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6 March 2014

Our Ref KDG/18162.1/LM
Your Ref BR 1502/001/RH/TB

Dear Sirs

The Barbican Estate - Remedial Works to Exterior Concrete

The Barbican Association has engaged William J Marshall & Partners to advise in connection with the technical issues which arise out of the dispute concerning the recoverability of the cost of works to the exterior concrete of the three tower blocks from the long leaseholders via the service charge. A copy of the preliminary report prepared by Mr de Silva is enclosed for your information.

It is apparent from the report that there was material non-compliance with the standards which were current at the time of construction. Such non-compliance provides at least preliminary evidence of the existence of defects which should be further investigated. To enable Mr de Silva to prepare a more detailed report he will need access to copies of the relevant contract documents, in particular, the specification. Please confirm that you are willing to provide such information either to us or to him directly for this purpose.

Yours faithfully

Pemberton Greenish LLP

Enc

Your reference:

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Ms K Glanville
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Our reference:
KdeS/OE/A.5463

BY EMAIL AND POST

4th March 2014

Dear Ms Glanville

Barbican, City of London

Thank you for your letter of 27th February 2014, instructing us on behalf of the Barbican Association to prepare a short report setting out our preliminary conclusions concerning the contemporary requirements for concrete cover and concrete compaction and, on the basis of the reports by Martech and Bickerdike Allen Partners, whether those requirements were met for the three tower blocks at the Barbican known as Cromwell Tower, Lauderdale Tower and Shakespeare Tower.

The data on the condition of the tower blocks is included in reports prepared by Martech dated 12th January 2012, 13th January 2012 and 27th January 2012, and by Bickerdike Allen Partners dated 16th March 2012, which were made available to us by the Barbican Association.

This letter sets out the preliminary conclusions we have reached thus far. Our views are based on limited information: in particular we have not seen the original construction drawings or the engineer's specification. Our views therefore remain subject to review upon further investigation.

Concrete cover

1. At the time of construction of the tower blocks, which I understand were completed in 1973 (Cromwell), 1974 (Lauderdale) and 1976 (Shakespeare), the general design standard for concrete cover to reinforcement was set out in the "British Standard Code of Practice for the structural use of reinforced concrete in buildings", BSCP 114: 1969. The standard required a minimum of 40mm cover to reinforcement in all external work where the face of the concrete was not adequately protected by a protective coating or suitable cladding.

2. We have analysed the information contained in Martech's reports regarding their measurements of the cover to the reinforcement of the towers. Over 2,400 No cover-meter readings were taken. The results are summarised in Table 1 overleaf.

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4th March 2014

COVER RANGE	INCIDENCE
0-10mm	<1%
11-20mm	<2%
21-30mm	6%
31-40mm	11%
41-50mm	23%
51mm+	58%

Table 1 - Summary of cover-meter results

3. The data in Table 1 above is evidence of non-compliance with the minimum cover required by BSCP 114: 1969. We note that the 40mm figure for cover in BSCP 114: 1969 was a minimum requirement. No reduction in cover below this level was therefore permitted, that is, there was no negative tolerance on the cover. Hence at least 11% and less than 19% of over 2400 No cover checks that Martech made revealed cover that was outside the requirements of BSCP 114: 1969.

4. We would expect the contract documents for construction of the tower blocks to have included a specification for the cover required to the reinforcement. Given the results summarised in Table 1 above, in particular that 81% of the cover-meter readings showed cover of 41mm or more, we think it likely that the cover specified was greater than the minimum required under BSCP 114: 1969. On that basis, the degree of non-compliance and deviation relative to the specification would be even greater than that relative to BSCP 114: 1969. Further investigations are however required to discover the cover set down in the specification.

Concrete compaction

5. BSCP 114: 1969 states that "*concrete should be thoroughly compacted during the operation of placing, and carefully worked around the reinforcement, around embedded fixtures and into the corners of the formwork*".

6. Martech recorded approximately 120 No locations of visible, surface honeycombing, generally measuring about 500mm x 500mm, indicating inadequate and non-compliant compaction of the concrete. A significant number of these locations were on the north elevation of Cromwell Tower. One result of the honeycombing is to reduce the level of concrete cover to the reinforcement.

7. Further investigations are required to discover the standard of compaction set down in the specification.

Ms K Glanville

KdeS/OE/A.5463

4th March 2014

Consequences

8. In general terms, the above non-compliances will have resulted in the affected areas being at greater risk of corrosion of the reinforcement. Corrosion can damage the surrounding concrete since the volume of the rust is greater than the volume of the parent steel. Such damage typically manifests in spalling of the surface of the concrete, which presents, among other things a safety hazard.

We trust this letter is sufficient for your present purposes but do please contact us if you require further information.

Yours sincerely

A handwritten signature in black ink, appearing to read 'K T R de Silva', with a long horizontal flourish extending to the right.

K T R de Silva
on behalf of William J Marshall & Partners LLP

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