



Project Name: St John's Downshire Hill

Visual Inspection Report

Date: August 2018

Project Number: A5653

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Signed on behalf of CTP	
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1.0 Brief

- 1.1 This report has been prepared for St John's Downshire Hill Trustees as detailed in our fee quotation and in accordance with instructions received on 4th May 2018.
- 1.2 CTP were instructed by St John's Downshire Hill Trustees to carry out a visual structural inspection of the south-west gallery of St John's Church, Downshire Hill, London. Subsequent to the first issue of this report CTP carried out a second structural inspection and revised this report based on findings.
- 1.3 We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.
- 1.4 CTP has no responsibility to any other parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents of this report solely at their own risk.
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2.0 Introduction

- 2.1 St John's, Downshire Hill is a Grade I listed church in Hampstead, London. The church was constructed in the early 1820s and much of the original interior remains.
- 2.2 The building underwent major structural works in 2004, including underpinning to stabilise the foundations and construction of an undercroft.
- 2.3 Recently cracking was noted to the ceiling underneath the south-west gallery by the main entrance, which caused concern. An investigative report by Hutton and Rostron (January 2018) identified a number of potential failures of the timber gallery members and recommended the full removal of the ceiling to access and assess the structure.
- 2.4 CTP attended site on 25th July 2018 to inspect and assess the gallery structure. Access was purely from below and visual only. In general members above ceiling level could not be accessed for inspection.
- 2.5 Following the initial site inspection further opening up was recommended and CTP attended site a second time on 11th October 2018 to inspect the gallery leading edge and timber support over the column head.

3.0 Observations and Discussion following Initial Site Visit

3.1 General

- 3.1.1 The gallery appears to be original and is formed fully in timber. A primary transverse edge beam runs along the leading edge between two cast iron columns. There are three trusses which run from the back wall down into the leading edge, one into each of the columns and the third at the midpoint of the edge beam. On top of the trusses sit floor beams which pick up the floor joists over. Ceiling joists span front to back and are picked up on a ceiling support beam midway along which spans between the truss members. See SK001.
- 3.1.2 Above the gallery towards the rear sits the organ. In the centre of the gallery is a sound desk which takes up a large proportion of the gallery width.
- 3.1.3 Cracking had occurred in the central part of the gallery ceiling, and the lath and plaster ceiling had been fully removed between the wall and the front edge and widthways between the two columns.
- 3.1.4 Works had been carried out in the 2004 renovation to potentially allow the installation of new partitions. These works had involved localised removal of the ceiling and notching out of timber members with additional timber strengthening inserted.

3.2 Ceiling supports

- 3.2.1 In general there are some long spanning timber elements, and the notching out has significantly reduced the capacity of some of these members. Of particular note are the two timbers which support the ceiling joists, which span between the trusses. From each of the locations where these have been notched large splits have formed and the beams have failed. It is likely that the resulting deflection will have been one of the main factors of the cracking within the ceiling. These members require replacing.
- 3.2.2 A number of the ceiling joists have been notched and strengthened with timbers connected to the side. However, the strengthening timbers have also been notched which has significantly reduced their capacity. These strengthening timbers should be removed and new timbers screwed to the side of the notched ceiling joists.
- 3.2.3 The ceiling joists appear to be original, and a variety of sections have been used. In some cases this means there is only a very small cross section at the end with little connection to the supporting beams. Some joists therefore have inadequate support and a new member should be inserted adjacent to the existing to pick up the laths. The original ceiling joists should be retained.

3.3 Trusses

- 3.3.1 The bottom chord (tie member) of the two trusses which connect into the columns have been notched near the column head. This has reduced the section capacity but there was no evidence of excessive deflection or failure of the trusses.
- 3.3.2 Holes have been drilled through the centre of the diagonal member of the trusses. This will have reduced the capacity of the member, but as these are generally slightly above the centre they are likely to be within the compression zone, so capacity could be reinstated by infilling these holes.

