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St James' Church, Wick

Structural Appraisal of Tower – Update to 2006 Report

for

Rectorial Benefice of the Glamorgan Heritage Coast PCC

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1.0 Introduction

1.1 Background

1.1.1 St James' Church, Wick has Norman origins. Its west tower dates from the 15th century, but was altered by Pritchard in the 1870's. The church is listed Grade II*

1.1.2 In 2006, Mann Williams were asked to inspect and report on cracks in the tower. This report (project ref 4528) is attached as an appendix for reference.

1.1.3 The 2006 report concluded that there were various structural cracks and other defects, which merited further investigation, and suggested that depending on the outcome of the investigations, some stitching of the masonry might be required to restore its structural integrity.

1.1.4 As far as we are aware, no investigations were carried out, nor any repairs.

1.1.5 Since 2006, we understand that the roof finishes have been replaced, and it appears that some work was done to the copings of the side aisle walls at the west end.

1.2 Brief for 2020 inspection

1.2.1 Recently, Mann Williams were asked to return to site to review the condition of the masonry of the tower and update our report. This report is therefore to be read in conjunction with the 2006 report, and as an update to it. For the general arrangement of the structure, etc, therefore please refer to the earlier report.

1.2.2 Mann Williams carried out a visual inspection from ground level on 19th February 2020, in the presence of David Walke, church treasurer. Access internally was limited to the ground floor, and the hatch through the ceiling. As explained below, the hatch through the first-floor structure (which is separate from the ceiling) was entirely blocked by bird nesting materials, so no inspection of the upper section of the tower internally was possible.

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2.0 Inspection

2.1 External

2.1.1 From a visual inspection from ground level, there is little evidence of any deterioration of the masonry of the tower since 2006. There are no obvious new cracks or widening or lengthening of existing ones.

2.1.2 The most significant defects identified in 2006 were as follows:

2.1.3 West elevation – apparently rebuilt masonry with bulging section. There is no obvious sign of change here. See comparative images below.

2006

2020

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2.1.4 North elevation – significant vertical crack at high level – no discernible change to severity or extent

2006

2020

2.1.5 North elevation – degraded facing masonry – there is local evidence that this has worsened somewhat, with some loss of small facing stones leaving voids, and further fracturing of some of the larger facing stones. The deterioration is not severe, but it is present.

2006

2020

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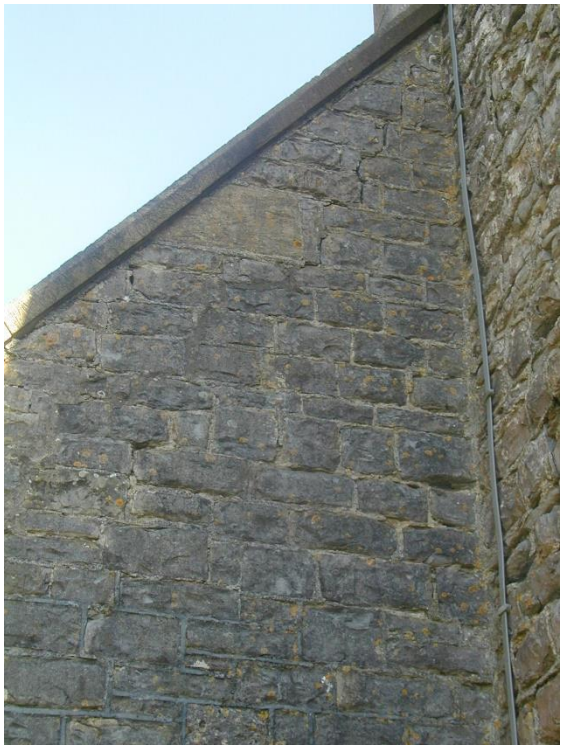
2.1.6 Cracks to north aisle return wall – there is no change detectable here. The copings to the wall head have either been re-set or pointed in as part of the recent roof replacement works.



