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Mr & Mrs Miller  
The Grange  
Norwich Road  
Little Stonham  
Suffolk  
IP14 5LX

19<sup>th</sup> January 2021

R/19/211

**Report on Cracking of Chimney: The Grange, Norwich Rd., Little Stonham.**  
**January 2021 Update:**

The property is a Grade II listed detached house with a pitched tiled roof on timber framed walls. There is a large masonry chimney to the centre left of the main house.

Adam Power Associates Ltd. were asked to carry out a site visit by the Client's builder Revive & Restore Ltd. to inspect cracking noticed in the chimney. The site visit took place in September 2019 and a report was issued on 24<sup>th</sup> September (copy attached).

The initial report was inconclusive but suggested that the cracking, which is ongoing, may be due to seasonal ground movement exacerbated by local vegetation in the surrounding clay soil. The report noted that to obtain a more thorough understanding of the problem it would be necessary to excavate a trial hole at the base of the chimney to determine the foundation depth, type and the condition of the subsoil. This work would have involved significant upheaval and damage to the ground floor and finishes and an alternative approach was suggested which proposed carrying out local repairs to the chimney to help it tolerate seasonal movement and monitoring future performance and ongoing movement. It was pointed out that this approach would not resolve the movement altogether.

On 12<sup>th</sup> December 2019, prior to repairs having been carried out, a further site visit took place after the Client reported further cracking. The visit confirmed that cracking had become more severe and that settlement of the south eastern corner of the chimney appeared to be the problem. It was decided that action was needed to carry out a more extensive repair to the east face of the chimney at first floor level and that investigation of the chimney foundations would also be necessary to confirm the exact cause of the problem. It was also determined that temporary shoring of the first-floor brickwork (on the east face of the chimney) was necessary as a precaution.

A scheme was prepared and issued in January 2020 to install a steel beam at roof level supported on a series of props and bearers at each floor level down to ground floor. The beam was designed to provide temporary support one side of the chimney while the damaged east face was rebuilt at first floor level. The beam also served to reduce the load on the foundations while exploratory trial holes were excavated to determine foundation and ground conditions. A copy of drawing D1 is attached.

In August/ September 2020 the Contractor Revive & Restore Ltd. completed installation of the temporary beam and excavation of three trial holes on the eastern side of the chimney. Probing of the trial holes using a Mackintosh Probe revealed that the foundation beneath the eastern side of the structure extends to at least 0.8m below ground floor level. The south eastern corner is underlain by well compacted brick fill to a depth of 1.8m above a band of weak silty soil approximately 0.5m thick. The north eastern corner is founded on soft clay above a similar band of weak silty soil approximately 1m thick. The unusually deep foundation with brick fill below suggests that the chimney was constructed over an ancient feature such as a former pond or moat. There is evidence that the chimney suffered some initial settlement after construction, but probably stabilized until relatively recently when decomposition of organic matter or a change in ground water level have caused further instability of the band of weak soil and further settlement is now taking place. From approximately 2.4m below ground level the soil beneath the chimney is firm clay.

Additional probe testing was carried out at the western end of the chimney in December 2020. The results indicate that the clay soil beneath the western end is moderately firm to a depth of 1m and then becomes very firm. No remedial improvement is planned for the western end of the chimney with improvements planned for the north and south eastern corners and at the eastern end of the link archway only.

The depth of the band of weak soil between 1.3m & 1.8m below ground floor level makes a traditional concrete underpin of the chimney difficult and alternative methods of stabilizing the structure are currently being explored. Two possible solutions being considered include; soil stabilization of the weak band of soil using resin injection, or the installation of piles around the north and south eastern corners of the chimney.

Adam Power Associates are currently in discussion with the following foundation specialist companies in order to determine the most efficient and economical foundation improvement solution.

- 1) Geologic Ltd. – Steel screw pile specialists
- 2) DJE Construction Ltd. - Traditional concrete piling specialists
- 3) Oxford Hydrotechnics Ltd. – Soil stabilisation specialists.
- 4) Geobear Ltd. – Soil stabilisation specialists.

Once proposals and quotations are received, these will be technically and financially evaluated by ourselves and a recommendation made to the Client.

An external site investigation was carried out by RSA Geotechnics Ltd. in October 2020 and a copy of the final report is attached. The results of the investigation indicate that the band of weak soil found beneath the eastern end of the chimney appears not to extend beyond the building footprint and the site is underlain by firm or stiff clay from a depth of approximately 1m. Subsequent to the site investigation by RSA, a sample of soil was recovered from the weak band of material beneath the eastern end of the chimney which was sent away for

grading analysis. The results of the analysis have now been forwarded to the soil stabilization specialists and a copy is included with this report.

In addition to finding a resolution to the foundation problem, significant repairs are also required to the chimney superstructure which is in poor condition owing to the movement. Repairs are planned in two stages with initial preliminary work to stabilize the structure prior to implementing the foundation solution. This will be followed, if necessary, by further repairs afterwards if additional movement occurs during the foundation works. Adam Power Associates are currently in discussion with Revive & Restore Ltd. to develop a safe and practical approach to the repairs. Details have not yet been finalized.

The Client has incurred Contractor and Consultant costs to date in connection with the chimney which are summarized as follows;

		Costs Excl. VAT
Revive & Restore Ltd.	Contractor	£15,393.33
Adam Power Associates Ltd.	Consulting Engineer	£3,337.48
RSA Geotechnics Ltd.	Geotechnical Engineers	<u>£1,569.50</u>
Total to date		£20,300.31

A breakdown of the costs associated with the work carried out by Revive & Restore Ltd. and Adam Power Associates Ltd. are provided on separate sheets attached.



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- 1) Sept. 2019 Engineers report
- 2) Engineering Drawing D1
- 3) RSA Geotechnics Ltd. Ground investigation report
- 4) Grading analysis on supplementary soil sample (recovered from soft soil beneath chimney)
- 5) Breakdown of costs to date – Revive & Restore
- 6) Breakdown of costs to date – Adam Power Associates
- 7) Final invoice – RSA Geotechnics Ltd.