STRUCTURAL REPORT

Client: Church of St Mary, Betws-y-Coed, PCC

Project: Structural Inspection of the Tower

Job No. : 15_10198

Revision:

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REPORT OF A STRUCTURAL INSPECTION OF THE TOWER AT THE CHURCH OF ST MARY, BETWS-Y-COED, CONWY, WALES

1.00 INTRODUCTION:

1.01 At the request of Revd. Stuart Elliott, Priest in Charge, the church was visited on Wednesday 11th May 2022 for the purposes of carrying out a visual structural inspection of the tower, both internally and externally. It is proposed to hang the ring of eight bells, tenor weight 11cwt 2qr 19lb, from the church of St John the Divine, Porthmadog, for full circle ringing in the existing belfry and augment them to a ring of twelve by the addition of four lighter bells. Advice had been sought on the structural feasibility of this proposal.

1.02 Details within this report are confined to the structural aspects as detailed in paragraph 1.01 above. The report does not constitute a full building survey and excludes certain items such as those listed below.

a) The decorative condition of the tower.

b) The condition of the tower with respect to dampness, dry rot, timber infestation and the like.

c) The condition of services.

d) The condition of roof, floor, wall and ceiling coverings.

1.03 No testing of materials, monitoring, breaking out or long-term investigation has been undertaken. 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 structure is free from defect.

1.04 The central tower is of stone masonry construction. The church was constructed in 1873 and the construction of the tower was completed in 1907. The church is listed by CADW as Grade II* and a copy of the listing is given below.

“History: The church was built in 1873 at a cost of £5,000 to replace the Medieval church of St. Michael, which had by then become too small to accommodate the fast-growing parish; the tower was completed in 1907. It was designed by E G Paley and J H Austin, architects of Lancaster and was built by O Gethin D Jones, building contractor of Penmachno; the land and some of the building stone were given by Lord Willoughby De Eresby of Gwydir Castle.

Exterior: Large Transitional-style church of cruciform plan, with crossing tower and organ chamber to S. Of rubble with grey stone facings and red sandstone dressings, the latter apparently from the Ancaster estate quarries in Lincolnshire; steeply-pitched roofs of small slates and gable parapets, and a pyramidal tiled roof to the tower. Tall E end with angle buttresses and grouped 5-light plate tracery window, the taller central light flanked by cusped occuli; 2 small lancets above. Large lancets to upper N and S chancel walls, with cill bands and continuous labels. 4-stage projecting stair turret to N side of crossing tower, the lower square and the upper semicircular, terminating in a conical stone roof. Entrance with chip-carved tympanum and engaged flanking shafts with waterleaf capitals; returned, moulded label and boarded door with decorative iron hinges. Lancets to first floor and belfry level, the latter flanking clock faces; buttressing as before. Sandstone parapet stepped-up at the corners, with moulded cornice below; decorative iron weathervane to roof apex..

Tall nave with 5 squat lancets to N and S clerestory, with double chamfers and returned labels. Single-storey aisles with 5 plain lancets; the eastern-most is, on the S side a double, and on the N side a triple window. Large gabled porch to N aisle at W end, with timber upper section on rubble lower walls; simply-cusped tracery bargeboards and framed gable with curved braces. Plain entrance with paired glazed flanking lights; similar to returns. Buff brick floor to porch, laid in herringbone pattern; stone wall bench to E side. Triple-arched main entrance with hollow sunk and keel-moulded detail; chamfered and broach stopped outer jambs, decorative ironwork to boarded door. Modern connecting bay to church hall addition at right-angles at the NW corner. Large plate tracery rose window to buttressed W end as before, with cusping and punched trefoils; chamfered and keel-moulded detail, plain lancet above. Long catslide roof to gabled and buttressed organ chamber with large twin lancets and an entrance below to R. This with double chamfer and returned label; external stepped access with stepped sandstone parapets. Bold blind arcading to central S side of tower, with chevron moulding, continuous labels and shafts with waterleaf and scalloped capitals.

Interior: Unrendered walls; buff brick floor in herringbone arrangement. 4-bay nave with clustered scissor truss roof with tie-beams at the bay divisions. Pointed-arched arcades to shallow aisles with plain roofs. Large columns with plain bases and alternating scalloped and waterleaf capitals; wide splays to rear arches of clerestory windows. Early English black and burgundy marble font on plain base, simple softwood pews. Early English pulpit of sandstone with blind arcaded sides and foliate decoration to the spandrels; pink marble parapet and black marble corner-shafts with shaft rings. Large crossing arch with keel-moulded outer and plain inner arches, the former with waterleaf capitals; stiff-leafed carving to corbelled inner aches above stall level. Stepped-up crossing with rib vault and angle shafts; decorative brass altar rails. Organ of 1870 by Gray and Davison of London. Chancel arch and vault as crossing; stepped-up chancel with arched recess to S side and aumbry to N. Simple decorative tiled pavement and Arts and Crafts oak choir stalls and reading desks, the latter with copper repousse panels. Reredos of Italian alabaster depicting scenes of Christ's Passion, in shallow niches; this was inserted in 1929.