3.4 Transverse edge beam

- 3.4.1 The transverse edge beam spans approximately 8.5m, and has a noticeable deflection at the midpoint. This was measured at approximately 45-50mm, which is a large deflection, even over such a span. The architect and client noted that the deflection has always been there to the best of their knowledge, and existed at the time of the 2004 refurbishment.
- 3.4.2 There is a significant crack at the eastern end of the transverse beam, amounting to a full failure at the bearing over the column. The crack pattern could be indicative of either bending failure of a continuous member at this point or shear failure of a simply supported member. Due to the tight nature of incoming beams it was not possible to determine if the beam is continuous or not.
- 3.4.3 While the crack appears to be old, and there does not appear to be new deflection to this member, it was recommended to immediately prop under the support at this location as a safety precaution.
- 3.4.4 The edge beam appears to now be supported on a metal strap projecting over the top of the column, which is not an adequate bearing in the long term as the strap is likely to eventually fail.
- 3.4.5 The edge beam measures 115mm wide x 215mm deep, which is an extremely small section for the span. However, there is no indication that the beam has suffered unduly, which implies there may well be additional structure supporting this edge. The two original projecting bolts in the soffit near midspan and the thickness of the parapet above imply the whole parapet is framed as a truss.
- 3.4.6 It is recommended that limited further opening up is carried out to the balustrade above to confirm if there are structural elements within this hence the integrity of the gallery.

4.0 Recommendations following Initial Site Visit

- 4.1 Prop the eastern end of the transverse edge beam.
- 4.2 Balcony access should be limited to individuals to use the sound desk only.
- 4.3 Limited further opening up to the balustrade parapet to confirm the structure (see SK002).
- 4.4 Circular holes within the truss tie beams should be infilled with a timber plug, resined tightly in (see SK003).
- 4.5 New timber members inserted above the split ceiling members from which the original members should be hung (see SK004). Two or three adjacent ceiling joists will require displacement to allow installations.
- 4.6 Fixity of the ceiling joists should be checked and additional screws provided if required.
- 4.7 Notched strengthening timbers should be removed and full depth new strengthening timbers screwed to the side of the notched ceiling joists.

5.0 Observations and Discussion following Second Site Visit

- 5.1 The purpose of the second site visit was to inspect the support to the gallery leading edge. The opening up recommended in sketch SK002 had been carried out, allowing good access to the structure.
- 5.2 As anticipated, the leading edge of the balcony is formed of a timber truss, with two primary diagonal members, a top chord beam and a bottom chord beam. Bolts are visible in two locations at the underside. The truss arrangement is shown in SK005.
- 5.3 The truss has been strengthened in the recent past (estimated to be within the past 20 years) by the addition of a plywood sheath to the inner face of the truss. This measured around 24mm thick and appeared to well glued and screwed to the primary truss timbers.
- 5.4 In addition, over the support, an additional vertical and diagonal timber member have been introduced, also glued and screwed to the plywood.
- 5.5 The arrangement is consistent with strengthening to reduce deflection of the truss, and also to resist shear at the support. The age of the crack implies it is several years old, and the ply installation could not have been carried out without revealing this crack. The new arrangement implies that strengthening of this joint was considered, and the arrangement makes it unlikely that the crack would have occurred after the ply was installed.

6.0 Conclusions and Recommendations following Second Site Visit

- 6.1 It is considered that the installation of the plywood sheath and additional timber strengthening is providing adequate shear capacity to the beam at the support. Temporary propping and access restrictions to the balcony are therefore no longer required.
- 6.2 The cracking to the plaster ceiling is deemed to be due to notched timbers failing. The repair works outlined in 4.4-4.7 should be carried out and the lathe and plaster ceiling reinstated.

Appendix A – Photographs from Initial Site Visit



Photograph 1
General view of balcony, showing central deflection



Photograph 2
General view of timber structure



Photograph 3

Notching to eastern ceiling support member causing failure



Photograph 4

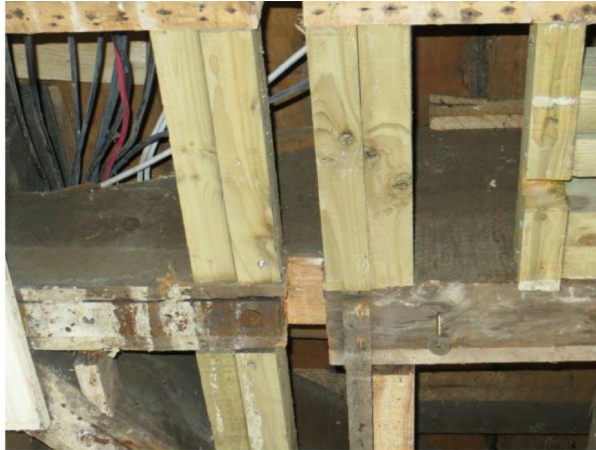
Notching to western ceiling support member causing failure