2006

2020

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2.2 Internal

2.2.1 Access to the tower internally was limited. Ladder access allowed the hatch through the ceiling to be opened, but the hatch above through the first floor was entirely blocked with bird nesting materials. There is a considerable build up of this material on the ceiling.

2.2.2 There is quite significant fungal decay to the timber next to the wall supporting the first floor, and to the floorboards adjacent to the wall.

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3.0 Discussion and Recommendations

3.1 Comparison with 2006 report

3.1.1 The passage of 14 years since the previous inspection provides a useful perspective on the cracks and other defects in the tower masonry.

3.1.2 It is clear from comparison of images that little deterioration is occurring. Crack severity and extent appears largely unchanged, though there has been some deterioration of the area of degraded facing stone to the north elevation identified previously.

3.1.3 These findings suggest that none of the defects seen are progressive to any significant degree.

3.1.4 However, the underlying issues identified previously (such as cracks permitting water ingress into the walls, potentially causing subsequent damage, damp issues internally, etc) remain relevant.

3.2 Recommendations

3.2.1 The vertical crack at high level on the north wall remains the most significant defect, and the one with most scope for allowing water ingress and associated deterioration.

3.2.2 We therefore recommend that the wall is scaffolded, mortar joints raked out and stainless steel Helibar reinforcement inserted into the joints, which can then be made good. The cracks should also be made god by filling with lime mortar. This is a simple and cost-effective technique which should reduce the risk of cracks worsening here.

3.2.3 On the same wall, the section where the facing stone is badly degraded should be made good, by piecing in new stone and/or locally consolidating as required.

3.2.4 Internally, we recommend removal of the bird nesting material in the tower. If left in situ, it prevents access to inspect the rest of the tower, and the damp material piled on the ceiling will accelerate its decay. Once better access is available, the integrity of the first-floor structure should be checked, and if necessary steps taken to renew decayed elements. If left in its current condition, the decay present is progressive, and will lead to collapse of the floor structure, putting ground floor users at risk.

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Appendix 1

Structural Inspection Report from 2006

PROJECT NO. **4528**

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ST JAMES'S CHURCH
WICK

STRUCTURAL REPORT

P Ruddock BSc CEng MIStructE

MAY 2006

CONTENTS

1.0 INTRODUCTION

1.1 St James's Church, Wick is a medieval structure and is listed Grade II*.

1.2 The quinquennial report on the condition of the building recently prepared by Davies Sutton Architecture identified cracking and other defects in the masonry of the west tower.

1.3 Mann Williams were instructed by Mr Frank Holness on behalf of the PCC to prepare a structural engineering report, advising on the condition of the west tower and recommendations for remedial works.

1.4 The report relates to the particular items described in 1.3 above and is not intended to be a full structural survey of the building. The report is based on a site inspection from ground level on 05 April 2006.

1.5 No opening up works have been carried out to expose concealed details and no tests have been carried out to determine the properties or load-bearing capacity of structural elements.

2.0 FORM AND CONDITION OF THE EXISTING STRUCTURE

2.1 General

2.1.1 The structure is predominately of medieval origin, believed to date from the fifteenth century. The nave is reported to have been rebuilt by John Prichard in 1871. The building comprises a traditional church plan from east to west of chancel, nave, and tower with a porch to the south.

2.1.2 The principal structure comprises load-bearing random rubble stone walls with timber roof structures and slate roof finishes.

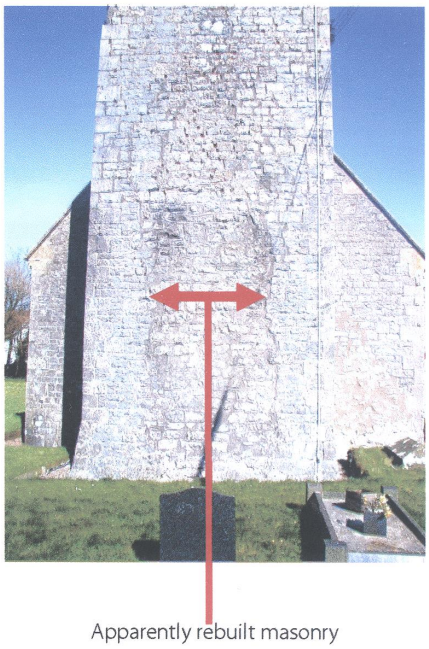
2.2 West Tower

2.2.1 The west tower measures approximately 3.6m square on plan and is approximately 10m high to the eaves. It has a steeply pitched roof with the ridge oriented east-west. The walls are around 900mm thick at the base reducing to approximately 600mm thick around 6m above ground level.