Good painted and stained glass windows to nave, aisles and chancel, mostly by Shrigly and Hunt of Lancaster; one designed by Carl Almquist. Further glass by Jones and Willis of London and Birmingham, and after designs by Sir E. Burne-Jones.

Listed grade II as an impressive and largely unaltered commission in bold Transitional style by Payley and Austin of Lancaster."*

2.00 EXTERNAL OBSERVATIONS:

The following observations were carried out from ground level with the use of binoculars.

2.01 North Elevation Wall:

In the centre of this elevation is a semi-circular projection which houses the spiral staircase giving access to the first intermediate chamber of the tower. To each side of this, in the north east and north west corners, are two substantial orthogonal buttresses which extend northwards. All three projections extend up to sill level of the belfry louvre window openings. At the top of the tower, in the north east corner, is a small telephone mast and just below this is a continuous gutter which catches rainwater from the tower roof. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

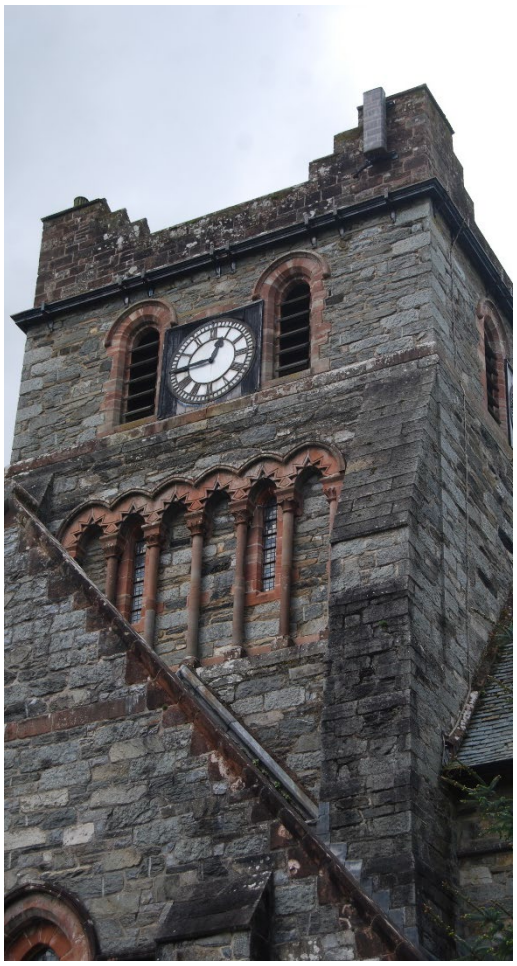
2.02 West Elevation Wall

The following observations are limited to the sections of wall which could be seen above nave and north and south aisle roof levels.

Just below parapet level, there is a continuous gutter, similar to that on the north elevation, which catches rainwater from the tower roof. This discharges via two downpipes to the north and south sides of the belfry louvre window opening onto the roof of the nave. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

2.03 South Elevation Wall

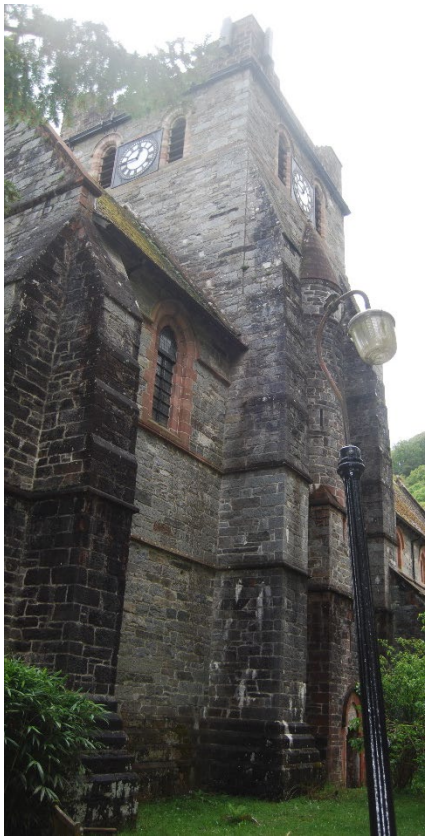
The following observations are limited to the sections of wall which could be seen above the roof of the south transept.