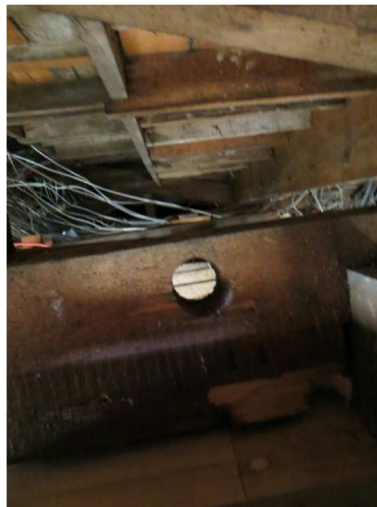
Photograph 5
Notching ceiling joists and strengthening



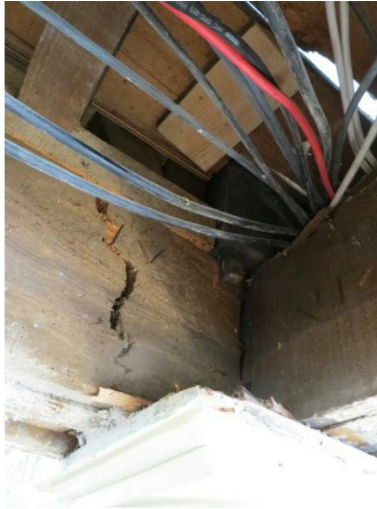
Photograph 6
Inadequate connectivity of ceiling joists



Photograph 7
Notching through tie beam



Photograph 8
Hole through tie beam



Photograph 9
Crack to bearing of transverse edge beam



Photograph 10
Column head with incoming cracked edge beam



Photograph 11
Centre of transverse edge beam with incoming tie beam

Appendix B – Photographs from Second Site Visit



Photograph 12
Opening up to external face of balcony showing truss

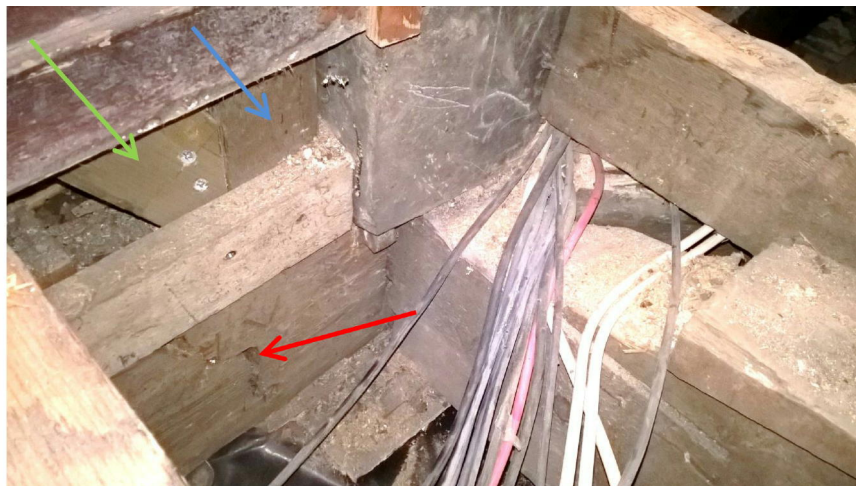


Photograph 13
Opening up to external face of balcony showing original truss members (dark) and new strengthening timbers (light)