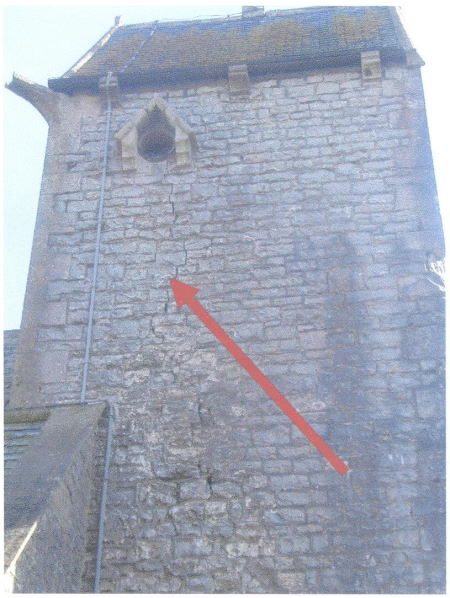
2.2.2 The tower is accessed via a door from the west end of the nave. There are slit windows at high level to the bell chamber.

2.2.3 Internally there are two levels: ground floor level and a timber joisted first floor. The first floor boards are rotten and unsafe. A single small bell is suspended at high level above the slit windows. There is a disused vitrified clay heating flue in the north east corner of the tower. The flue is around 400mm in diameter up to eaves level. Above this level the diameter reduces and the flue appears to exit through the ridge adjacent to the east wall.

2.2.4 The rubble masonry of the tower has been much altered. On all three principal faces (south, west and north) large areas up to approximately the mid-height of the tower appear to have been rebuilt. The rebuilt portions appear to comprise much of the three sides of the tower excluding the south west and north east corners. The entire tower, and the remainder of the church, has been pointed at various times with hard cement mortars. Some of the rebuilt sections of the tower are poorly constructed, particularly on the west face where the masonry bulges out by approximately 100mm relative to the remainder of the tower in a zone approximately 3m to 6m above ground level.



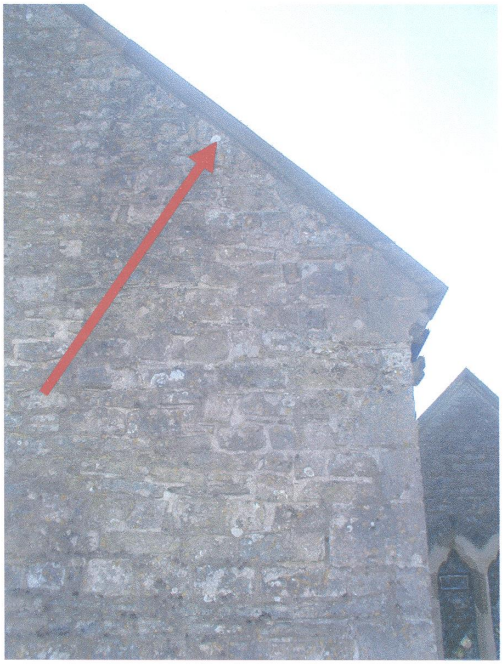
2.2.5 On the north face the area of rebuilt masonry has deteriorated significantly, losing the facing to the rubble stonework over an area of several square metres. At high level on this face there is a near vertical crack. The crack tapers from approximately 100mm near eaves level to zero at the top of the rebuilt section, a distance of around 4metres.