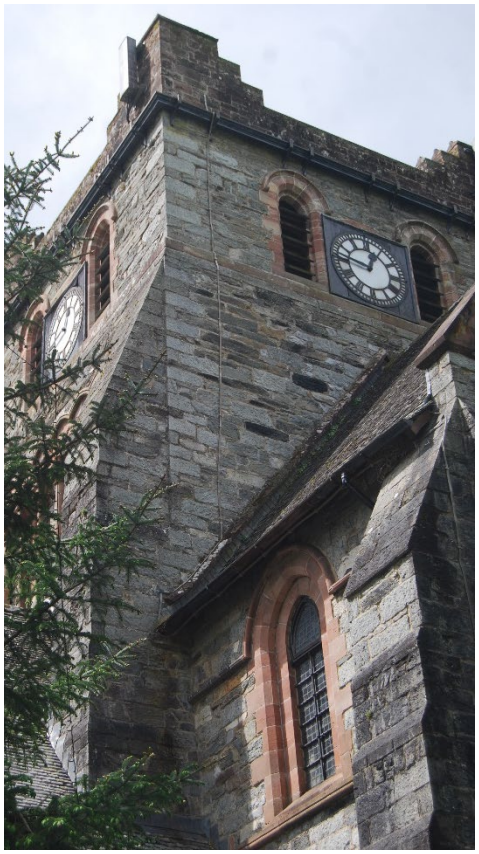


In the south east and south west corners are two substantial orthogonal buttresses which extend southwards and up to sill level of the belfry louvre window openings. At the top of the tower, in the south east corner, is a small telephone mast and just below this is a continuous gutter, similar to that on the north elevation, which catches rainwater from the tower roof. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

2.04 East Elevation Wall

The following observations are limited to the sections of wall which could be seen above the roof of the chancel.

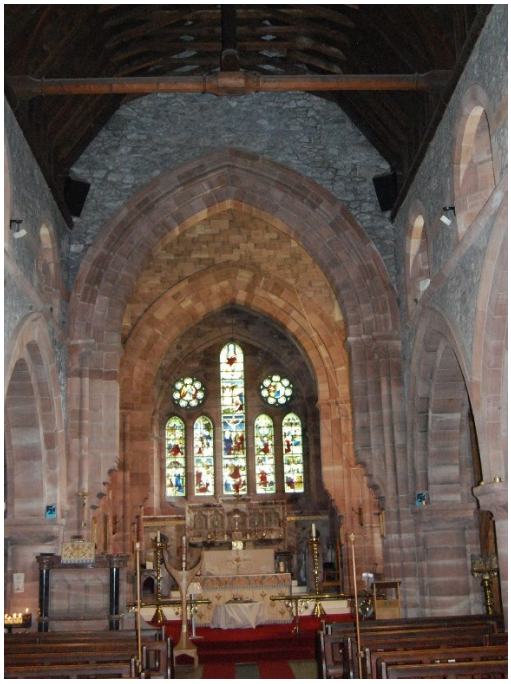




Just below parapet level, there is a continuous gutter, similar to that on the north elevation, which catches rainwater from the tower roof. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

3.00 INTERNAL OBSERVATIONS:

3.01 Ground Floor Level:



The walls at this level are of exposed stone masonry construction. There are almost full internal height archways in each elevation which take up almost the whole of the internal elevation widths, such that the tower is supported effectively by four substantial stone columns. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

There is a vaulted stone ceiling to the ground floor chamber. This has a circular trapdoor in the centre to allow equipment to be hoisted up to the first intermediate chamber. Measurements from above showed that the trapdoor is approximately 1130mm clear diameter. Again, the masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

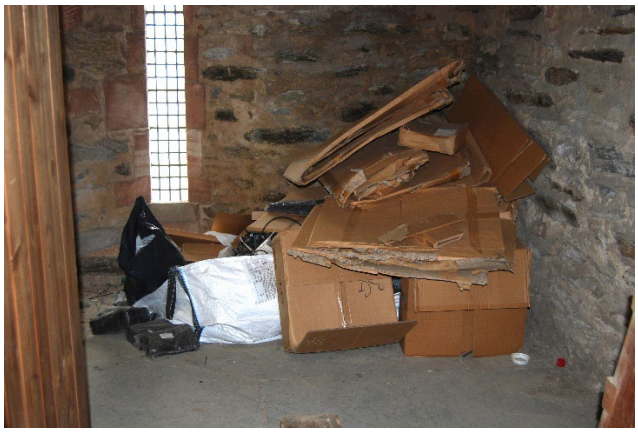
3.02 First Intermediate Chamber (Clock Chamber)

This chamber houses the clock mechanism, which stands in a wooden case and is supported on two timber spreader beams which run east west and bear onto a solid stone-flagged floor.

The chamber also houses mobile telephone equipment which stands on the floor adjacent to the east elevation wall.

The walls at this level are of exposed stone masonry with rather heavy “butter” pointing. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

The trapdoor noted in the vaulted ceiling to the ground floor chamber is positioned below the clock case, severely limiting access.