Photograph 14

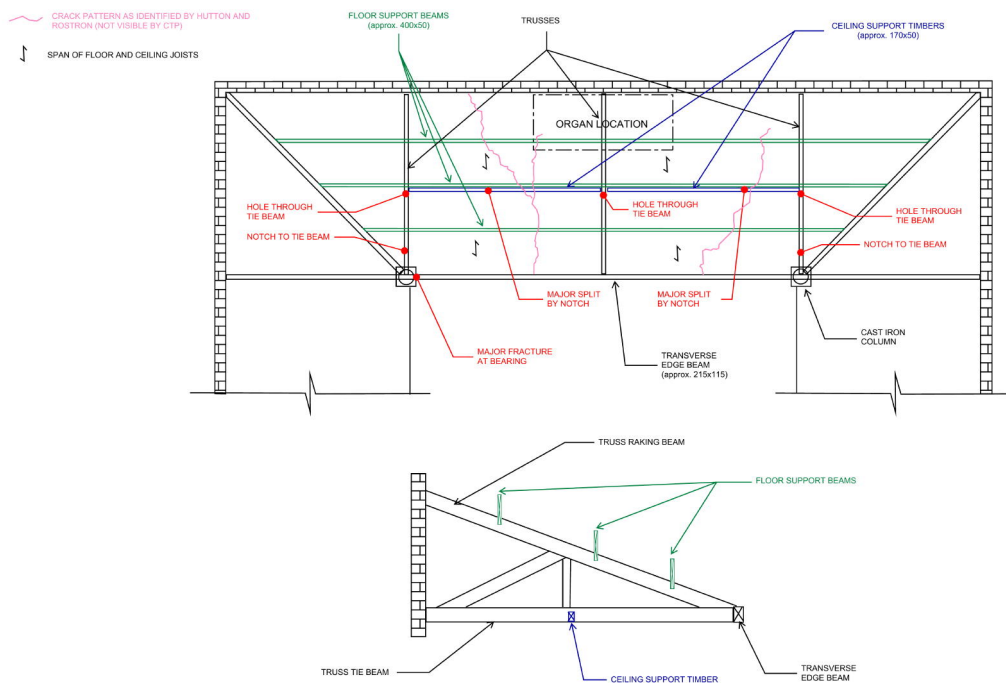
Strengthening timbers glued and screwed to plywood sheath



Photograph 15

Connection over column head viewed from balcony internal. Crack to beam (red), strengthening diagonal timber (green), original vertical (blue)

Appendix C - Sketches

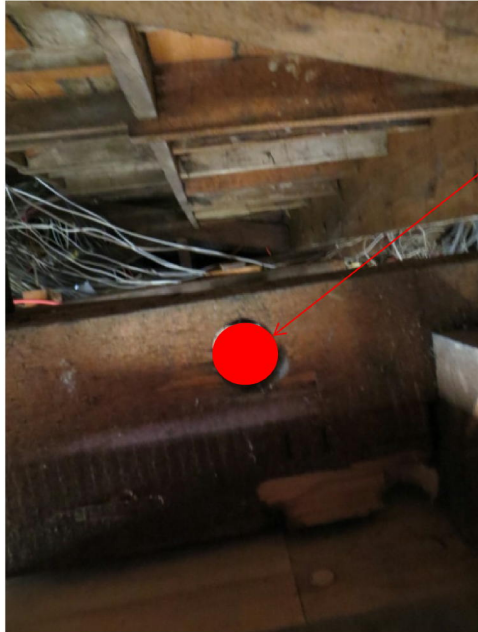


CAREFULLY AND NEATLY REMOVE PANELS EITHER SIDE OF BALUSTRADE, TAKING CARE NOT TO CUT ANY TIMBER STRUCTURE BEHIND. ENSURE SUFFICIENT OPENING UP TO FULLY ASSESS ANY PRIMARY STRUCTURE AND ALSO DETAIL OVER COLUMN HEAD



CAREFULLY AND NEATLY REMOVE PANELS TO FRONT AND REAR FACE TO ASSESS CONNECTION OF TIE BEAM/RAKING BEAM AND EDGE BEAM

CAREFULLY REMOVE ONE OR TWO ROWS OF FLOORBOARDS TO GALLERY ADJACENT TO BALUSTRADE TO ALLOW GOOD VIEWING OF THE STRUCTURE.



HOLE TO BE INFILLED WITH C24 TIMBER PLUG OF
MATCHING MOISTURE CONTENT. PLUG TO BE
TIGHT FIT, RESIN FIXED IN USING ROTAFIX
STRUCTURAL ADHESIVE ALL ROUND.