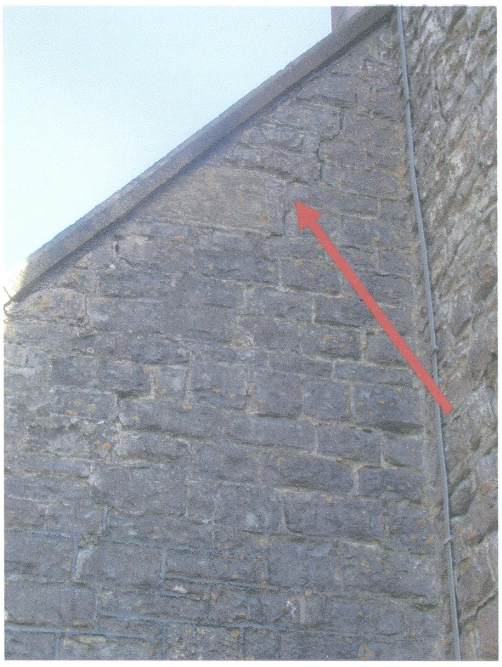
2.2.6 Internally, the tower is plastered up to the "first floor level" (approximately 3m above ground level). Above this the walls have been rendered with a rough cement render up to the point at which they reduce in thickness. The crack in the north wall is not visible internally although it may be concealed behind the heating flue.

2.3 Nave and Chancel Stonework

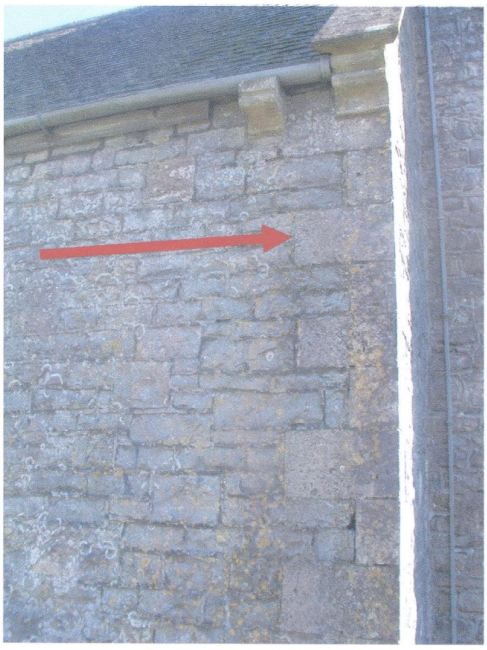
2.3.1 There are a number of cracks visible externally in the stonework on the corners of the nave and chancel. The crack patterns on the north west, north east and south east corners of the church are similar.



2.3.2 Diagonal cracking occurs on the gable walls roughly following the slope of the top of the gable, in some cases immediately below the dressed stone copings and in some cases a few courses lower down. The cracks extend on the western gable from the abutment of the nave roof with the tower almost to ground level. The cracks measure up to 5 -10mm wide locally at high level on the western gable but more typically 1 - 2mm lower down. In a number of locations the cracks are through stones, not through the mortar joints. The cracks are less extensive and less severe on the east gable.



2.3.3 Near vertical cracks are also present on the north wall adjacent the north west and north east corners. They roughly follow the joints around the dressed stone quoins although there are occasional cracks through stones. Typically the cracks are 1-2mm wide.



2.3.4 The cracks in the corners of the church are not obvious internally.

3.0 CONCLUSION

3. 1 West Tower

3.1.1 Overall the west tower is a massive rubble stone structure, made inherently robust by its proportions.

3.1.2 The masonry of the tower is in poor condition as a result of one or more poorly executed alterations or repairs. It is not clear why large sections of the walls were apparently rebuilt but the standard of workmanship of the facing stonework of the repairs is notably poorer than the remainder of the building. The condition of the rubble core of the walls, including in the apparently rebuilt sections, is not known.

3.1.3 The hard cement pointing is detrimental to the facing stonework, trapping water in the mortar joints behind the pointing and leading to potential damage due to freeze – thaw action. The effects of this are visible on the north face of the tower where a substantial area of facings to the stonework has fallen away.

