The Manor House

Church Street

Littlehampton BN17 5EW

Report on a Structural

Inspection of cracking present to the Property

May 2016

Issue 2

	Name	Signature	Date
Report prepared by	Robert Stone		12th August 2016
Report checked by	David Ventress		12th August 2016
Report approved by	Jamie Collins		12th August 2016

1. Introduction

Robert Stone Associates were instructed by Collins Project Delivery Ltd on behalf of Littlehampton Town Council to carry out a structural inspection of the property and accordingly Robert Stone visited the property on the 4th May 2016.

The purpose of the inspection was to determine the cause of two vertical cracks to the outside of the property on its south elevation and to suggest suitable remedial works.

2. General

It should be noted that the inspection carried out was specifically and solely with regard to the above mentioned cracking.

The inspection also concentrated on structural aspects only with no checking of elements such as drains, services or similar items.

The purpose of the inspection was to identify any significant structural defects immediately apparent within the property.

To assist the inspection a mobile elevated platform was utilized.

The weather at the time of inspection was warm, sunny and dry.

Whilst no structural calculations have been carried out to justify the adequacy of the original construction analysis has been carried out giving consideration of the proposed remedial works.

This report has been specifically prepared for the sole use of the above named clients and reference to the report by any third parties is entirely at their own risk.

3. Results of Inspection

3.1 – General

The building comprises a substantial two storey detached office building, the subject area displaying rendered elevations.

Above the wall was a pitched tiled roof.

3.2 – General External Observations

To the elevation vertical cracking was noted to the left of the left hand side windows, between the two windows present at first floor and to the right hand side of the right hand first floor window, the wall height being some 8m.

It was evident that the vertical crack between the two windows at first floor was the most extensive one with outward displacements being in the order of 1.5mm to 3mm.

Cracking to centre of first floor windows

Cracking to centre of first floor windows

It was noted that the cracking also extended through the parapet with horizontal cracking also evident within the parapet feature.

Cracking to parapet

Horizontal Cracking

3.3 – General Internal Observations

Inspection internally adjacent to the area of cracking present revealed a large open plan room measuring some 12m long by 10m wide.

On the internal face of the wall two piers were evident in the vicinity of the vertical cracking present with evidence of beams to the roof structure also.

General Internal view

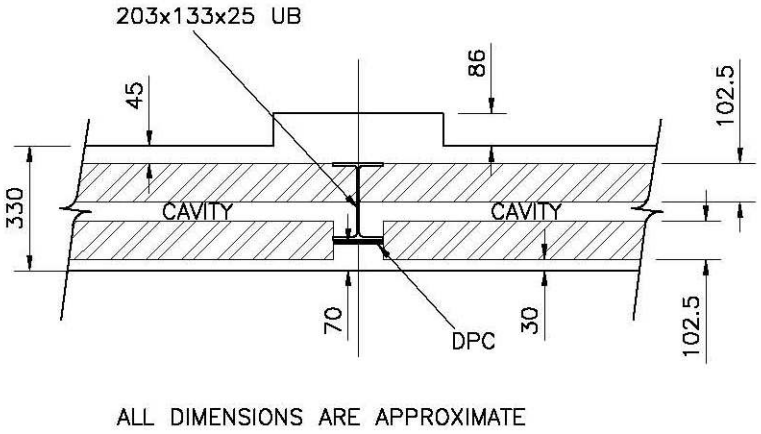
Local to the pier features evidence of minor cracking to the plaster was present together evidence of water leakage.

Minor cracking to plasterwork

3.4 – Intrusive External Observations

To investigate the cause of the cracking present local breaking out in the vicinity of the central crack above the two first floor windows was carried out, the location being chosen due to it being the most extensive cracking present.

Breaking out revealed the wall construction generally to comprise of 30mm of render over a brickwork outer skin with a 50mm cavity and a brickwork inner skin. Within the area of the vertical cracking a steel “I” section column was present with its outer face being some 70mm back from the face of the render.



Existing arrangement

Extensive corrosion was present to the steelwork affecting the outer flange and the web section within the outer masonry leaf.

Moisture content readings were taken of the brickwork which revealed readings of between 18 and 20%.

Steelwork column within wall

View of steel column within cavity

Examination of the render revealed a different surface texture within the zone of the cracking with also a strip of pvc type damp proof course being present to the outer face of the steel.

To gain further insight into the structure of the building further breaking out was carried out above the initial investigated area at the location of the horizontal cracking.

The breaking out revealed a similar cavity wall construction with a rolled steel angle section running horizontally connecting to the column.

Again extensive corrosion was present with again a section of pvc type dpc present to its front surface.

View of horizontal steel angle section

Viewing of the cavity revealed rivets to be present to the steel column connecting what would appear to be a connection plate possibly relating to the roof beams with a bolted connection between the column and the rolled steel angle noted.

Rivets present to column and angle bolt connection

4. Observations and Conclusions

4.1 General.

It is evident that the building is of steel framed construction with steel present within both the inner and the outside leaf of the masonry.

Whilst protection against moisture within the inner leaf is provided to a degree by the cavity the outside leaf's protection against direct moisture is provided only by the render coating which given the cracking present has been compromised.

Indeed the results of the moisture testing confirm that the outer leaf was moist at the time of the inspection.

Additionally given the lack of insulation it is likely that interstitial condensation will occur at times affecting the inner face of the external leaf.