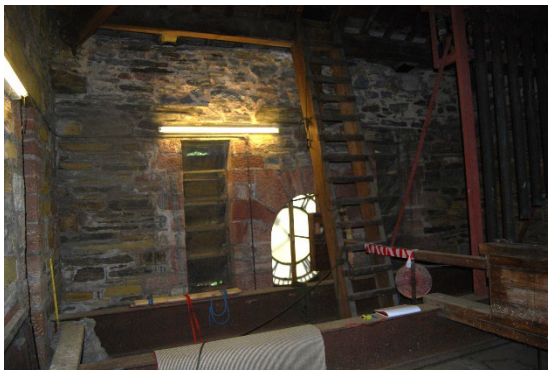


A pile of rubbish, possibly packaging from the mobile telephone equipment, has been left on the floor in the south west corner of the chamber.

The floor of the belfry is visible from this level and consists of timber boards running north south, supported on a number of substantial timber beams running east west and supported on stone corbels built into the east and west elevation walls.

3.03 Second Intermediate Chamber (Belfry):






The walls at this level are of exposed stone masonry construction which has not been as heavily repointed as the clock chamber. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.



There are 4 no. steel I-section beams installed just above floor level. These run east west and are built into the east and west elevation walls of the tower. It is possible that these beams were installed originally to support a ring of bells.

At present, the beams support a ring of nine tubular bells hung in a metal frame, a bell hung for static chiming in a timber frame and the clock drive linkage mechanism.

The floor of the belfry is covered with waterproof sheeting and there appears to be a trapdoor in the centre, below the box where the three drives for the clock hands are connected to the vertical drive from the clock in the chamber below.

4.00 PROPOSALS:

4.01 As stated in the introduction, it is proposed to hang the ring of eight bells, tenor weight 11cwt 2qr 19lb, from the church of St John the Divine, Porthmadog, for full circle ringing in the existing belfry and augment them to a ring of twelve by the addition of four lighter bells.

5.00 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS:

5.01 Externally and internally, the tower masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

5.02 The walls of the tower are of substantial stone masonry construction, well buttressed and restrained by the walls of the nave, chancel and south transept. It is therefore considered that the proposed installation of a ring of twelve bells, tenor weight 11cwt 2qr 19lb, for full circle ringing is structurally feasible and will not cause any significant adverse effects on the tower structure, providing that the recommendations in 5.03 and 5.04 below are followed.

5.03 At present, there are four steel I-section beams just above belfry floor level, running east west and built into the east and west elevation walls. The beams are imperial section, 18" x 7" and are positioned such that their soffits are just below louvre window sill level. This is at a level where the tower masonry is relatively weak due to the presence of louvre window openings in all the elevations and clock face openings in all the elevations except the west elevation wall.

In view of this, it is recommended that the existing steel beams and the belfry floor boards are removed so that a new grillage of steel foundation beams can be installed at a lower level in the tower, where the masonry is stronger. It should be possible, if desired, to retain the existing timber belfry floor support beams and install the upper, secondary, steel foundation beams running east west between them such that the tops of the beams are at, or just above, existing belfry floor level. The lower, primary, steel foundation beams can be installed running north south to support the secondary foundation beams. There are a number of competent bellhanging companies in the UK who will be able to design an appropriate twelve bell frame, together with suitable supporting beams.

5.04 It is of paramount importance that no differential movement is allowed to occur between the ends of the new steel bell frame foundation beams and the walls into which they are built. It is therefore recommended that the foundation beam ends are built into pockets formed in the walls of the tower and surrounded with good quality, well compacted, ordinary Portland cement concrete mixed with just enough water to make it workable. Under no circumstances should lime based concrete or lime mortared

masonry be used to surround the foundation beam ends. It should be noted that ordinary Portland cement concrete inhibits corrosion and also allows a good load transfer between the ends of the foundation beams and the tower walls when the bells are rung full circle.

5.05 If it is desired to retain the existing ring of tubular bells in its frame and the bell hung for static chiming with its timber frame, there should be space to do this in the existing clock chamber, or alternatively above the new bell frame with suitably designed supports.

5.06 It is recommended that “Galebreaker” or similar membranes are installed on timber frames attached to the internal faces of the existing belfry louvre window openings. This will prevent rainwater penetration and allow ventilation within the belfry.

5.07 The circular trapdoor in the floor of the clock chamber is immediately below the clock case, restricting access. It will therefore be necessary to temporarily remove the clock to allow for installation of the new bells and bell frame. It will also be necessary to modify the drive linkages from the clock to the clock faces when the new bells and bell frame are installed.

5.08 A pile of rubbish was noted on the floor in the south west corner of the clock chamber. This could be a fire hazard and it is recommended that it is removed as soon as possible.

FOR AND ON BEHALF OF WARD COLE

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