3.1.4 The cause of the crack at high level on the north face is not apparent, and its severity is not clear as it may penetrate through the full wall thickness and be concealed by the heating flue on the interior. It seems unlikely that the flue or its fixings are the cause of the cracking but closer inspection at high level should reveal more here.

3.2 Nave and Chancel Stonework

3.2.1 The diagonal cracking following the line of the gable copings is likely to be related to water ingress at the tops of the walls. The copings may have been periodically renewed as they are more exposed to the weather than the remainder of the walls. If not properly bedded on the wall below they are prone to movement down the slope of the gable. Water ingress may also have affected ferrous fixings of the copings causing corrosion and damage to the masonry. The tops of the walls are also more exposed to thermal changes and less restrained by their mass than the body of the walls below.

3.3 Masonry Generally

3.3.1 In both the West Tower and the nave and chancel stonework, at least some of the defects identified above appear longstanding. They generate zones of weakness which reduce the robustness of the structure and leave it susceptible to further movement.

3.3.2 The cracks allow ingress of moisture into the core of the rubble walls which can further weaken the structure.

3.3.3 The masonry will continue to deteriorate if prompt action is not taken to consolidate the areas weakened by cracking.

4.0 RECOMMENDATIONS

4.1 General

4.1.1 The approach to the repair of the structure should reflect its Grade II* listed status. The key aspects of this approach are the use of materials sympathetic to and compatible with the existing structure, and where approriate the clear distinction between existing fabric and modern intervention.

4.1.2 Consolidation and repair of the damaged areas of masonry should be carried out. Local physical investigations of the fabric will be needed before the final repair details can be determined but the techniques to be used are likely to include "grouted sock" anchors, consolidation grouting, local masonry repairs and pointing.

4.1.3 Stainless steel "grouted sock" anchors are suitable for use in masonry of variable quality and can tie across voids caused by cracks or poorly filled rubble cores in walls. They can be arranged so as not to be visible on completion of the works.

4.1.4 Consolidation grouting with very weak "heritage" grouts can fill voids in the rubble core of the masonry walls and improve their robustness without introducing material which would be incompatible with the existing construction.

4.1.5 The extent and type of replacement pointing will need discussion with the architect.

4.2 West Tower

4.2.1 The junctions of the apparently rebuilt areas of stonework with the apparently older sections should be locally investigated by the removal of stones at the junction to attempt to determine the likely history of the alterations and if possible the condition of the rubble core of the wall.

4.2.2 Access should be provided inside the tower to allow the area of wall corresponding with the crack externally on the north face to be inspected.

4.2.3 Dependant on the outcome of these investigations, it is anticipated that "grouted sock" anchors will be used to tie across the junctions between the rebuilt and original areas of stonework and across the crack on the north face.

4.2.4 Consolidation grouting of the wall core and local masonry repairs, especially on the north face, should also be carried out where required.

4.3 Nave and Chancel Stonework

4.3.1 The coping stones should be locally removed from the north and south gables to investigate the presence of corroding ferrous clamps which may be causing the cracking in these areas. Although no cracking was noted to the masonry of the south west corner, it would be prudent to investigate the fixings of the copings here when the works are carried out to the other three corners.

4.3.2 Repairs of the cracked areas incorporating "grouted sock" anchors should be carried out and the copings replaced using non-ferrous clamps.