The effect of the above is that the steelwork has been exposed to moisture and has over time been extensively affected by corrosion reducing the effective cross section of the steelwork.

A further effect of the corrosion is that as the volume of the corrosion products are some six times the thickness of the original steel present expansion forces are generated within the surrounding fabric resulting in the cracking evident.

It should be noted that whilst this report concentrates on the vertical cracks present local to the windows noted given the nature of the building's construction it is inevitable that similar corrosion is occurring elsewhere although not currently affecting the render so significantly.

4.2 Current Structural Condition

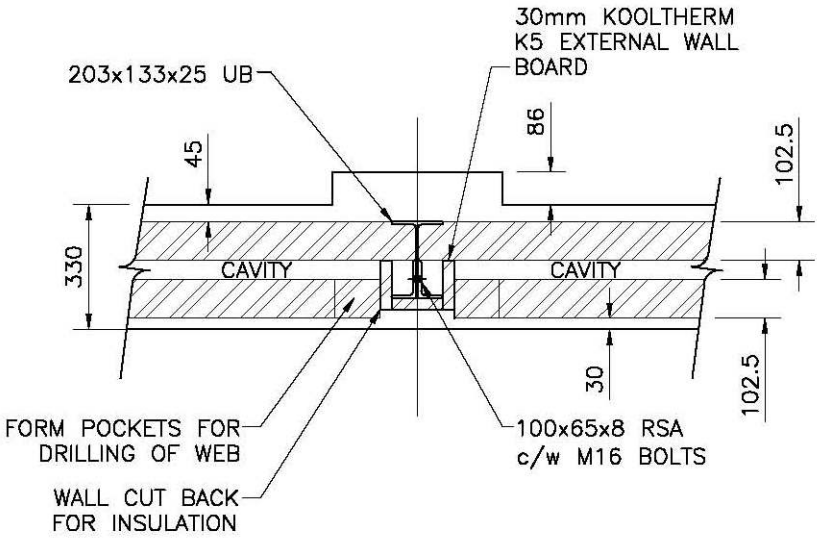
It is evident that extensive corrosion is present to the column sections reducing their load carrying capacity and adversely affecting the render.

Additionally the cracking to the render is allowing further moisture ingress into the wall construction thus accelerating the corrosion process.

4.3 Proposed remedial works

One option would be to expose the steelwork, remove the corrosion, repaint and rerender as has been carried out in the past.

Whilst overcoming the current situation with regard to the cracking present this would not enhance the structural performance of the columns and corrosion and cracking would reoccur in the future.



Proposed detail to column

It is therefore recommended that the following works be carried out:-

1. That scaffolding be erected at the three vertical crack locations.

2. That the render to the face of the 3 columns present at the crack locations be removed for their full vertical height together with the render in front of the horizontal steel member just below parapet level.

3. That the brickwork be carefully cut as indicated on the sketch above.

4. At this point it is will be necessary that the exposed steelwork be inspected by a suitably qualified and experienced Chartered Engineer to compare the situation with that envisaged from this inspection and to confirm the suitability of the proposed remedial works. It may be necessary that the scope of works will require revision following exposure of the steelwork so the ordering of materials up to this stage should be provisional.

It should be noted that when considering the effects of the proposed remedial works it has been assumed that in view of the rivet detail observed at the head of the column during this inspection that roof loads are transferred to the columns via a cap plate, thus minimizing load eccentricities, and also that restraint is provided at first floor level with vertical loads being transferred also into the external masonry wall.

5. That temporary propping be installed to support the loads present at roof and first floor levels.

6. Following this that one half of the front flange of the columns be removed.

7. That the exposed steelwork be prepared as per the paint treatment specification below.

8. That a full height 100x65x8mm primed mild steel angle be installed to one side of the column fixed with M16 bolts at 300mm centres.

   (This angle shall be predrilled with 18mm diameter holes at 150mm centres)

9. That the remaining half of the front flange be removed in its entirety.

10. That a second full height 100x65x8mm primed mild steel angle be installed to the other side of the column fixed with M16 bolts at 300mm centres

    (This angle shall be predrilled with 18mm diameter holes at 300mm centres with between these fixings 30mm diameter holes to accommodate the nuts of the previously installed angle)

11. That the corroded horizontal angle section below parapet level be replaced with a similar primed 100x100x12mm rolled steel angle section (support of the brickwork above will be required)

12. That the whole of the steelwork be painted as detailed below.

13. Following the above 30mm Kooltherm K5 external wall board shall be installed as indicated.

14. The brickwork pockets and areas of broken out masonry shall then be made good with class B semi engineering brickwork using mortar designation (iii) and the render made good utilizing light mesh reinforcement and painted all to match the existing and the temporary support works and scaffolding removed.

Proposed Paint Specification

Important – All surface preparation and painting shall be carried out in full accordance with the manufacturer's instructions and recommendations.

Existing corroded steelwork

Clean corroded steelwork with wire brush.

Apply OWATROL Oil, Colorless, penetrating and isolating rust inhibitor.

Apply OWATROL RA.85 Aluminium Paint Finish for All Surfaces.

New steelwork

Apply OWATROL AP.60 Anti-corrosive Primer.

Apply OWATROL RA.85 Aluminium Paint Finish for All Surfaces.

Robert Stone BSc (Hons) CEng MIStructE MCIWEM FConsE IMaPS
For Robert Stone Associates

12th August 2016