Project **ST JOHN'S DOWNSHIRE HILL**

Job No: **AS653**

ctp consulting engineers

Description:

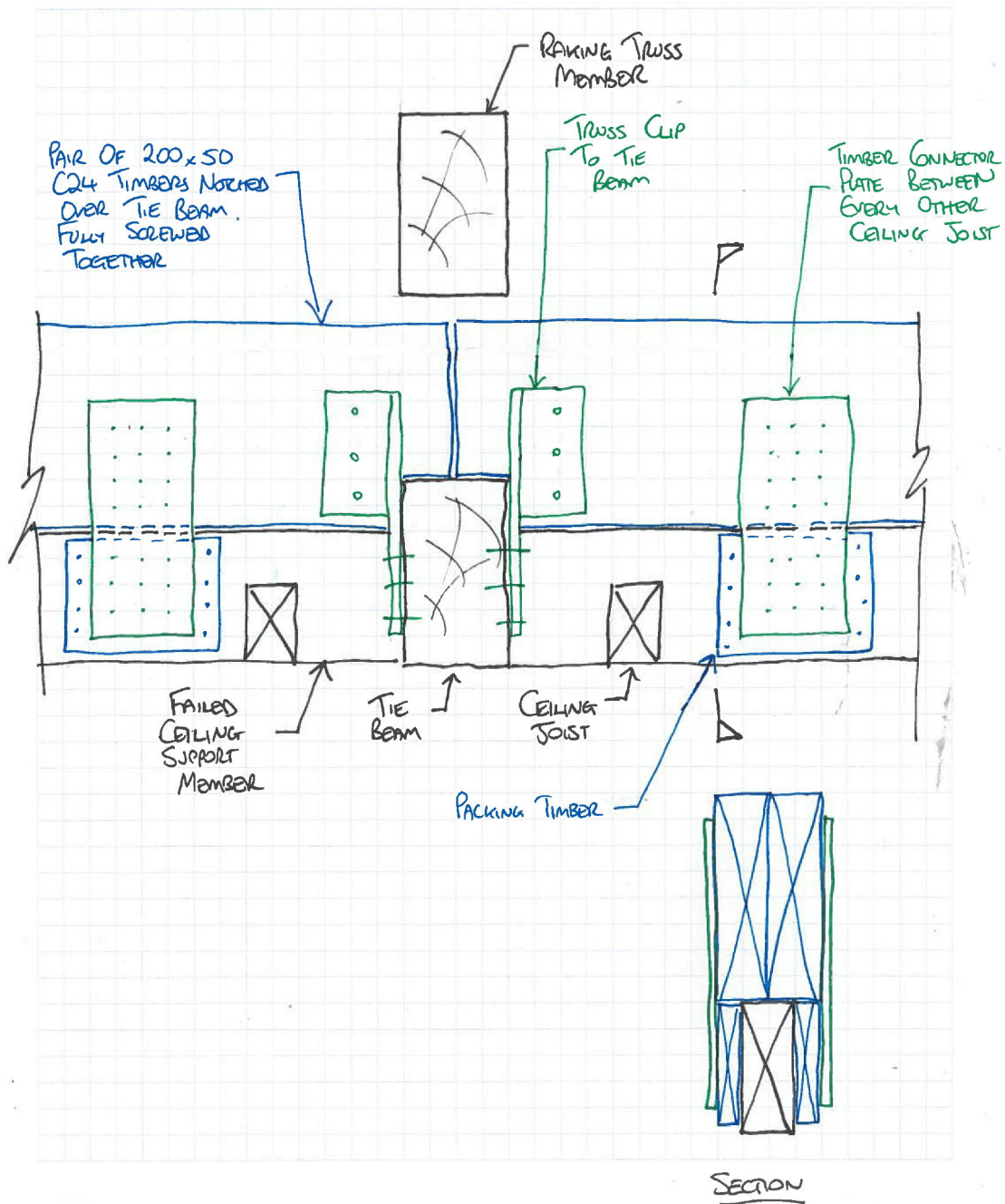
**RE-SUPPORT DETAIL TO CEILING
SUPPORT MEMBERS**

By: **JK**

Date: **02/08/18**

Sheet No: **S0004**

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Project **ST JOHN'S DOWNSHIRE HILL**

Job No: **AS653**

ctp consulting
engineers

Description:

**TRUSS ARRANGEMENT TO BALCONY
LEADING EDGE**

By: **JK**

Date: **25/10/18**

Sheet No: **SK005**

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