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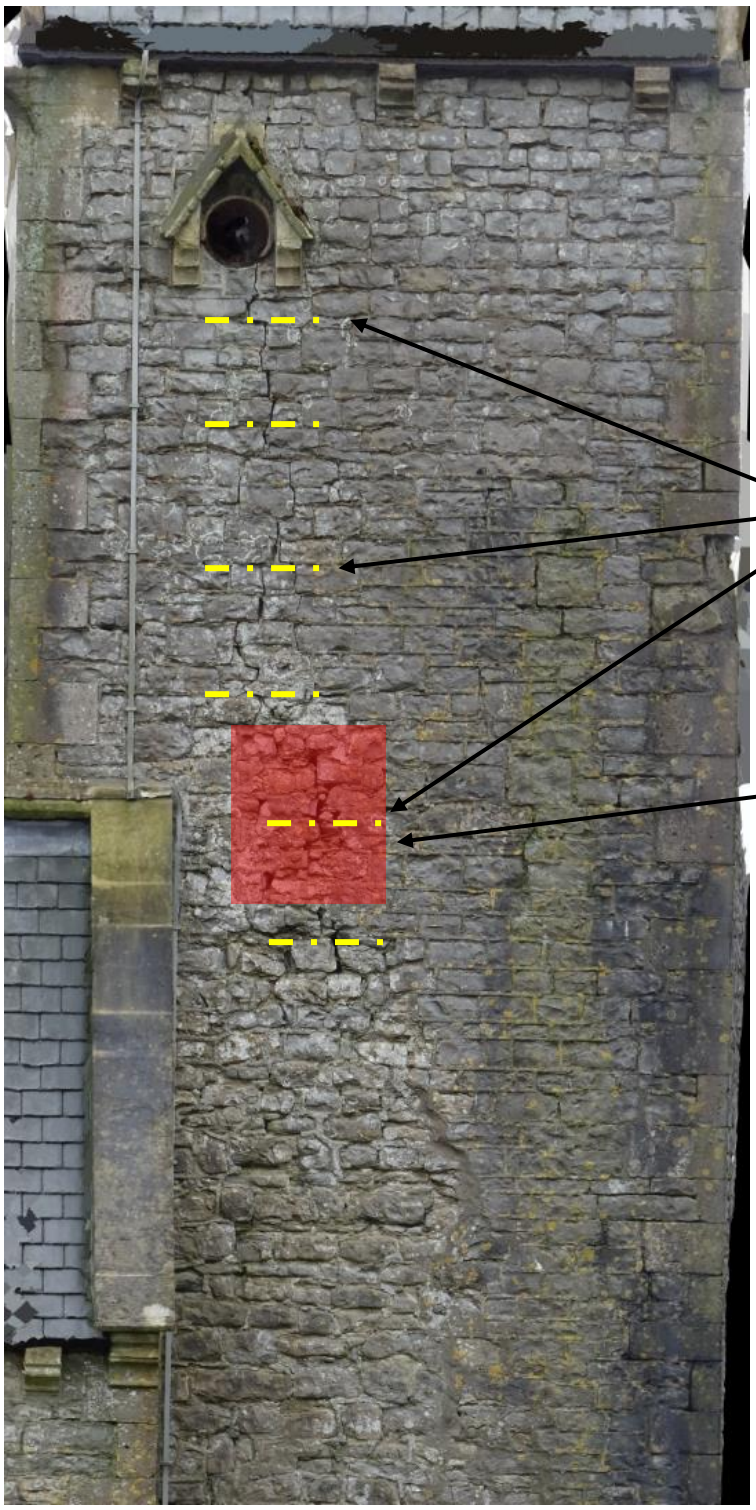
Appendix 2

Sketch of Proposed Repairs to North Wall of Tower



Stitch crack with 6 No 1m lengths of 6mm dia stainless steel Helibar reinforcement. Rake out mortar joints, insert proprietary grout and reinforcement and make good joint in lime mortar

Consolidate area of degraded facework, piecing in new stone to match existing as necessary, otherwise making good in lime mortar to match existing

North Elevation

Rev	Description	By	Date

Project
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WICK

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3) All dimensions are to be checked on site and any discrepancies reported to the engineer before work commences
4) Any ambiguities or discrepancies between this drawing and any other information given elsewhere must be reported to Mann Williams for clarification before work proceeds
5) All drawings to be read in conjunction with the project specification with all works carried out in accordance with the latest British Standards and codes of practice

Title
TOWER
NORTH ELEVATION
PROPOSED REPAIRS

Drawn	Chkd	Size	Scale	Date
PR		A4	NTS	FEB 20

Status
PRELIMINARY

Project	Drawing	Rev
10287	SK01	P1