham House, 4 The Mount, Hampstead

Hurst Peirce & Malcolm were asked to visit site to inspect the leaning north gable wall and chimney at the above property

We carried out our inspection on the 5th September 2018, in the presence of Paul Styles. We report as follows:

Description

Bentham House is a semi-detached three-story house dating back to the early 19th Century, according to the Listing, and is Listed at Grade II as a group with adjoining No,s 1-3 The Mount.

The house is of solid brickwork, but stucco-fronted. The roof is formed of triple duo-pitched slated roofs on strutted purlin timber structures. Floors are of timber construction, with internal walls mainly in studwork.

Large chimney stacks are built above both the north and south gable walls.

Observations

The north gable wall and chimney were inspected from the garden of the adjoining property, from the public house behind the property and from the top of the roof itself. The loft space and rooms below at first and second floors at the northern end of the building were also inspected.

No intrusive investigations were carried out.

Both the top section of the north gable wall and north chimney stack are leaning fairly significantly. A plumb line dropped on the chimney stack measured 180mm out-of-plumb over 1900mm height of stack. It was not possible to measure the lean on the gable wall, but this is estimated at a further 100-150mm over the approximate 1500mm height from eaves level (where the lean appears to begin) up to parapet level. The term 'lean' may be misleading because the gable wall and chimney stacks are actually curved over.

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The curvature is more exaggerated at the base of the stack. The kink visible in the second photograph below may indicate that the stack has been rebuilt in the distant past and has then continued to curve over further.

The stack had been fairly recently repointed in heavy cement ribbon pointing so gauging the condition of the brickwork was difficult, although there were no obvious signs of deterioration.

No cracking was visible in either the upper gable wall or chimney stack.

Internally, inspection of the loft space revealed no breaks in the continuity of the chimney breast brickwork at the base of the stack.

Similarly, from inspection of the rooms below, the chimney breasts were still in place at second and first floors (ground floor was not available for inspection). The breast widens out at second floor then splits into two separate breasts at first floor.

Both the timber floors at first and second floor level have a noticeable deflection towards the centre of the building but are not 'bouncy'.

Some vertical cracking was noted at the junction of the chimney breast and gable wall at first floor as well as at the junction of the internal spine partition wall and the gable wall.

It is understood that only one of the flues is still in use, but for a boiler rather than an open fire. It is not known whether any of the flues are parged or otherwise lined.

Discussion and Recommendations:

Traditionally constructed brick chimneys have a tendency to lean (curve) over time. This lean is normally towards the prevailing windward side, and more often than not, towards the centre of the building.

The factors causing the lean can be manyfold, but usually it is down to weathering loss of mortar and drying–out on the windward side, plus expansion of the lime mortar on the leeward side as salts from flue gasses are drawn towards that side by moisture migration where they crystallize and expand This leads to the curvature and confirms that the process is long term and there will not have been any sudden change.

Repointing with cement mortar whilst not trying to deal with the other issues can accelerate the effects.

The plumb check on the stack alone reveals a lean of 180mm over a height of 1900mm, the overall stack is 300mm higher than this and has some tall clay pots on top.

Assuming that the stack works as a single entity 580mm wide, this puts the centre of gravity just inside the 'middle 1/3, which is considered to be stable for a static structure not subject to wind load. However, the stack and flues are subject to wind load and there is no guarantee that the stack does work as a single entity, as withe walls can be notoriously poorly bonded. In addition, there is already eccentricity at the base of the stack from the leaning gable wall below. There is also no provision for future increase of the lean.

We would therefore conclude that the stack should be treated as structurally unstable.

Furthermore, to remove all the eccentricity from the lower gable wall and the knock–on effects on the rest of the structure, the gable wall and chimney should be carefully demolished down to eaves level (where the lean starts) and rebuilt true and vertical, in a suitable lime mortar, reusing as many existing bricks as possible and matching sound reclaims to make up any shortfall.

However, we appreciate the impact this would have on the listed building, time, cost and extent of work required, so we have tried to assess the possibility of just rebuilding the stack above roof level.

The gable wall above eaves level by itself is stable by calculation but cannot be treated as distinct from the chimney stack due to the effect the stack is currently having on pulling the wall inwards. The gable wall is afforded some restraint by the roof structure, though there are not any solid internal perpendicular walls that could provide better restraint.

Therefore, rebuilding the stack vertically above the roof only (ie down to flashings level) might be an acceptable compromise, albeit one that leaves some eccentric loadings in the wall and structure generally, but only if a strutting system can be provided. Locating such a system inside the roof structure is unlikely to work, given the shallow depth of the roof voids, so the benefits would be minimal. It would really need some form of external strutting. Even if this were possible, we believe any such system would detract more from the listed building than a carefully rebuilt wall section & chimney stack. In addition, there is not really any solid internal structure below to bring struts down onto.

The stack should be rebuilt to match the existing, but true and vertical, in a suitable lime mortar, reusing as many existing bricks as possible and matching sound reclaims to make up any shortfall. The withe walls should be adequately bonded in and flues should each be lime parged internally as work progresses.

The vertical cracking at the breast/wall junction is likely to be due to the eccentric loading being applied to the chimney breast (and possible poor bonding of brickwork) by the leaning stack and the vertical wall/partition crack is likely to be due to differential settlement caused by vertical creep in the timber spine partition below. Simple repairs should be carried out once the stack issues are resolved.

We trust that you will find the above sufficient for your needs at this time, but please let us know if you have any queries.

Yours sincerely

Richard Salmon
BEng(Hons), CEng, MIStructE, PDD(Build.Cons)
For and on behalf of Hurst Peirce + Malcolm LLP

Richard Salmon's findings, the photographs and this report have been reviewed by me and I can confirm that I agree with the assessment and recommendations.

Andrew H Dutton
MA(Cantab), CEng, FICE, FIStructE, FConsE.
CARE Accredited Engineer
For and on behalf of Hurst Peirce + Malcolm LLP

cc. Paul Styles, PD Styles & Company Ltd, Chartered Surveyors, 17 Constantine Road, London NW3 2LN